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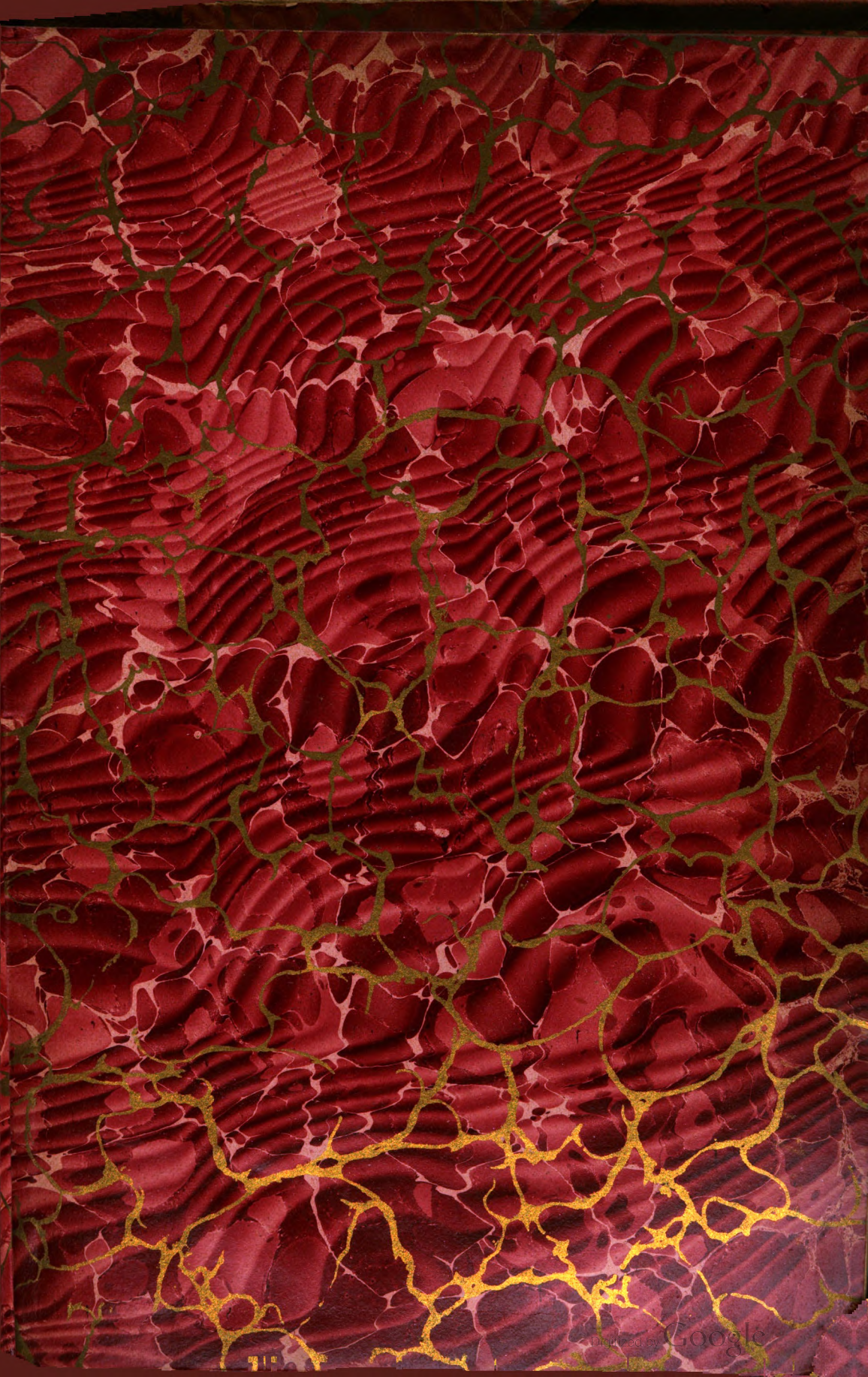
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JAR OR BATTERY SYSTEM FOR HATCHING FISH.

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REPORT

OF THE

DEPARTMENT OF FISHERIES

OF THE

COMMONWEALTH OF PENNSYLVANIA

FROM

JUNE 1, 1903, TO NOVEMBER 30, 1904.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA,
1905.

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DEPARTMENT OF FISHERIES

OF THE

COMMONWEALTH OF PENNSYLVANIA.

COMMISSIONER OF FISHERIES.

WILLIAM E. MEEHAN, Office, Harrisburg.

BOARD OF FISHERY COMMISSIONERS.

W. E. MEEHAN, President.
JOHN HAMBERGER, Erie,
HENRY C. COX, Wellsboro,
CHARLES L. MILLER, Altoona,
ANDREW R. WHITAKER, Phœnixville.

SUPERINTENDENTS OF HATCHERIES.

Corry Hatchery: WILLIAM BULLER, Corry, Pa.
Erie Hatchery: ABRAM G. BULLER, Erie.
Bellefonte Hatchery: HOWARD M. BULLER, Bellefonte, R. F. D. No. 2.
Wayne County Hatchery: NATHAN R. BULLER, Pleasant Mount.
Torresdale Hatchery: JOHN F. BNOWER, Assistant in Charge, Holmesburg, Philadelphia.

1—24—1904

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LETTER OF TRANSMITTAL.

Hon. Samuel W. Pennypacker, Governor of Pennsylvania:

Sir: It is with much pleasure that I submit this, my first annual report of the operations of the Department of Fisheries for the fiscal year beginning June 1st, 1903, and ending May 31st, 1904. The duties which were conferred upon me by the act of the Legislature and by you through your appointment of me as Commissioner of Fisheries have been very pleasant and I have endeavored to fill every obligation I undertook, when accepting the position.

To carry out the plans, formulating full operations of the Department, I have uniformly had the strong support and hearty cooperation of every member of the Board of Fishery Commission. In not a single instance has there been the slightest difference of opinion. All have united in forwarding the fishery interests of the Commonwealth. Wherever individual assistance has been asked, it has been given with a heartiness, which exhibited their devotion to the work.

From letters and newspaper comments from all parts of the Commonwealth there appears to be a strong public sentiment in favor of the enforcement of the fish laws and extensive expansions in the work of fish propagation, also cordial approval of the work which the Department has performed in the first year of its existence. It is especially gratifying to me that even a considerable number of those persons whom the Department was forced to proceed against for fishing illegally have expressed themselves as satisfied of the justice of the proceedings and avowed themselves hereafter as willing to uphold the fish laws and the Department of Fisheries.

I have endeavored to place all branches of the work of the Department of Fisheries on a firm business like foundation and to conduct it on business principles. I have been greatly hampered in performing my work thoroughly and to the best advantage by the meagreness of the appropriation to the Department of Fisheries. The appropriation was divided into three parts: $25,000 for general work, including the operation of the hatcheries, the office expenses and the expenses of the Commissioners; ten thousand dollars for the warden services and fifteen thousand dollars for the locating and erecting of two new hatcheries. The first sum named was the same as that which was granted the Fish Commission which preceeded the Department and which was only sufficient to operate three hatcheries. There are five hatcheries now to be operated on the same amount of money, plus whatever the State might receive as its share of fines and penalties for illegal fishing and from license fees on Lake Erie. To add to my difficul-

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ties, the work of the hatcheries was necessarily much extended, but not nearly the amount of work was accomplished, which could have been, had there been more money at command.

By carefully conducting the affairs of the Department on Lake Erie, I have been able to make that hatchery, under present conditions, nearly self-supporting, it being necessary to draw less than $1,500 from the general appropriation to supply the deficiency. The demands on the hatcheries from all parts of the State have been many times greater than the present ability to supply owing entirely to the financial stringency. There are at the present moment on file in this office at least two thousand applications for fish, which the Department was unable to fill during the year, and there were in addition to that nearly as many more applications made individually, which could not be filled. Moreover, I was unable in the applications which were filed to send as many fish as should have been and which were asked for.

In carrying on my work, I wish to express my hearty appreciation of the cordial assistance which was given by my office force. My clerk, Major Barton D. Evans, has exhibited intense interest in his duties and in their performance has been neglectful of time. He has been found regularly at his desk in the evenings as well as during the day, and during my frequent absences through the State on official business I have felt that the office was safe in his care. While his duties were not of such a varied character as those of Major Evans, yet I can give the same measure of praise to my stenographer, Williard R. Black. He too has exhibited an unselfish and warm interest in the Department and has always been at command when needed.

Before entering into detail on the work of the Department for the year, it may be well to lay before you in summary form some of the things which have been accomplished during the fiscal year.

The Department of Fisheries established June 1st, 1903.

Began the experiment of rearing whitefish fry in ponds, so that when planted they may take better care of themselves.

Hatched and planted nearly 100,000,000 of fish in Pennsylvania waters, including whitefish, lake herring, wall-eyed pike, blue pike, yellow perch, black bass, sunfish, goldfish, brook trout, lake trout and bull-frogs.

Established Bellefonte hatchery and had it in operation within four months.

Established a hatchery at Pleasant Mount, Wayne county, for black bass and interior lake fishes, and began the construction of the necessary ponds and buildings.

Induced the councils of the city of Philadelphia to turn over to the Department of Fisheries a tract of ten acres of land at Torresdale on the Delaware river for the propagation of river fishes and transferred the Bristol hatchery to this site.

Aroused public sentiment in the city of Philadelphia to a point where active steps are being taken to establish an aquarium in Philadelphia on lines similar to the one at Washington, D. C.

Took part in successful efforts for a convention of Fish Commissioners of Canada and States bordering on the Great Lakes for more nearly uniform regulations governing commercial fishing in those waters.

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Established the practice of sending out public bulletins, whenever there is anything of interest to those affiliated to the advancement of fish culture.

Introduced nursery ponds in the trout hatcheries the contrivance of one of the superintendents, thereby increasing the capacity of the State from two to three fold without appreciable additional expense, except for feeding the fish.

Introduced more economical and effective methods for the transportation of green eggs from the spawning grounds to the hatcheries.

Began the hatching of tadpoles with the idea of encouraging farmers to undertake frog culture, now known to be a coming valuable industry.

Undertook for the first time the culture of lake trout on a large scale, the eggs being gathered from wild fish from Lake Erie.

Undertook the propagation of goldfish for distribution in public schools for educational purposes.

Brought to a successful conclusion experiments of the Fish Commissioners in small mouth black bass culture.

Began experiment in rearing Atlantic salmon to maturity in ponds in the hope that fry could be bred therefrom for stocking the Delaware river.

Succeeded in forming a State organization of fish protective clubs and Associations in the various counties to give wider interest in fish protective work and to render greater assistance to the Department of Fisheries.

Re-organized the fish warden service and placed it on a more effective basis, with the result that the first year it was nearly self-supporting.

The Erie hatchery was made nearly self-supporting from the collection of license fees from fishermen on the lake.

Began the re-organization of the constable service in the capacity of these officers as ex-officio fish wardens.

Conducted experiments for the extermination of German Carp from the waters of the Commonwealth, as a dangerous and destructive fish.

Projected and began work on twenty-five new ponds at the various hatcheries for breeding fish.

I am sir, with much respect, your obedient servant,

W. E. MEEHAN,
Commissioner of Fisheries.

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REPORT OF THE BOARD OF FISHERY COMMISSION.

To the Hon. Samuel W. Pennypacker, Governor of the Commonwealth of Pennsylvania:

Sir: The Board of Fishery Commission have the honor to submit this, their first annual report.

The members, appointed with Mr. Meehan, the Commissioner of Fisheries, on June 2d, 1903, organized as soon as possible thereafter. Recognizing that the bulk and responsibility of the work would fall upon Mr. Meehan, we were yet anxious to assist him by every means in our power to further the great and important work with which we were charged.

One of the important functions which arose almost immediately was the establishment of the two new hatcheries authorized at the previous sessions of the Legislature. The sum of $15,000 had been appropriated. This, it was felt, was insufficient to complete the two places and we accordingly advised the Commissioner to divide the money as nearly as possible and to equip the two hatcheries to a point that they could be operated at as early a date as possible.

Mr. Meehan had selected a site near Bellefonte, in Centre county, for a trout station to take the place of the dilapidated hatchery at Allentown, which we decided should be abandoned, because it was leased property and because the purchase price asked, we considered entirely too high, and also because it was impossible to propagate fish at the Allentown hatchery on a scale which would meet the ever increasing requirements of the people. Citizens of Centre county presented a large tract of land, but there was no dwelling house or barn on the property and both are essential to a successful carrying on of the work of the hatchery. The Superintendent must of necessity dwell on the site, and the assistant should also. Furthermore, we found that there was a restriction on the spring on the property. The restriction did not in any wise hamper the Department in its work of fish culture, but it was recognized that it could cause some annoyance. The person who held the water-right claim owned the adjoining tract and there was a dwelling house and barn thereon. We recommended that the tract, including the buildings, be purchased and at the same time get rid of the water restriction. While the water supply of the spring was ample for the hatching house and for a large number of ponds, we felt it would be better to have the supply augmented from another source and the Board recommended that another source be found. The property mentioned was purchased for $2,600, and a ninety-nine year lease at $50 a year was entered into, which gave us the right of the use of the water from the Logan Branch Run through an old mill-race. By this means fully 8,000 gallons of water a minute was added to the supply of the hatchery and it became possible if desired to flood every foot of the hatchery grounds.

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The Commissioner located a second hatchery at Pleasant Mount, Wayne county, and as was the case in the site near Bellefonte, Centre county, a large tract was given free of cost for hatchery purposes. Like Bellefonte there were no buildings and the Board recommended the acquirement as soon as possible of an adjoining tract which would supply the want. This was done in October, 1904, by the purchase of four acres of the Freeman estate for $2,000. There is a large house and a barn, and a couple of smaller buildings on the property, and in addition to this advantage the Department secured some valuable water rights in two large springs on an adjoining property, which water rights went along with the Freeman property.

As there has been a great and growing demand for black bass and other fishes in addition to brook trout, it was decided to make the hatchery at Pleasant Mount, which was named the Wayne County Fish Hatchery, a station for the propagation chiefly of that type of fish with brook trout only as in incident. The Commissioner of Fisheries in his report has given a full description of what has been accomplished.

With the approval of the Board the hatching house at Bristol, which was on leased ground was transferred to a property at Torresdale, turned over to the Department at a nominal rental by Philadelphia. There are ten acres in this tract and it is proposed here in addition to shad to raise black bass, white perch and other food fishes and game fishes, among which brook trout are not included, the water not being suitable. The Board feels that in the Bellefonte and Wayne county properties the State has acquired two exceedingly valuable sites for fish hatchery purposes, and when there is money enough to complete them, they will be the largest and finest of the kind in the country. There is practically no limit to the number of brook trout which may be raised at the Bellefonte hatchery, and the little building at the Wayne county hatchery, by the new method introduced, can turn out more trout in one year than the old Allentown hatchery could in two years. The water supply of the Wayne county station is of such a character that the output of other game fishes should in the future be very large.

One of the important duties assigned to the Board of Fishery Commission is to gather statistics of the fishery industry of the State. At the present, owing to the poverty of the Board, its opportunity for fulfilling this duty was limited. But it did what it could. It detailed one of its wardens to gather the figures of the fishing industry of Lake Erie. These figures show that during the year 1903 the total amount of fish caught off the city of Erie and along the Pennsylvania shore of the lake was as follows:

Herring,	5,330,000	lbs.
Blue pike,	1,964,900	lbs.
Whitefish,	36,500	lbs.
Mixed fishes,	247,000	lbs.
Total,	7,280,500	lbs.

The value of these fishes is about $300,000. During the year 1902 the fish caught was about double this amount, due to unfavorable

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weather conditions in the lake in 1903. The few whitefish caught is accounted for, because only a few boats were fishing for them with their big mesh nets. Tugs don't get up whitefish (big mesh) nets anymore; and what big mesh nets were around the last two years were mostly used up in fishing for large herring, which the fishermen think is more profitable than to go after whitefish exclusively. There is a strong evidence that the number of whitefish is increasing, owing to the work of artificial hatching done by Pennsylvania and the United States. The fishermen all agree that in a few years the whitefish will be once more sufficiently plentiful to warrant the use of whitefish nets.

In catching the 7,280,500 pounds of fish the following nets and boats were used:

Forty-five pound nets, 72 trap nets, 65 steam tugs with gill nets, 12 sail boats and 6 gasoline boats with gill nets.

The value of these boats is as follows:

65 steam tugs, @ $4,000,	$260,000
12 sail boats, @ $300,	3,600
6 gasoline boats, @ $600,	3,600
84 boats valued at,	$267,200

The steam tugs registered at Erie cost all the way from $3,000 to $10,000 each, and there is one fine steel tug that cost $12,000.

The value of the gill nets used by the 83 boats was about $160,000. In their manufacture the fishermen used mostly number 35-2 cord linen, 3½ inch mesh (stretched) and four inch mesh. There was considerable cotton twine used the last two years, but the fishermen are going back to the linen again, as the cotton is not strong enough and wears out too quick, and it is not as nice to handle as linen.

Each boat had about five miles of gill nets in the lake all the time, with about the same amount on the reels to dry. The whole fleet had about 400 miles of gill nets in the lake all the time. There were about 350 men employed on these boats, and about 100 men in the fish houses, as dressers and packers.

The men employed on the tugs and in the fish houses all belong to organized labor. The captains and the engineers belong to the L. T. P. A. (Licensed Tugmen's Protective Association). Their pay for 1903 was $105 a month for the captains and $100 a month for the engineers. The fishermen belong to the Gill Net Fishermen's Union, and they worked on shares. The owner took the captain's and the engineer's shares and paid them their respective wages. For instance, if a boat carried a captain, engineer and four fishermen, and caught $380 worth of fish in a week, one-half or $190, was divided into six shares of $31.67 each, then the four fishermen would get $31.67 each, the captain $24.50 and the engineer $23.33, leaving the owner the balance of $205.49. But if the boat only caught $100 worth of fish a week, each fisherman would get one-sixth of $50 or $8.33, the captain $24.50 and the engineer $23.33, which would leave the owner $18.85.

Owing to the fact that some of the men on board the boats work the nets on shares, it is difficult to summarize the amount accu-

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rately of the money paid out last year, as wages or stipends. The wages of the men on the boats aggregated about $150,000. The value of the total catch was $300,000, and, according to the way the fishermen were paid on the share system the crew received about one-half the value of the whole amount caught.

Now the value of $300,000 for the 7,280,500 pounds of fish caught was based on the price received by the fishermen who own their boats and nets. There are about twenty independent boats that are owned and operated by different fishermen and they sell to the dealers in Erie. This value was also the basis on which the men on shares were paid. It averaged about 4 12-100 cents a pound.

Of course the Erie dealer or wholesaler sold fish at an advance and the retailers in Pittsburg, Cincinnati, New York and other places were obliged to sell at a still higher price. The retailers must have sold their stock at least 11 cents a pound, thus when the 7,280,500 pounds of fish reached the consumers the value was about $800,855. It must be remembered that this statement of the catch and its value applies only to the fish caught from Lake Erie within the jurisdiction of the Commonwealth of Pennsylvania. When this statement is made some faint idea may be gathered of the great importance of the entire fish industry of Lake Erie.

The dressers in the house belong to the Fish Dressers' Union, and they receive $2.50 a day. The twine is strung by the "Twine Stringers' Union," composed mostly of the wives, daughters and relatives of the fishermen. They get from 30 cents to 50 cents a pound, according to the fineness of the twine strung.

The warden accompanied the data by other exceedingly interesting information and the Board decided to issue his report in the form of a bulletin, entitled "The Fishery Industry of Lake Erie. Bulletin No. 1." The Board decided to do this not merely because of the value of the material furnished by the warden, but because the issuance of such bulletins also was part of the duties of the Board.

Subsequently, when it was decided that there should be an exhibit of the fisheries at the World's Fair it issued a second bulletin on "Pennsylvania's Fish Culture Work from the establishment of the first Fish Commission to the beginning of the work of the Department of Fisheries." The Board decided not to issue bulletins regularly, but only when something of more than ordinary interest arose. Hence the two bulletins mentioned are all that had been published since the Department was organized. At the last session of the Legislature a measure was enacted authorizing the catching of eels upon the procuring of a license to do so, by means of what are commonly known as fish or eel baskets.

As there had been a great deal of discussion over the value of the eel industry in Pennsylvania the Board considered it advisable to secure, if possible, some data on the subject and this was made possible by the act just noted. A warden was therefore appointed to visit all the licensed baskets and procure all the data possible. We regret to say that the work was not done in a thorough manner, although it is only just to say that the warden labored under considerable difficulties. A large number of the licensed men did not understand the purpose of the inquiry. They are suspicious of the intention of the warden's visit. There were in all 206 licenses issued and of these the warden either only visited 65 licensees or se-

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cured data from that number only. From the figures obtained it appeared that 65 baskets caught 44,750 pounds and the prices received ranged from seven to twelve cents a pound. At seven cents the value of the eels reported as captured would be $3,132.50. Assuming the same ratio for all the other baskets the catch of eels in the baskets in 1903 would be 141,308 pounds and at seven cents a pound their value would be $9,891.56. It thus became apparent that the eel industry is a valuable one and should be encouraged, although there is no gainsaying the fact that the eel basket is a dangerous device. In all fairness to those who used fish baskets last year it should be said that indications point to the fact that the majority took out the license.

Although the wardens exercised considerable diligence the number of arrests made for illegally using fish baskets was only 56 arrests made last year. Of course, the Board recognizes the fact that these were not all. There were many men who failed to take out a license and who managed to escape the vigilance of the wardens. For example, there were thirteen wingwalls on the North Branch of the Susquehanna at Nanticoke, to which nets were attached. The warden captured the nets, but failed to secure the men. It transpired since that the wingwalls were all owned by seven men and they were all captured this summer and punished. The punishment of those who were captured last year had a wholesale effect and this year the number of licensed baskets considerably exceeded that of last year.

The warden assigned to the duty of gathering statistics concerning the eel industry gained some valuable information for the Department. For example, he found that the act authorizing the use of the fish basket had created a strong sentiment along the Susquehanna Valley in favor of the Department of Fisheries and the maintenance of the fish laws. A large number of the men who followed fishing as a calling, realizing that licenses gave them a protection which they never had before strongly advocated the licensing of all devices used in commercial fishing and the enactment of a measure, which will make fish stolen from such licensed device the subject of larceny.

While the figures gathered and the estimates indicated a large and valuable industry, they cannot be taken as the real value of this fish to the Commonwealth. From the data gathered by the warden it is evident that in favorable years the catch would be enormously increased, seeing that the catch of 1903 was abnormally small.

About the time it became lawful to catch eels by means of eel-baskets the Susquehanna valley was swept by a series of heavy rain storms, so that with the exception of a comparatively few nights the baskets could not be operated. From the allegations of the licenses of the baskets there were but three in the Susquehanna river which were operated at a profit. All the others claim to have lost money. Two of the men claim that they each caught 4,000 pounds, whi'e the third man caught 3,000 pounds in a single night. The season's work did not average more than 1,000 pounds to each basket. Some were as low as 100 pounds. One or two baskets in the tributaries of the Susquehanna were reported as having been operated profitably.

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The Board feels that the Department does not possess adequate means for the protection of the fishes of Pennsylvania. The appropriation is so small that despite the utmost care it is almost impossible to make both ends meet. It was helped somewhat by the moneys received from the licensing of eel baskets, a sum amounting in 1903 to $1,030. The Board had hoped to be able to augment the amount available by the money received from fines for illegal fishing, but the needs of the hatcheries were greater and the bulk of that money had to be employed to eke out the small appropriation for fish propagation. The Board feels that at least double the amount appropriated for the two years is necessary to carry on the fish protective work of the State to good advantage. That is clearly shown by the work performed by the wardens during the last two years. Effective as their work was they yet merely scratched the surface. For every man who was captured for illegal fishing at least twenty escaped.

In concluding this report the Board desires to express its gratification at the strong public sentiment which has been aroused in all parts of the Commonwealth in favor of the enforcement of the fish laws and in favor of a greatly increased propagation of fish for planting in the streams and lakes.

The above is respectfully submitted.

W. E. MEEHAN,
President.
HENRY C. COX.
JOHN HAMBERGER.
CHARLES L. MILLER.
ANDREW R. WHITAKER.

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REPORT OF THE COMMISSIONER OF FISHERIES.

The Department of Fisheries was created under an act of the Legislature approved April 2d, 1903. It took effect on the first Monday of June of the same year. The act creating the Department reads as follows:

"An act to establish a Department of Fisheries, to provide for its proper administration, and to provide for the protection and propagation of fish by the Department of Fisheries.

"Section 1. Be it enacted, etc., That there be and is hereby established a Department of Fisheries, to consist of a Commissioner of Fisheries and four other citizens of the Commonwealth, who together shall constitute the Fisheries Commission, each of whom shall be appointed and commissioned by the Governor, by and with the consent of the Senate; the Commissioner of Fisheries, for a term of four years, two of the said citizens for a term of two years, and two of the said citizens for a term of four years; and thereafter all appointments shall be made by the Governor, by and with the advice and consent of the Senate, for a term of four years. The persons so appointed, before entering upon the discharge of their duties shall each take and subscribe to the oath of office prescribed by article seven of the Constitution of Pennsylvania. The Commissioner of Fisheries, and the Fisheries Commission, so appointed, shall be clothed with all the powers heretofore conferred by law, respectively, upon the Board of Fish Commissioners, so far as the same are consistent with the provisions of the act.

"Section 2. The Commissioner of Fisheries shall be the president and executive officer of the Fisheries Commission, and shall also be chief superintendent of all hatching stations and fish-cultural establishments belonging to the State; and he shall have full control and management of all such establishments, now existing or which may hereafter be established; and he shall have full control, direction and management of all fish wardens or water bailiffs; and he shall assume full charge of the work of the enforcement of the laws relating to the protection, propagation and distribution of fish; and all fish-wardens, constables, police, sheriffs and guardians of the peace, shall make prompt report to him of all cases of violation of the laws relating to fish.

"Section 3. It shall be the duty of the Fisheries Commission to encourage and promote the development of the fishery interests of the State, and to obtain and publish information respecting the extent and the condition of the fisheries of the Commonwealth, and to make all rules and regulations for the enforcement of all laws designated for the protection, extension and propagation of fish; and it is empowered to employ such legal and other service as may be

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necessary for the protection of fish, and for the apprehension and punishment of persons who may violate any of the laws relating to fish, or any of the rules and regulations which, under the powers herein given, may be adopted by the said Commission.

"Section 4. The Commissioner of Fisheries shall receive a salary of three thousand dollars per annum, payable quarterly by warrant drawn by the Auditor General on the State Treasurer, and in addition thereto shall be reimbursed for all necessary expenses incurred by them in the performance of the duties of their office.

"Section 5. The Fisheries Commission shall have an office in the State Capitol, and it shall be the duties of the Board of Commissioners of Public Grounds and Buildings to provide, from time to time, the necessary rooms, furniture, apparatus and supplies for the use of the Department of Fisheries, created under the provisions of this act.

"Section 6. The Commissioner of Fisheries shall have the power to employ one clerk, at a salary of twelve hundred dollars per annum; one stenographer at a salary of six hundred dollars per annum, said salaries to be paid monthly, by warrants drawn by the Auditor General on the State Treasurer.

"Section 7. This act shall take effect on and after the first Monday of June, one thousand nine hundred and three.

"Section 8. That all acts or parts of acts inconsistent with the provisions of this act be and the same are hereby repealed.

"Approved—The 2d day of April, A. D. 1903.

"SAML. W. PENNYPACKER."

My appointment as Commissioner of Fisheries took effect on June 2, 1903. With me were associated as the Board of Fisheries Commission, John Hamberger, of Erie, Henry C. Cox, of Wellsboro, Andrew R. Whitaker, of Phoenixville and Charles L. Miller, of Altoona. The first two named and myself had been members of the Fish Commission, which was replaced by the Department.

I appointed Major Barton D. Evans as clerk and by virtue of his office he became Secretary of the Board of Fishery Commission. I also appointed Williard R. Black, stenographer. Temporary quarters were provided for the Department in Number 26 North Third street, room 26. My first duties, of course, were to organize the office, and this was accomplished very speedily, the routine work running smoothly within a month.

The Fish Commission at the time of its being replaced by the Department of Fisheries had three hatcheries in operation and one which had not been operated for some time on account of a lack of funds. These hatcheries were as follows: A lot in the city of Erie 165 x 165 feet, containing a building and three small ponds, all the property of the Commonwealth. It is known as the Erie hatchery and is for the propagation of lake fishes exclusively.

A lot containing about 19 acres, two miles outside of the city of Corry, containing a dwelling house, a barn, three hatching houses and about forty ponds, also the property of the Commonwealth. The hatchery which is known as the Western Station was for the propagation, chiefly, of brook trout.

A lot containing nineteen acres at Allentown, having thereon a dwelling house, two hatching houses and about thirty ponds for the

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A careful survey of the Bristol hatchery and its surroundings convinced me that the station was not in a suitable location. It was nearly eight miles from the nearest shad fishery. There was absolutely no room for expansion or for any other work, excepting shad and sturgeon, and possibly to a limited extent for white perch. At this juncture through the efforts of Hon. Henry F. Walton, Speaker of the House of Representatives, who was chairman of the Executive Committee of the Pennsylvania Commission to the Louisiana Purchase Exposition, a proposition was submitted to the officers of the city of Philadelphia to preserve the fish exhibit at the World's Fair by turning it over to that municipality. In order to accomplish this it was suggested that a fish hatchery be located on the Delaware river within the limits of the city of Philadelphia for the purpose of hatching shad and other river fishes. The Bristol hatchery having been practically abandoned on account, partly, of its undesirable location was transferred to the proposed new site, a tract of ten acres of land at Torresdale. Here there is, in addition to the river, a fine stream of water, two good springs and every facility for work on a scale which would only be limited by the amount of money which could be expended and which should yield an output equal to, if not exceed, that at the Erie Station, which varies from sixty to one hundred million fish a year. As soon as the papers were drawn up and signed by the Department of Fisheries and the city of Philadelphia, the lease of the ground at the Bristol hatchery was cancelled and the buildings moved to the new site, but too late for this season.

An item in the general appropriation act provides the sum of fifteen thousand dollars for the erection of two hatcheries for the propagation of fish, one to be located in the central part of Pennsylvania and the other in the eastern part. A large number of properties were offered—some at absurdly high prices. But a number of people in the various counties recognized the advantage of having a hatchery located in their midst and these offered sites for the inspection of the Department of Fisheries, and the persons extending the invitations offered as an inducement all the land necessary for hatchery purposes to the State free of all cost.

The Department had determined in locating the two hatcheries, to do so with a view of having one chiefly for trout to take place, as before mentioned, of the hatchery on the leased property at Allentown, and to set aside the other station principally for the propagation of black bass and other important game fishes and with trout only as an incident.

After inspecting a number of eligible places the Board of Fishery Commission finally selected a site at Pleasant Gap, four miles from the town of Bellefonte. There was one large spring and one small spring on the premises. Logan Branch creek flowing many thousand gallons of water a minute, with headwaters less than one-fourth of a mile away, and with a maximum temperature for the summer of fifty degrees, runs close beside the grounds. Citizens of Centre, Clearfield and contiguous counties purchased eighteen acres of land and kept their part of the agreement by presenting it to the State. Subsequently Col. Edward Pruner, who owned what was known as the Hartranft farm, presented three acres in addition for the purpose of the propagation of black bass. The grounds, how-

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ever, had no buildings on it and consequently the Department purchased about two acres of land with a house, barn and a small spring, making a total of twenty-three acres of land, nearly all of which could be used for hatchery purposes. The site was definitely chosen on July 21st and on August 4th the deeds were turned over to the Department of Fisheries. Within two days thereafter ground was broken. A hatching house one hundred and twenty feet long and thirty-five feet wide, capable of holding one hundred and five double hatching troughs and ten nursery ponds thirty feet long and ten feet wide were built, and the third week in October the establishment was ready for operation. I take considerable pride in the speed with which this work was accomplished. Usually it required nearly a year to put a station in readiness for work. But the Bellefonte hatchery, as the place was named, was in operation in a little over three months after the deeds were turned over.

The supply from the springs on the ground was augmented by water from the Sugard spring about one hundred yards away, the owner having generously given the right to use it. But this water was not sufficient to do more than supply the hatchery and about eight or ten ponds. Consequently a ninety-nine years' lease was entered into with Mr. Simon Hoy by which the right to carry water from Logan's Branch Creek was obtained, so that the Department now has at its disposal at least eight thousand gallons of water a minute, a supply that can flood every part of the spacious grounds.

The Bellefonte hatchery is nearly one-half mile long and about midway there is a railroad station adjoining the premises. The Pennsylvania Railroad also ran a siding on the hatchery grounds at cost and the citizens of Centre county erected a building over a portion of the track as a barn in which to house the Department fish car "Pennsylvania." Hence for the first time in the history of the fisheries of Pennsylvania the State has a hatchery from which fish can be shipped without any highway haul whatever.

At the close of the year 1904, in addition to the hatchery building and the ten nursery ponds there have been constructed nine large ponds for breeding purposes, capable of holding about twenty thousand brook trout and one large pond for gold fish. In addition to the brood fish which were transferred from Allentown, the Department of Fisheries purchased several thousand yearlings from a commercial hatchery in the State. The United States gave two thousand yearlings and the Blooming Grove Park Association presented about as many more, adding about ten thousand fish to the fish of this character in the new hatchery.

A few days after the selection of the Bellefonte hatchery the Board of Fishery Commission located the second hatchery at Pleasant Mount, Wayne county. The ground selected covered about sixteen acres on the headwaters of the Lackawaxen river. All but about three acres were owned by Miss Alice Stirling. Two were owned by Mr. John O'Neill and about an acre held under deed to Miss Stirling was not in clear title, a family named Mumford apparently having some claim, but all three, namely Miss Alice Stirling, John O'Neil and the Mumfords presented the land to the State for a fish hatchery and gave deeds thereof without cost. Unfortunately this property did not reach a dedicated road. To correct this

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difficulty the Mumfords, Mr. O'Neil and Mrs. Freeman opened and dedicated a road from the public highway to the hatchery grounds and that without cost to the State.

As was the case at the Bellefonte hatchery there were no buildings on the grounds. A barn and a dwelling were absolutely necessary and when the opportunity offered the Department purchased for the sum of $2,000 a tract of land adjoining and extending to the highway. The tract embraces about four acres of land with a large twelve room house and frame barn thereon, besides several small buildings.

The State owns, therefore, in this hatchery about twenty acres of land unusually well suited for hatchery purposes.

There is a pitch from one end to the other of about twenty-five feet. The Lackawaxen at that point, a large and fine trout stream flows through the grounds. There are also a number of small springs, one of which has a capacity of about four hundred gallons of water per minute—water having a temperature of forty-seven (47) degrees.

By the purchase of the Freeman property the Department also secures the water-rights from two other springs with an aggregate of about four hundred gallons of water per minute of the same temperature. The property was secured too late to begin any work before the close of the year. Plans, however, were prepared and work begun on the 15th of July.

A contract was awarded for the erection of a hatchery house for brook trout, to be located close to the main spring. The hatching house is sixty feet long and thirty feet wide and fitted up with twenty-four of what are known as the Clark-Williamson troughs for the hatching of trout eggs. The design at this hatchery is to care for the fry in ponds in the open air and with that end in view a number of nursery troughs have been built below the house. Although the house is so small, by using the Clark-Williamson troughs the building will have a capacity for over seven million eggs.

The plans also call for the construction, as quickly as possible, One pond containing one and a quarter acres, one of an acre and a third and one three-quarters of an acre, in addition to the three ponds for yellow-perch, each 150 by 45 feet, three ponds for trout fry, four ponds for breeding trout and one pond for pickerel, besides a small pond for the holding of carp with which to feed the breeding bass and pickerel.

The topography of the grounds is such as to render the building of the ponds at a very small expense, much less than such ponds usually call for. I regret to say that the appropriation of $15,000 will not be sufficient to complete the two hatcheries, but it will be sufficient to put them both in good working order, as will be noted in the proper place.

It was at first decided to call the station in Wayne county the Pleasant Mount Fish Hatchery, but because of the Pleasant Gap Station at the Bellefonte Hatchery, so much confusion was caused that the name was changed to the Wayne County Fish Hatchery. The station is situated three miles from the railroad station, which is as near as is ordinarily possible to get. The road leading thereto, however, is in very good condition, but hilly.

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I cannot draw attention too strongly to the public spirited action of the citizens who presented land with which to build the Bellefonte and Wayne County Hatcheries. It so often happens that when the Commonwealth desires any land the people interested in the sale seemed to think they should receive two or three times the amount they would ask private individuals. But here we have a group of men and women who feel that they should do something towards the glory and benefit of the Commonwealth, and who, instead of asking excessive prices present without one dollar of cost, the necessary land, and who assisted in many other ways in making the new hatcheries a success.

It may be said that the establishment of the fish hatchery is a benefit to the community, in which it is located. While that may be true to a limited extent, it in nowise lessens the degree of generosity of the donors. Indeed in the case of the Wayne County Hatchery had the persons who gave the ground consulted their own personal feelings they would probably not have sold the property for hatchery or any other purposes for any sum. The greater part of the property was designed by the original owners for a private pleasure grounds and the motive which led to the gift was purely one of public spirit. I refer particularly to Miss Alice Stirling and her parents, Mr. and Mrs. Amos Stirling who joined with the daughter in making the gift.

The Blooming Grove Park Association presented nearly four hundred large trout with which to stock the Wayne county hatchery ponds. The United States Bureau of Fisheries contributed four thousand yearling brook trout and four thousand yearling California trout. The Wildwood Club of Wayne county gave two hundred large pickerel and fifty large perch. In addition the Bellefonte, Corry and Erie Hatcheries sent many thousand yearling trout, black bass, rock bass and yellow perch, so that the ponds were well stocked with breeding fish.

While the work of locating and starting the new hatcheries was in progress the work of putting the Corry Hatchery buildings into good shape and building additional ponds was taken up.

As the appropriation for hatchery work was limited, only repairs of the greatest urgency could be undertaken. Number one hatching house was in the worst condition, being in danger of falling down on account of the rotton sills. The building was put in thorough repair and the work done with a view of permanancy, terra cotta being used instead of the old wooden sills. Some repairs were also made to number two house, but nothing like the work was done there that ought to have been. The worst of the ponds were overhauled and terra cotta or cement walls built in place of board sides and it is my purpose to replace, as rapidly as the funds will permit, all the board sidings with cement or tile walls.

In addition to repairing old ponds I caused five new ponds to be built, three for very large trout, and two for yearlings having a capacity of about twenty thousand in all and just before the closing of the year the construction of five more well begun. Number three hatching house was also completed.

The Corry Fish Hatchery is undoubtedly the most beautiful of all the stations, under the control of the Department of Fisheries.

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Nearly the entire site is dotted with handsome deciduous and evergreen trees and most of the forty-five completed ponds are within the shade of these trees. With the exception of a portion purchased by the Fish Commission three or four years ago the Corry Fish Hatchery presents the appearance of a lovely park. There are handsome and well-kept lawns, beds of flowers, rough bridges, well graveled walks, seats and pavilions for visitors. Indeed the place is regarded as a park by the people of Corry, and it is estimated that over fifteen thousand people visit the place every year. A visitors book was placed on the grounds in the spring and many hundreds of persons registered. Nearly as many more, it is estimated, neglected to do so. Among the names to be found on the book are many who reside in distant states and having business within twenty or thirty miles of Corry, Pennsylvania, paid the place a visit.

Nothing can better illustrate the interest which people are taking in fish culture than the crowds which visit the hatchery at Corry. There have been as many as two and three hundred on a Sunday afternoon.

The capacity of the Corry hatchery for taking eggs can be quadrupled, although the capacity of trout fry has very nearly been reached. Two of the hatching houses can care for four million trout fry. Number three house itself can take care of nearly two million, but owing to the lack of facilities elsewhere, number three house is devoted to lake trout work, an industry which was started on a large scale for the first time last fall.

Late in October or the beginning of November, 1903, the Department received word that the fishermen of Dunkirk would give all the lake trout eggs to Pennsylvania on the single condition that a proportion of the fish hatched should be planted in Lake Erie on their fishing grounds. As this was a fair proposition the Department agreed, naturally, since many of our Pennsylvania fishermen draw their nets in that locality. It is estimated that the take of lake trout eggs at Dunkirk often reaches ten or twelve millions a year, but unfortunately the Department received word too late in the season to get the full supply. But nearly a million and a half were gathered and placed in the hatchery. Over a million were produced, six hundred thousand of which were planted near Dunkirk. About two hundred thousand were planted on the depleted trout beds near the city of Erie and the remainder in suitable inland lakes of the Commonwealth. In addition to the eggs enumerated the United States Bureau of Fisheries sent 200,000 surplus eggs of lake trout, and all trout which were hatched were planted in Lake Erie. This fall the bureau sent 1,000,000.

I regard the beginning of this work of lake trout culture on a large scale with eggs from wild fish as being one of the very important efforts of the new Department of Fisheries. The Lake trout industry in Lake Erie is a valuable one, where the fish are still abundant. The beds within the jurisdiction of Pennsylvania have become so thoroughly depleted that they no longer are profitable. By planting heavily there is every reason to believe that in a few years the Pennsylvania industry can be restored. I am also of the opinion, which opinion is founded on some encouraging results, that the lake trout can be firmly established in a number of the larger

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and deeper inland lakes of Pennsylvania, especially in the northeastern part—Wayne, Susquehanna, Pike, Monroe, Luzerne and Lackawanna counties. As the lake trout is what is known as the "bottom fish," that is to say, a fish which lives on the bottom, they will do little or no harm to other game fishes already established. As the fish grow to a very large size and as its flesh is highly estimated for the table, ranking not far behind the delicate brook trout and the salmon, the successful establishment of the fish would add materially to the fish product of Pennsylvania and afford good sport to the angler.

The arrangements which were made last year with the fishermen at Dunkirk were renewed this year with equally good terms, but unfortunately on account of the unfavorable weather the fishermen were unable to put out their nets, hence it was impossible to take any eggs and all the lake trout that will be propagated this year at the Corry hatchery will be from the million or more eggs to be received from the United States Bureau of Fisheries sometime in January. The failure of the lake trout egg crop this year has caused me to feel that while the Department should always secure all the eggs possible from the wild fish in Lake Erie whenever it is possible to do so, that it is unwise to depend absolutely on this source of supply. Several years ago the fish commission held breeding lake trout in its ponds at Corry, but owing to the demand of the public for brook trout and the restricted facilities in the way of hatching led the commission to abandon the raising of breeder lake trout and devoted the use of the ponds to brook trout. With enlarged facilities owing to the increased ground space at the Corry hatchery and the larger areas at Bellefonte and Wayne I feel it is possible again to resume the rearing of lake trout and I have determined to do so in three hatcheries. I have decided to do this after a consultation with the superintendents and the failure of the egg crop in Lake Erie and a careful study as to the cost of doing so. It is apparent that while the lake trout grow to a very large size two of such fish do not require more food than three three-year old brook trout. The only unfortunate circumstance connected with this work is that it requires five years to raise the fish to a breeding stage, but I shall begin the work this season of rearing the fish from the fry stage.

In addition to the trout work at the Corry Station I directed that the experiment in black bass culture be continued. Three small ponds had been built under the direction of the old fish commission and just before its deplacement for the Department the Superintendent, Mr. William Buller, had practically demonstrated his ability to rear small mouth black bass. Just before the first of June the mature bass took to the spawning beds and by the middle of June the ponds, to use the expression of the superintendent, "were black with little fish." They were healthy and lively. But just as the Department was about to distribute them there came a cloudburst, which broke away the outlet of the three ponds and washed the little creatures into a creek which empties into French Creek, known some miles southward as the Venango River. As reports came to the Department during the spring of an extraordinary large number of small bass in the upper waters of the Venango river, it

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would seem that that stream at least had been benefitted by the first successful experiment in small mouth black bass culture.

But while it was evident that Mr. Buller had solved the problem of propagating small mouth black bass by pond culture, it was equally evident the water at Corry was not well adapted to the work and that the ponds were entirely too small. Other states have been experimenting in bass culture and the results which they obtained and all our observations led us to the firm conclusion that to successfully breed the small mouth black bass in large numbers it was necessary to have very large ponds and warm water. The available acreage at Corry would not permit large ponds and the temperature of the water much too low for the little bass to grow rapidly enough for planting. Fish in the Corry Hatchery of four months old would be two-thirds smaller than fish reared in the little ponds at Erie where the temperature was fifteen degrees higher. It was thereupon decided to abandon further culture of black bass at the Corry Station and to transfer the breeding stock to the Wayne county hatchery. The ponds built for bass at Corry, it was decided, by diminishing the flow of water and raising the temperature, could be used for the propagation of yellow perch, and this will be done next season.

Since fish culturists successfully solved the problem of hatching the wall-eyed pike, there has probably been no work of greater importance and of wider interest than the successful propagation of the small mouth bass. Next to the brook trout, indeed, in the estimation of many its equal, is the black bass. It is an introduced fish, having first been planted in Pennsylvania waters about 1870. It took kindly to its new home and in a few years nearly every suitable water teemed with them, but for various reasons within the last ten years there has been a decided decrease in the number of this great game fish in all the water with the exception of a few places. For the decrease the German carp, destructive methods of fishing, water pollution and a lack of new blood are laid the blame. Whatever may be the cause it remains a fact that with each year the demands on the fish culturists have become greater and more insistent. It has reached such a point that last winter at a convention of Fish Protective Organizations from all parts of Pennsylvania a resolution was unanimously adopted, requesting the Legislature to establish as many hatcheries which would produce black bass equal to the number of brook trout which might be hatched by the State.

One great difficulty that presents itself in the work of cultivating blackbass is the fact that the eggs cannot be taken from the fish in the same manner as eggs can be taken from the brook trout, the shad, the whitefish and the wall-eyed pike. It was finally demonstrated that the only successful methods would be to allow the fish to spawn naturally on beds in specially constructed ponds. But while the superintendents seem to have finally solved the problem of hatching small mouth bass they have not yet discovered a means to carry the little fish over to the fall without an enormous loss in number through cannibalism. For example, last spring the Department hatched about twelve thousand fry. These were placed in a pond of water of the proper temperature at Erie. It was thought that by abundant feeding the little creatures might be weaned from

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their cannibalistic tendencies. It was found that they readily and eagerly took ground fish and so this food was given them six times a day. Every twenty-four hours they were given each about three times their weight in ground fish and in addition they were very closely watched. In spite of that, when the fish were ready to be distributed there were only a little more than six thousand in the pond. The others had been devoured by their larger or stronger brethren. Nevertheless while it is evident that the secret of preventing cannibalism has not been discovered the Department considers that it is more profitable to carry the little fish over the summer months until the first of September, even though the stock is diminished by one-half.

One of the Superintendents, Mr. Nathan R. Buller, has devised a method, which with some slight alterations proposed by me, he hopes to minimize the loss from cannibalism, and this method will be tried at the Wayne county hatchery. The idea is simply the building of nursery ponds about thirty feet long and three feet wide with a slight tilt, to place the bass fry therein and feed them automatically with ground fish, to go over the troughs at least once a week and separate the larger from the smaller fish. What the result will be time will easily tell.

I have felt for a long time that to secure the greatest amount of support in fish protection is to carry on a campaign of education. I am also a firm believer in promoting Nature Study in the public schools. With these two thoughts in mind I began last spring the propagation of gold fish for distribution among the public schools in the Commonwealth. The Department only had a few fish for breeding purposes and these were in a small pond at the Corry station. A very large number of little goldfish were hatched, but unfortunately on account of the inexperience in that particular line of work the superintendent permitted cold water to flow through the ponds, so by that the first of October there were only a few thousand of a size suitable for distribution. These were sent to those schools which had made application in proper form. I regret to say that owing to the demand made on the Department for the exhibit of fish at the World's Fair, this year I have been compelled to suspend further work in this direction until next year. I am, however, placing gold fish of breeding size in the Bellefonte, Wayne county and Torresdale hatcheries and in 1906 I hope there will be a sufficient number of gold fish to supply all the schools which may call for them.

Principals who received the gold fish last fall have expressed themselves as much gratified at the results which they obtained through possessing them. They kept the children interested and they obtained a broader knowledge of fish and the teachers were unable to instill in the minds of the young a better idea of the value and importance of the fish product of the State and the necessity for its protection.

The Department considers that an unusually large amount of work was accomplished at the Corry Hatchery during the fiscal year—much greater than ever was accomplished before and it was done without adding to the number of employes. But hereafter at least one additional man will be required in the fish work for the reason that to meet a growing demand for brook trout fifty thous-

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and young trout were saved from last winter for future breeding purposes. They will begin yielding eggs in the fall of 1905. The force in the hatchery at that time will be entirely inadequate for enlarged work. Another permanent man is also needed at the Corry hatchery to keep the place in order to cut the grass, trim the trees, keep the ponds clear and feed the fish.

ERIE HATCHERY.

The Erie Hatchery is near self-supporting. Under an act, approved May 29, 1901, to regulate fishing on Lake Erie it is provided that all commercial fishermen shall pay a license fee. The cost of operating the Erie hatchery is a little more than three thousand dollars. The annual revenue from the license fees is about two thousand dollars. The fishermen seem perfectly satisfied to pay the license, because they recognize the fact that the maintenance of the fishery industry of Lake Erie depends almost wholly on artificial propagation of lake fishes.

In former years it was the custom of Pennsylvania to take its eggs for the Erie hatchery wherever it could find them in Lake Erie. The United States Commission, now the Bureau of Fisheries, did the same thing. The results were not satisfactory. On assuming charge of the Department I at once entered into correspondence with the United States Bureau of Fisheries with a view of bringing about a better plan. The Government Bureau met my advances most cordially. The result was that an agreement was entered into by which the United States Bureau of Fisheries would collect or take charge of the collection of all the eggs. Pennsylvania was to have all of the take from what were known as the Port Clinton grounds in Ohio. Under the agreement Pennsylvania was to pay its pro rata share of the cost of taking the eggs from these grounds and also to pay its pro rata share of taking the eggs of whitefish, which the United States kept in pens. The understanding also was that the United States was to receive credit for the eggs so taken and turned over to Pennsylvania. The plan has worked very successfully and I hope it can be carried on indefinitely.

Although the site on which the Erie station stands is very small the output of fish is the largest of any of the hatcheries, many times larger in fact than all the other hatcheries combined, with the exception of Torresdale, as it is designed. The reason is, that Lake Erie is the great breeding pond—all the eggs hatched being taken from wild fish. The method of hatching the eggs is also different from that which is required at the Corry, Bellefonte and Wayne county hatcheries. Instead of troughs, the eggs are placed in jars set opposite a series of troughs, set one above the other, the whole forming what is known as a battery. By the battery method a comparatively small quantity of water is used and an enormous saving of space results. It is to be regretted that trout eggs cannot be as nearly successfully hatched by the battery system as by the flat trough system. There are three small ponds on the Erie grounds and these are used for hatching purposes. During the past season the Erie Station turned out seven species of fish, to-wit: yellow perch, black bass, sunfish, whitefish, herring, wall-eyed pike and blue pike. In addition there were many thousand frogs hatched and distributed.

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Taken as a whole the work at the Erie station between May 31st, 1903, and June 1st, 1904, was a great improvement over previous years. This was partly due to the fact that the three little ponds on the grounds were in continual use. As soon as one species of fish penned there were disposed of, another was installed. The fall work, namely, that of whitefish and lake herring, was considerably greater than in many of the previous years, but the takes of wall-eyed pike and blue pike eggs in the spring and also yellow perch were much smaller than usual. The fall-off in the two first named fishes was partly due to storms on the lake. In all there were only about 35,000,000 wall-eyed pike eggs received and of these 27,740,000 were hatched. Twenty-three million eight hundred and ten thousand were planted in Lake Erie. The remainder were deposited in streams like the Susquehanna, Delaware, Allegheny, Venango and kindred waters. A number of years ago the Fish Commission issued applications for wall-eyed pike in the same manner as they issued blank applications for trout, but this action was soon found to be a mistake. The majority of the people who were interested in the planting of the fish knew nothing whatever about the habits of the wall-eyed pike. The result was than fully seventy-five per cent. of the applications were for waters in which the fish either would not thrive or would destroy other equally valuable food and game fishes. As a consequence the Fish Commissioners ceased sending out the blank applications and instead either planted the fish themselves or through their authorized representatives. As the policy was undoubtedly a sound one, the Department of Fisheries has pursued the same methods and issues no applications. Whenever a person writes to the Department asking for wall-eyed pike, if the stream which is named is suitable, he is notified that the Department will plant the fish where he has indicated and will authorize him to plant them for the Department. By this means the best results have been obtained. The rivers mentioned above are famous for their wall-eyed pike and the numbers are increasing rapidly every year. In fact for the last two years it is declared by the fishermen that more wall-eyed pike have been taken than black bass.

WALL EYED PIKE FRY.

Many persons interested in planting fish in Pennsylvania have written to the Department asking, if it were possible to hold the wall-eyed pike until they are several inches long, instead of planting them when they are of almost microscopic size. To these the Department has invariably replied that there are three reasons which lead to the planting of the small fish instead:

First: That at the present time there are no known means of feeding the little fish and keeping any number of them until they have obtained such growth. It has been found that the young fish after they have lost their sac will take oatmeal and other foods, but in course of a few weeks fully ninety per cent. die. It is therefore absolutely necessary to plant as soon as the sac of the little fish are absorbed.

Second. That with the vast quantities hatched, reaching sometimes as high as 70,000,000 there is not pond room available and even if there was any method of feeding it would be too expensive.

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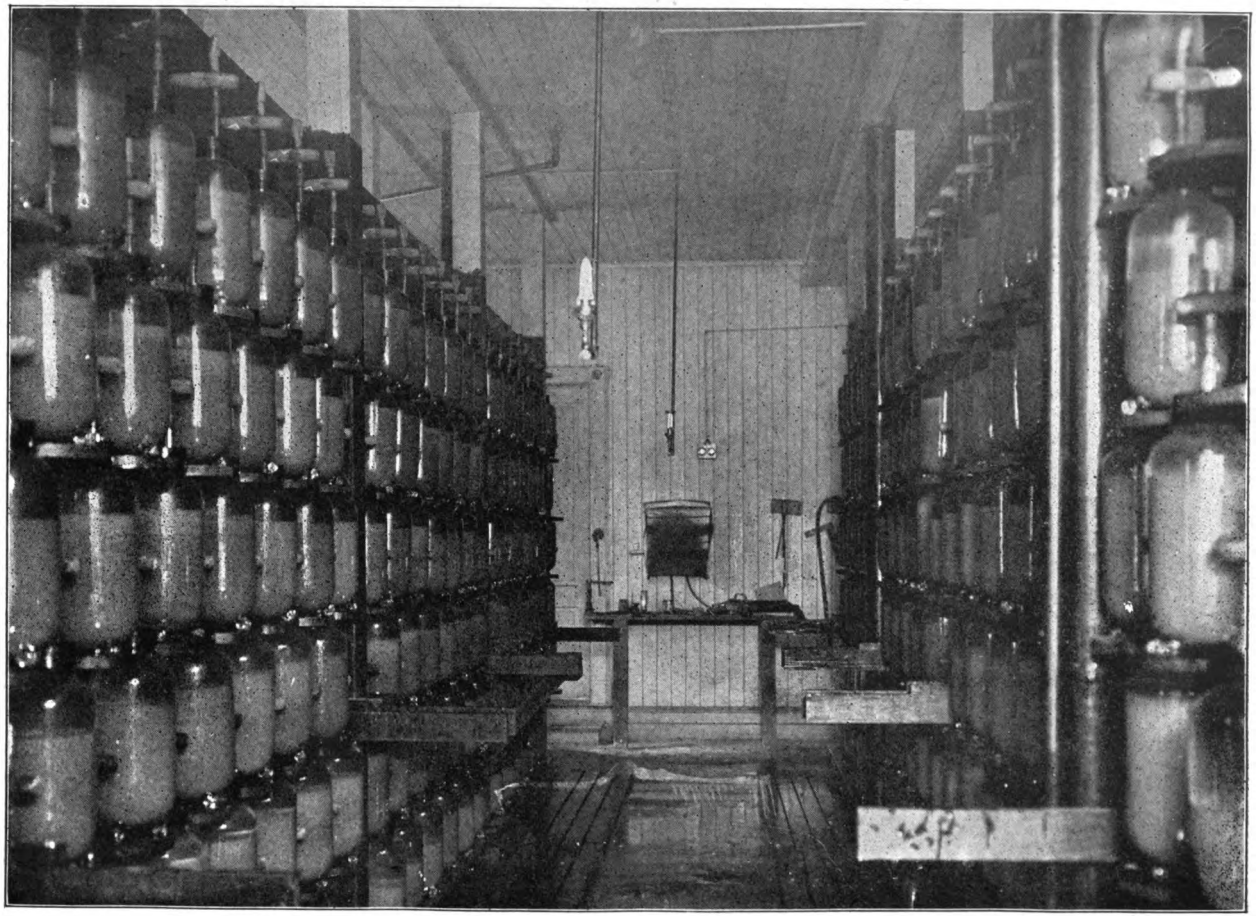

BATTERIES FOR HATCHING LAKE FISH, ERIE HATCHERY.

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Third. And this is about as important as the first: That it is a peculiar fact, and experiments have demonstrated, that the tiny wall-eyed pike are better able to take care of themselves if properly planted than any other species of fish which are hatched by the Department. If the little creatures are planted close to the shores after the manner of other fry, they will all be devoured by minnows; but if they are taken out into the stream and into the pools, in which the large fish live the little fellows will at once seek the bottom and hide themselves under the stones where they are reasonably safe from most of their enemies until they have obtained some growth.

All of the whitefish eggs hatched at the Erie Station both in the fall of 1903 and 1904 were taken by the United States Bureau of Fisheries. The bulk of the eggs were from wild fish, but many were taken from fish captured in the nets and then held in pens built by the United States. The number of eggs thus furnished by the United States in the fall of 1903 was 46,280,000. The lake herring eggs were taken by our own men from the boats fishing out of the city of Erie. They number 11,360,000. The battery at the Erie Station is built to hold 488 jars, but at the present time there are 380 installed. If the full complement of jars had been on the racks they could all have been filled with lake herring eggs. Unfortunately the state of the finances prevented this, as the jars with their fixings cost about $200 a hundred.

There was also a decrease in the number of blue pike eggs hatched and that was due not altogether to the decrease in fish or to storms, but to the fact that last spring instead of males and females appearing at the beginning of the season the sexes came to the nets at different times, and at length when they did come together most of the fishermen had cut out their nets. As a result it was only possible to secure and hatch 2,000,000, at least 12,000,000 less than the usual number.

For the first time since yellow perch culture has been taken up by Pennsylvania the Department distributed fingerling perch hatched from eggs taken from the adult fish. Hitherto they were planted as soon as the sacs were absorbed. In July, 1903, 33,300 fingerlings were sent out. This year the number was not nearly as large, being only 9,900, because it was not possible to secure as many eggs. The eggs of the yellow perch have heretofore been taken from the wild fish in Lake Erie. Sometimes they are exceedingly abundant and again they are very, very scarce. Recognizing the importance of the yellow perch work, the Department has secured a large number of adult fish and placed them in ponds at Corry and Wayne county in order that it may be independent of the Erie fish. The yellow perch distributed last year and this year were mainly hatched in one of the little ponds on the Erie hatchery. It is exceedingly easy to take the eggs from the perch, but it has been found that eggs which have been naturally deposited by the female and impregnated by the male yield better results, a finding which is exactly opposite to all other species of fish from which the eggs are pressed. The methods employed is to allow the fish to spawn naturally on brush placed in the ponds. The brush with the clinging spawn is then removed into the ponds in which there are no mature fish. By this method fully ninety per cent. are incubated.

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moving and also that it might be desirable to maintain the present station. But it emphatically recommends that the Legislature authorize the establishment of another or supplementary station within easy reach of the city of Erie, where there can be a very large extension in fish cultural work. It is impelled to this for three reasons:

First. The necessity for increasing the output of black bass; second, the propagation of yellow perch on a vast scale for Lake Erie and other waters under the jurisdiction of the Commonwealth; and third, that the rearing of whitefish may be experimented with on a large scale.

HOLDING WHITE FISH FRY.

Until two or three years ago there was a general impression among fish culturists that whitefish could not be successfully retained, but must be planted as soon as the sacs were absorbed. There are many physical difficulties in the way of doing this to the best advantage. When the whitefish are hatching ice still covers the bays in Lake Erie and it is often necessary to cut holes in the ice before the fish can be planted, and the best spot for planting cannot always be selected. Hence while encouraging results have followed the artificial propagation and planting of whitefish, the results in the estimation of the Department are not as great as they might be. A couple of years ago experiments were conducted on a small scale at the New York Aquarium in rearing whitefish with artificial feeding. Gratifying success was met with. Mr. A. G. Buller, Superintendent of the Erie Hatchery carried on some experiments on his own account. By the first of June, 1904, out of several hundred fry, he had only lost about a dozen, and the survivors were about an inch and a half in length. It was found that they would take certain foods readily and thrive on them.

Mr. Buller in his report to the Department says: "It is my true belief that if a portion of the whitefish hatched were retained in sufficiently large ponds until fall it would pay the Department to care for them until that time, as they would then be of a sufficient size to better care for themselves. If this were done I am positive that in a very short time the catch of whitefish in the lake would be greatly increased. To begin this work it would be necessary to have more space, as it requires several very large ponds. The fishermen feel it would be to the general interests if a portion of the fry could be retained."

I heartily concur in the above and I would be glad if you would recommend to the Legislature that it appropriate a sufficient sum of money to establish a supplementary hatchery. I believe it would be one of the most important of all the stations under the care of the Department. It should contain not less than twenty-five acres and ought to be double that size. From such a station it would be possible within a few years to annually hatch as many fish as are now hatched at the Erie Station and that without abandoning the latter.

The Department feels that the experiments in rearing young whitefish is one of the important matters undertaken during the first year work of the Department, and the results achieved render me exceedingly anxious to extend them on a large scale.

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THE WHITEFISH.

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Naturally it is not expected that a great deal of work could be accomplished at the Bellefonte Hatchery, owing to the fact that it was not located until July and not ready for operation until October, 1903, but I am happy to say that the station has taken its place as an effective one; that a gratifying amount of work was accomplished. There was not a fish in the new ponds in October and those which were sent by the United States Government and the Blooming Grove Park Association, and those which were purchased from the Penn Forest Brook Trout Company and installed in November could not be breeding fish until the fall of 1904. But the Penn Forest Brook Trout Company, the Weissport Brook Trout Company and the Blooming Grove Park Association promptly came forward and gave their surplus trout for the new hatchery. Through these concerns many millions of eggs were placed on the Bellefonte troughs and the output last spring was nearly half as many as that of Corry, the oldest established hatchery in the State. It would have been very much larger had it not been for three causes:

First. A natural loss through the transporting of green eggs.

Second. The loss of several hundred thousand eggs through the carelessness of the express company in allowing them to freeze, and

Third. The death of several hundred thousand fry by the accidentally turning off of the water running through the troughs and through inherited weakness of others hatched from eggs taken from the Allentown fish.

By these three means the output was diminished by about a million and a half. At the end of 1903 there was a hatching house and one large pond. A second pond had been started. As soon as the fish were distributed in the spring the incomplete pond was finished and divided into four. Three other handsome ponds were laid out and finished by the first of August and by the first of October, 1904, two other ponds were completed for fry to be retained for breeding purposes. The grounds surrounding these ponds were carefully graded, sown with grass seed and trees planted. Another spring was opened up and surrounded by cement walls so that by the early fall that portion of the new hatching grounds present a pretty appearance. With the trout from Allentown, the trout received from other sources mentioned grown to maturity and nearly 50,000 fry, which will produce eggs in 1905, the Bellefonte hatchery in one short year has been placed on a firm foundation. The Penn Forest Brook Trout Company through its Treasurer, Mr. Butler, in the fall of 1904 again tendered all its surplus eggs and all but 500,000 were sent to the Bellefonte Hatchery. More than 500,000 eggs were taken from the breeding fish in the ponds. Hence the large hatching house is now filled with eggs and in January or February the ten nursery ponds should all be occupied. This fall the Penn Forest Brook Trout Company again presented all its surplus eggs to the State, and over 4,300,000 were thus obtained and distributed to the Bellefonte and Warren Hatcheries.

ATLANTIC SALMON.

Many years ago Mr. Thaddeus C. Norris and other noted Pennsylvania anglers conceived the idea that the Delaware river was suited for the support of Atlantic Salmon, unquestionably the

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greatest food and game fish known. Many thousand eggs were secured from Canada, hatched in New York and planted in tributary streams near Easton and the experiment was repeated for two or three years in succession. To the delight of those interested for four or five years some mature fish were caught ascending the Delaware river, heretofore barren of Atlantic Salmon. But the number caught was so few in proportion to the number of fry planted that the experiment was abandoned. This was early in the 70's. Early in the 90's Henry C. Ford, then President of the Fish Commission resumed the experiment. He held that the first failure was due to the fry having been planted in tributaries too far down the Delaware river; that they should be planted in streams leading into the Delawere in Pike and Wayne counties. He secured eggs from the United States Fish Commission, hatched them at Allentown and planted the fry in streams like the Blooming Grove and Big and Little Equinunk and the Dyeberry. His faith was rewarded by a catch five years later valued at over five thousand dollars. Unfortunately Mr. Ford did not live to see the result of his good work. It was impossible to secure eggs every year from the United States Fish Commission, because of the scarcity of eggs from the fish in the New England rivers and further planting on the Delaware therefore had to be abandoned.

As I have assisted Mr. Ford in his experiment and was a firm believer in the possibility of making the Delaware river a great salmon river, I naturally felt great regret that the work of stocking ceased. Learning last summer that the United States Bureau of Fisheries had succeeded in domesticating Atlantic Salmon and taking eggs therefrom in some numbers, I at once determined to attempt the same thing. Expressing my desire to the Hon. George M. Bowers, United States Fish Commissioner, that gentleman promptly sent me several thousand salmon eggs, which were incubated at the Bellefonte hatchery. About two thousand were cared for in one of the nursery ponds through the summer and on the last of September were sent to the Wayne County Hatchery to be cared for in ponds there to maturity.

Very great interest has been evinced throughout the eastern part of Pennsylvania in this experiment as its success means a great deal to the fishermen of the Delaware river and to the anglers of Pennsylvania. If, by domesticating the salmon fry can be hatched in sufficient numbers the Delaware river can be made into a great salmon stream, it will mean a large sum of money added to Pennsylvania's fish industry. There are many streams tributary to the Delaware river which would make ideal salmon streams and much American money which now goes to Canada and New Foundland might be retained in Pennsylvania.

The salmon fry sent to the Wayne County Station for two reasons:

First. Because the spring water at that station is two or three degrees colder than that at Bellefonte. Moreover the best streams for the young fish tributary to the Delaware river are in Wayne county and the upper part of Pike county, within easy reach of the hatchery. The Department feels that every effort should be made to stock the Delaware river, it having been clearly demonstrated that the fish will thrive there; that it only requires persistent efforts and heavy stocking to make it a great salmon stream. It

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THE ATLANTIC SALMON.

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feels that even though it is possible to domesticate the salmon, that the eggs which will be obtained in that manner from such fish will not be sufficient to do the work properly and that the domesticated eggs should be supplemented by the purchase annually of a large quantity of eyed eggs from Canada. Unfortunately the finances of the Department at the present time does not warrant any such purchase. In order to make the river a good salmon stream and within the shortest possible space of time there should be not less than two million fry planted in the tributary streams every year. To do that would cost about two thousand dollars a year for the eggs. It is not a large sum and that it would be well expended is my honest belief.

WAYNE HATCHERY.

There was no fish hatching work accomplished at the Wayne County Hatchery at the close of the fiscal year, as the work of putting it into shape was not begun until July, 1904, and the preliminary ponds and hatching house not completed until October, but by the close of the calendar year there were over 1,300,000 trout eggs in the hatching house. On that date in addition to the hatching house there was practically finished one pond of an acre and a quarter for black bass, one pond 150 feet long by 30 feet wide; one pond 50 feet long by 30 feet wide; one pond 100 feet long by 50 feet wide, two ponds 35 feet long by 200 feet wide for yellow perch, and three ponds averaging about 75 feet long and 200 feet wide for breeder trout, three trout fry ponds and one pickerel pond of half an acre. During the summer a few yellow perch and sunfish and trout were caught from natural waters and deposited in the ponds and on the 30th of September all the ponds were filled with fish sent from Corry and Bellefonte and the Station is now ready for work next spring. The hatchery is now filled with eggs of trout from wild fish and from fish in the Penn Forest Brook Trout Company, and the Blooming Grove Park Association preserves, which were given freely to the State. Hence all the trout hatching houses in the State were in full operation at the end of the calendar year.

In addition to the fish already enumerated, one very large pickerel pond has been constructed and three ponds 60 feet long each by 20 feet wide have been built for trout in the Wayne County Hatchery. The first named pond has been stocked by over a hundred fish averaging more than two and a half pounds each, given by the Wildwood Club of Wayne county; and that organization has promised a further supply for breeding purposes.

The demand for brook trout has always been much larger than the supply, and last year it was greater than the capacity of all the trout hatcheries of the State in operation under the old method of hatching. There is also the certainty of a largely increased demand for 1905, and there is reason to believe that the annual demand will greatly increase.

In order to meet new conditions the Department has begun a radical change in all the trout hatching houses by ordering the introduction of what is known as the Clark-Williamson trough method of hatching. In former years it was the custom to care for the trout fry in the troughs in the hatching houses. It is needless to say that the output was greatly reduced. The No. 1 hatching

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house at Corry could not accommodate more than 2,000,000 eggs and fry. By introducing the Clark-Williamson method and by transferring the necessary hatching fish to specially constructed ponds outside and devoting the troughs entirely to eggs the capacity of the hatching house became practically unlimited. Each trough will hold 480,000 eggs as against less than one-tenth of that number under the old system.

The specially constructed ponds on the outside are known as nursery ponds. Of these we have established three types. One, the simplest, but probably the least effective, is at the Corry hatchery. This is simply one pond 100 feet long by 20 feet wide with the water about eight inches. The difficulty with this type of pond is that the fry cannot be placed there until nearly a month after they have lost their sacs. The second, and a very effective type, was installed at Bellefonte. This consists of ten ponds, each 30 feet long and 10 feet wide, extending from the side of the hatching house, the water running through a faucet from the inside supply troughs. Each pond is covered with boards at the house end, and thereupon was erected a box, on which was set automatic feeders made of a water wheel, a piston rod and a porcelain jar about the size of a tomato can, holding ground liver. With each revolution of the water wheel the piston rod threw a minute quantity of ground liver out and dropped it into the pond, so that the fish could feed if they desired all day long. As a result of this type of pond there were many thousand fry hatched in January, 1904, which reached the length of from six to seven inches by the first of October. A few even obtained the size of eight inches. There was not a trout under four inches in length and the bulk were five inches.

The third type of nursery ponds was erected at the Wayne County Hatchery late in the fall. It consisted of a series of three tiers of troughs, each about 20 feet long and 3 feet wide, supplied by water from the hatching house, also each regulated with an automatic feeder. The advantage of this particular type of nursery pond is that the little fish can be placed therein, if necessary, before the sac is absorbed and they can be cared for much easier than even by the nursery ponds, established at Bellefonte.

By the establishment of nursery ponds it is possible to care for as many fry as can be produced from the egg capacity of the hatchery. The future output, therefore, of brook trout in Pennsylvania will depend entirely on the number of breeders it is possible to maintain on the hatchery grounds, and the amount of money available to distribute them. As it is the intention of the Department of Fisheries to set aside each year between seventy-five thousand and one hundred thousand fry for breeding purposes in each hatchery, in five years from now, the Department should be in a situation to supply an enormous number of trout, at least twenty times the present output.

It is the intention of the Department also in view of the experiments conducted by Mr. A. G. Buller, at the Erie Station, to introduce the Wayne county system of nursery troughs for the cultivation of the young of black bass. By placing the fry of this fish in the nursery troughs and detailing a man exclusively to their care and in their sorting and feeding, it is hoped to diminish cannabalism and hold a large percentage for the fall output.

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LOWER POND TORRESDALE HATCHERY.

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In gathering eggs from Lake Erie or elsewhere it had formerly been the custom to transport them in a green stage by means of cans or jars, but the results were not always satisfactory, in fact the loss was generally heavy. At the suggestion of one of the Superintendents, a change of methods was made in this particular. Boxes twenty inches square each containing trays covered with heavy canton flannel were devised. About two quarts of lake eggs are spread evenly over each tray. A space near the top was left for crushed ice. In this manner the green eggs were transported in a much better condition, with far better results to the hatchery. The same methods will be adopted for the carrying of brook trout eggs as soon as practicable.

TORRESDALE HATCHERY.

As already stated the two considerations which led the Department to remove the hatchery from Bristol to Torresdale, were:

First. At Bristol it was too far from the main fisheries, from which shad eggs could be obtained, and

Second. The property was too small to do anything other than shad work.

As soon as the property at Torresdale was turned over to the Department of Fisheries by the city of Philadelphia, the building at Bristol was put upon scows and carried to its new quarters and put in good repair. The cost of moving was $475.00, which included putting it in place.

The more the new site was examined the more evident it became that it was in every particular an ideal spot for a fish hatchery. The stream of water which flows beyond Eleven Mile Lane through the ravine in the property to the river was found to be punctuated with springs, and later a bunch of springs was found, which will probably enable the Department to do a limited amount of trout work.

There were two ponds already on the property. One was entirely filled with half dried mud, through which the stream had cut a channel. The lower pond was filled in within about a foot or two of the surface with soft mud. A contract was awarded to clean the upper pond and when this was finished early in October there was a body of water 350 feet long and 50 feet wide for a distance of 300 feet, and 75 feet wide for the remaining 30 feet, and a pond with a depth of 6 feet in the kettle hole and from one to two feet for the remainder. It is an ideal pond for the cultivation of black bass, to which purpose it is to be devoted.

When the water from the lower pond was drawn off for the purpose of cleaning it, it was found to be alive with fish: black bass, calico bass, pickerel, catfish, whitefish and sunfish—in all nearly four thousand fish were taken from this pond, which is about 400 feet long. When removing them it became necessary to place them altogether in the upper pond, where I am sorry to say nearly three thousand of the sunfish became food for the voracious black bass and pickerel. Some idea of the immense voracity of these two species may be obtained by the statement that the total number of black bass and pickerel was less than 100 and the 3,000 sunfish were devoured in less than 30 days.

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Owing to the supply of money becoming exhausted, the cleaning of the lower pond could not be completed, but sufficient mud was taken out to enable the ponds to be used for the breeding of white catfish and yellow perch, and a number of these fish were placed therein late in the fall.

In addition to these ponds a third pond, triangular in shape and about 100 feet across the breast and 200 feet to the point of the triangle was built. This body of water is to be devoted to the propagation of yellow perch.

The hatching house is equipped with a battery and a table and the two have a capacity of over 400 jars. Unfortunately the house at present only contains 100 jars of the McDonald pattern and there is no money available to purchase enough to fill the battery.

The city of Philadelphia has evinced a decided interest in the Torresdale hatchery and in addition to providing the grounds, has made an appropriation of $5,000 with which to erect a building, which is to be used as a dwelling house. As this sum is more than will be needed for the purpose, an amendment was introduced into the city councils authorizing any moneys which were left over from the building to be expended on the hatchery grounds.

The interest which the city of Philadelphia has shown in the transfer of the Bristol hatchery to Torresdale and its liberality in placing at the disposal of the Department of Fisheries a large tract of land and in appropriating $5,000, must gratify every friend of fish culture in Pennsylvania. This innovation of a municipality taking a practical interest in the State's work of propagating fish cannot be too highly praised and it cannot but have a strong influence in extending the interest to all parts of Pennsylvania.

At present the station is under the charge of assistant J. F. Brower, but will be under the superintendency of John P. Creveling, as soon as spring arrives.

When this hatchery is in operation it should be one of the most important under the control of the State. The shad fisheries of the Delaware constitute a great industry and it is possible, provided the eggs can be secured, to hatch 50,000,000 or more shad for planting in the Delaware river and the Susquehanna river. In addition, if it is found possible to impound white-perch, many millions of these little creatures can be hatched; and with the other fishes the output of the Torresdale hatchery in the near future should be not less than 100,000,000, or as many as is now propagated by all the other hatcheries in Pennsylvania combined.

CONDITION OF THE FISHERIES.

The reports of the fish wardens and the various fish protective associations from all parts of the State exhibit on the whole an increased condition of affairs as to the fisheries, both angling and commercial.

The Erie commercial fisheries, while there was a falling off as compared with former years, it was not due to a scarcity of fish, but to weather causes, storms or heavy swells.

The fishermen report an enormous number of whitefish and other fishes, and some report the capture of a fish which they call herring, but which partakes more of the nature of a whitefish, and it is believed these are hatchery planted fish from whitefish eggs, impregnated by herring milt.

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The report of the Erie warden shows that for 1903 the total catch of fish in Lake Erie within the jurisdiction of Pennsylvania was 7,280,500 pounds, of which 5,330,000 pounds were lake herring, and blue pike 1,964,000 pounds. There were only 36,500 pounds of whitefish taken. This, it is stated, not because there are no whitefish, but because the fish are yet too small to warrant the fishermen going over them with their large meshed nets and the capture of small fish would yield only herring prices, which are considerable less than that of whitefish.

Reports from the Allegheny and Susquehanna rivers indicate a marked increase in the number of pike-perch, commonly called Susquehanna salmon. This fish which was introduced into the Susquehanna in the middle of the 18th century, it is said, by a Jesuit priest and an Englishman, has always found a congenial home in the two waters named; but the supply, once very abundant, decreased rapidly until the Fish Commission began stocking heavily every year. A million or more were planted in the two streams and their tributaries annually and the result is an overwhelming triumph for the artificial propagation and planting of fish. It was stated that in the year 1903 and 1904, that more pike-perch were caught in the Susquehanna river than black bass, once the predominant fish in the Susquehanna. Pike-perch are said also to be quite abundant in the Upper Delaware, but so far as the Department can learn there are no particular efforts made to fish for them. That they are in such quantities has been abundantly proven and it is believed that if the pools from Trenton Falls to above the New York state line were fished as enthusiastically and as methodically as on the Susquehanna river, it would be found that the fish are there in great abundance. The pike-perch is also abundant and increasing in the Juniata, and encouraging reports were received from the Venango river, also called French Creek, as to the number of this species of fish.

BLACK BASS.

It is reported regretfully that the returns are not quite as satisfactory as regards the black bass. There is overwhelming evidence to show that in nearly all the waters of the Commonwealth the black bass is decreasing in numbers at an alarming rate. There are a few notable exceptions, namely, the extreme upper waters of the North branch of the Susquehanna river in Pennsylvania. The Venango river from its mouth to well within Crawford county and in the upper Allegheny. Apart from these few places and perhaps a few other isolated streams the reports are of the most discouraging character. Even most of the mountain lakes show a marked fall-off in the number of fish caught. There are a number of reasons assigned for this unfortunate state of affairs, to-wit:

1. The German carp.
2. Water pollution.
3. Discontinuance of stocking by the State.
4. A parasitic worm.
5. A falling-off in fertility.

While I cannot, and very naturally, prove it beyond dispute, I am inclined to believe that all of these agencies are working harm.

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By this I do not mean that they are all combined in all parts of the State. There are places for instance, from which there are no reports of the parasitic worm. In others where there is absolutely no pollution; and again there are waters in which certainly no more than one of the agencies named can possible be at work.

For example, in the lakes of Wayne county, it is very unlikely that the carp are playing havoc among the bass. Certainly there is no pollution and in a majority there are no signs of the parasitic worm. On the other hand in some of the mountain lakes in the Northeast Pennsylvania nearly all the fish are infested with the parasite. The parasitic worm in large quantities in the fish of the Susquehanna river and its tributaries. The carp are also in vast numbers in the same stream. The river is often filthy from pollution and there is not the slightest doubt that pollution, the carp and perhaps the worm play havoc among the bass.

It was unfortunate that the old Fish Commission was compelled a few years ago on account of a cut in its appropriation to cease planting black bass. Although it must be confessed that the number which they were enabled to place in the waters was ridiculously small, when compared with the thousands which were captured every year by fishermen; but the new fish undoubtedly gave an opportunity to put new blood into the stock in the streams.

It is a well-known fact among biologists that it often happens that when a particular form of animal or vegetable life is taken from its natural environments and transplanted to new surroundings the tendency is to infertility. Even though the new home may apparently be the same as the one formerly occupied, there seems to be something, which does not exactly fit the requirements of the new occupancy. The creature may produce young and they may have progeny and so on from generation to generation, but it is noticed that very often the progeny from generation to generation decreases in number. It has been noticed for instance that the California or rainbow trout do not thrive well or seem to increase naturally to any great extent in our Pennsylvania waters. Even in the hatcheries, where the most favorable conditions exist it is rare to find more than fifty per cent. of the females, which produce perfect eggs, which can be fertilized, or more than fifty per cent. of the males, which produce perfect milt. I cannot recall a single stream in the Commonwealth of Pennsylvania, in which indisputable proof can be produced that California trout propagated naturally. A few years ago it was stated in one of the reports of the Fish Commission, that two streams seemed to be an exception to this respect, but later, certain parties confessed to me that they had been annually stocking the stream with young California trout, and in one of the two streams, since that annual stocking ceased, there has been no showing of young California trout. If the question of change of environment be accepted without reserve, it may be that this is one of the causes of a diminished supply of black bass. As is well known, the bass is an introduced fish, and not a native of Pennsylvania waters. Prior to 1870 it is doubtful if there were any black bass anywhere in the Commonwealth. When first introduced they seemed to take eagerly to their new home, but for ten years past there have been reports of a diminishing supply from nearly all parts of the Commonwealth and these reports were accompanied

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by statements of fewer and fewer young fish. Hence it may well be, that growing infertility is one cause of a lessened number.

But there are one or two localities in Pennsylvania where the reports would apparently indicate that the theory of increasing infertility due to change of environment is not as strong as it might be. For example, Warden Shoemaker reports that during the summer of 1904 there were thousands of black bass in the North Branch of the Susquehanna river and that they are of greater abundance than for many years. He says, that people in that locality attribute the increase to the greater protection that has been given the river at that point. While this unusual increase in the number of small black bass in the upper parts of the Susquehanna river apparently weakens the theory of growing infertility, it does not necessarily do so. It may well be, that the increase this year is due to the increased protection and the enforcement of the fish laws, as is claimed by residents, and if that be so it is possible that the decreased supply will become apparent later and be traced to infertility.

The pollution of streams is no doubt a factor which will operate against a natural increase of black bass. The filthy mud from the culm banks settles on the spawning beds to such a depth that the black bass cannot build nests, or if they do build them, cannot keep them clean so that the eggs can hatch, the eggs covered with mud "smother" just as hen's eggs will "smother" when covered with grease and will not hatch.

There is an alarming increase in a parasitic worm, which finds a lodgement in the black bass, chiefly during the late spring and early summer. A few years ago it was comparatively unknown. To-day there are few waters in which it appears the bass are entirely free from the pest. It should be said that this gives weight to the belief that the worm is responsible somewhat for the decrease in fish, as the parasite is most abundant during the early and middle summer months. One correspondent who evidently has been a close observer, writes concerning this parasite as follows:

"For years I have summered at Lake Carey, Pennsylvania. A few years ago there were a great many black bass in this lake. In short, it seemed that it had more black bass in it than any other lake about this section. Now there are few, if any, black bass there. Within a few years I have noticed that the bass that were caught were swollen, caused by a growth within them, somewhat resembling a white spongy mass. Upon close examination this mass is composed of a small white worm, having no head visible to the naked eye, but when stretched they will expand about a quarter of an inch and when they are not pulled they contract. The spawn in the fish is found full of them. In the creeks about the lakes the bass are free from the parasite, but I also noticed the same thing in the large bass caught at Harvey's Lake this summer (1904)."

In another letter the same correspondent writes:

"The number of worms in a badly affected bass is almost beyond computation. The bunch of spongy white substance contained in this fish being in size sufficient to cause the bass to be swollen. Upon opening the fish it is found that these small and apparently headless worms are about a quarter of an inch long and can be, in some instances stretched to a half an inch and they have penetrated

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on which is found water life necessary for food to the young bass and also thus destroy the hiding places and shelter places for the little creatures from mature carnivorous fishes.

As it seems to me impossible to exterminate the German carp, there seems to be only one means to restore the black bass to the streams and that will be by artificial propagation and rearing. This will require numerous and spacious hatcheries.

There is no doubt whatever that there is a tremendous increase in the number of carp in all waters. Changed environment has certainly not affected this inferior food fish. That it is an inferior food fish is generally declared in Pennsylvania. It seems almost impossible to eliminate a strong muddy taste and otherwise make it palatable. The majority of people who claim taste in the matter of food exclude it from the table. Yet there is undoubtedly a very large industry in German carp, and strange to say, that notwithstanding its muddy taste and otherwise inferior food qualities it commands a comparatively high price at all times in the markets. Indeed there are periods when the live fish bring as much as the Kennebec salmon. They have been known to sell as high as 23 cents a pound and it is said to be exceedingly rare for the price to fall below 8 cents. In Philadelphia last year 3,490,000 pounds were sold with a total value of $174,700, and in Allegheny county the industry was proportionately large. In fact the carp industry in Philadelphia ranks second to that of shad. So readily do the fish sell that there are fishermen who eagerly offer to pay $5.00 a month for the privilege of catching them under the title of authorized representatives of the Department of Fisheries for removing undesirable fish from the waters, and were it not that the carp is certainly so distinct of other more desirable and more valuable food and game fishes the Department might well hesitate to advocate its extermination.

There are two classes of our people who freely purchase the German carp. One does so because the fish can be purchased alive and killed according to their religious observances. The other purchases the fish because, notwithstanding its high price, the quantity of meat is so great that by cooking it with bread and onions, and garlic, and greens and potatoes, a food can be produced, which in bulk would be much less in cost than any other species of fish or of meat.

I can understand how in other states where high classed game and food fishes are scarce that the German carp might be a boon to the mass of people. But in our Pennsylvania waters formed of mountain spring water, and usually fine rocky bottoms and waters in which the very finest types of fish, not even excluding the great Atlantic salmon may find a congenial home, there should be no place for the inferior and destructive German carp. In fact the demand for its extermination is so widespread throughout the Commonwealth, a demand which meets the very sympathy of the Department of Fisheries, that I have been experimenting as to means to at least decrease the number. I feel that the extermination is impossible. Under section 29 of the act of May 29, 1901, the Department of Fisheries is empowered to remove by means of nets any fish which may be considered as injurious to other game or food fishes. Acting under that authority I have from time to time appointed

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authorized representatives to remove carp by means of seines or other nets; and the number of fish of this species captured was enormous by this means. In the Schuylkill river, where the plan was tried liberally, carp became very scarce inside of twelve months. I feel so encouraged that I feel justified in recommending the enactment of a measure similar to section nine of the act of May 29, 1901, repealed two years ago, but surrounded with restrictions such as will lessen the danger of the destruction of other fishes and which will do away with the objection which caused the repeal. I feel also that there should be some other legislation, which will allow a greater freedom for the capture of German carp.

SUNFISH.

With the last four or five years there has been a strong interest exhibited in behalf of the sunfish. That interest was so strong that in 1901 this excellent little fish was placed among the list of game fishes and given a closed season when it was unlawful to catch them. People residing in the extreme northeastern part of Pennsylvania, in what is known as the mountain lake region, cannot understand the cause which led to the demand in other parts of Pennsylvania to make the sunfish a game fish. In most of the mountain lakes the sunfish is so numerous as to be almost a nuisance to the anglers for other fish, and many which are hooked are destroyed in anger because they interfere with the angler in his pursuits of what he terms better fish. But while the sunfish is unquestionably very numerous in the mountain lakes of the northeast and northwest Pennsylvania, it is rapidly disappearing from all the streams in every other part of the State and unless they did receive protection and unless there is heavy replanting, the once familiar sunfish will in a few years entirely disappear, except in the lakes just described.

There are three species indigenous to the eastern parts of Pennsylvania: the river sunfish, the long-eared sunfish and the yellow sunfish. The two first grow to a considerable size, but the third sometimes called a "pumpkin seed" rarely obtains a quarter of a pound weight. There is another and very fine species having a large, marketable value, which is indigenous to Lake Erie and is variously known as the blue sunfish or Lake Erie sunfish. This particular species sometimes obtains a weight of a pound and a half, and fish from one-half to three-quarters of a pound are not uncommon.

Several years ago efforts were made by the Fish Commission to introduce the blue sunfish into eastern waters. In the majority of instances there were no good results from the planting, due possibly to the fact that like its cousins they did not seem satisfied excepting when biting at a hook. This summer one of my wardens reported an exception to this rule. This is on the north branch of the Susquehanna river and there the blue sunfish, it is said, has established itself firmly. It is also found in some numbers in the upper Delaware river. It would be a good thing, if the blue sunfish could be successfully introduced into all our eastern waters, for it is not only a good angling fish, especially for young anglers, but it is a pan fish not excelled by the yellow perch and black bass.

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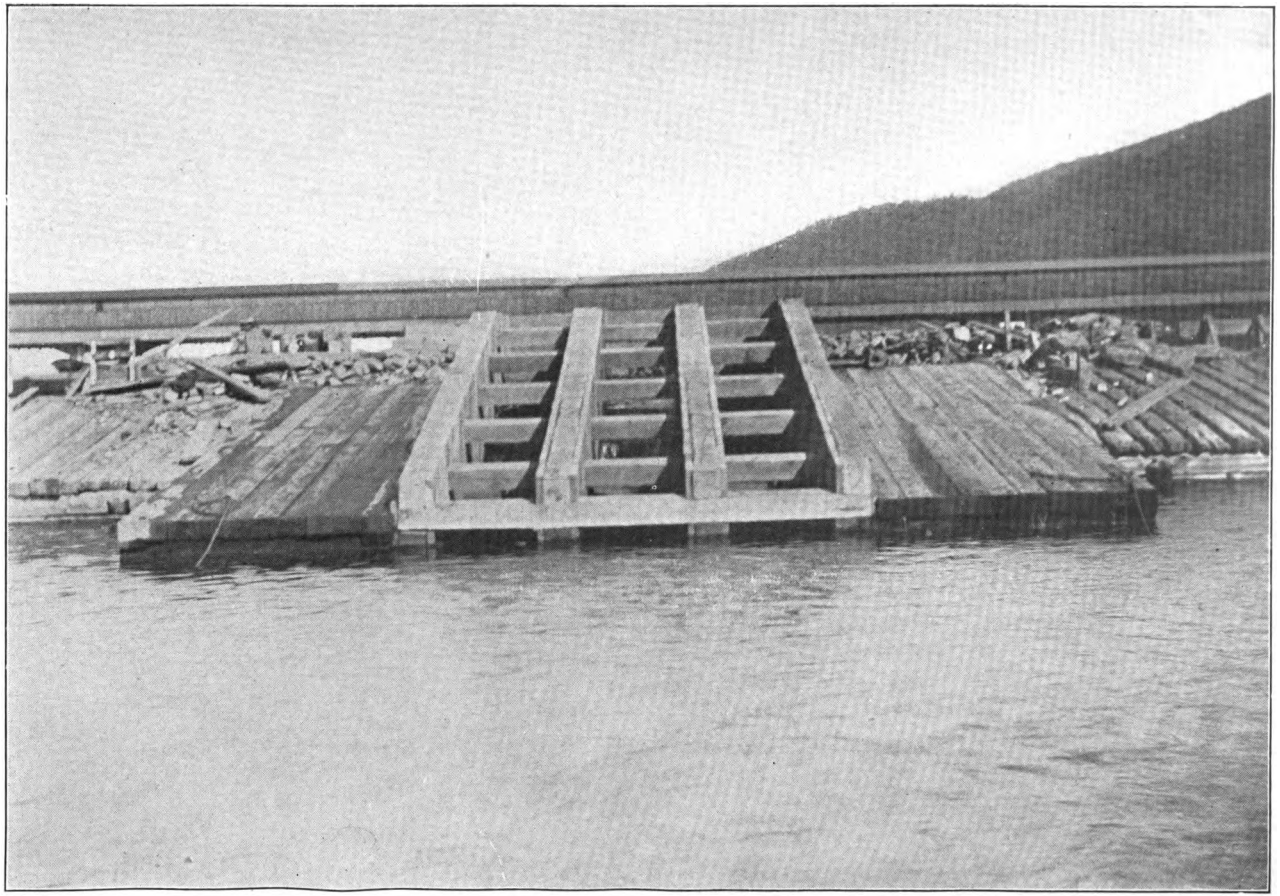

FISHWAY IN SUSQUEHANNA RIVER DAM, AT CLARK'S FERRY, PA.
(Showing top before completion.)

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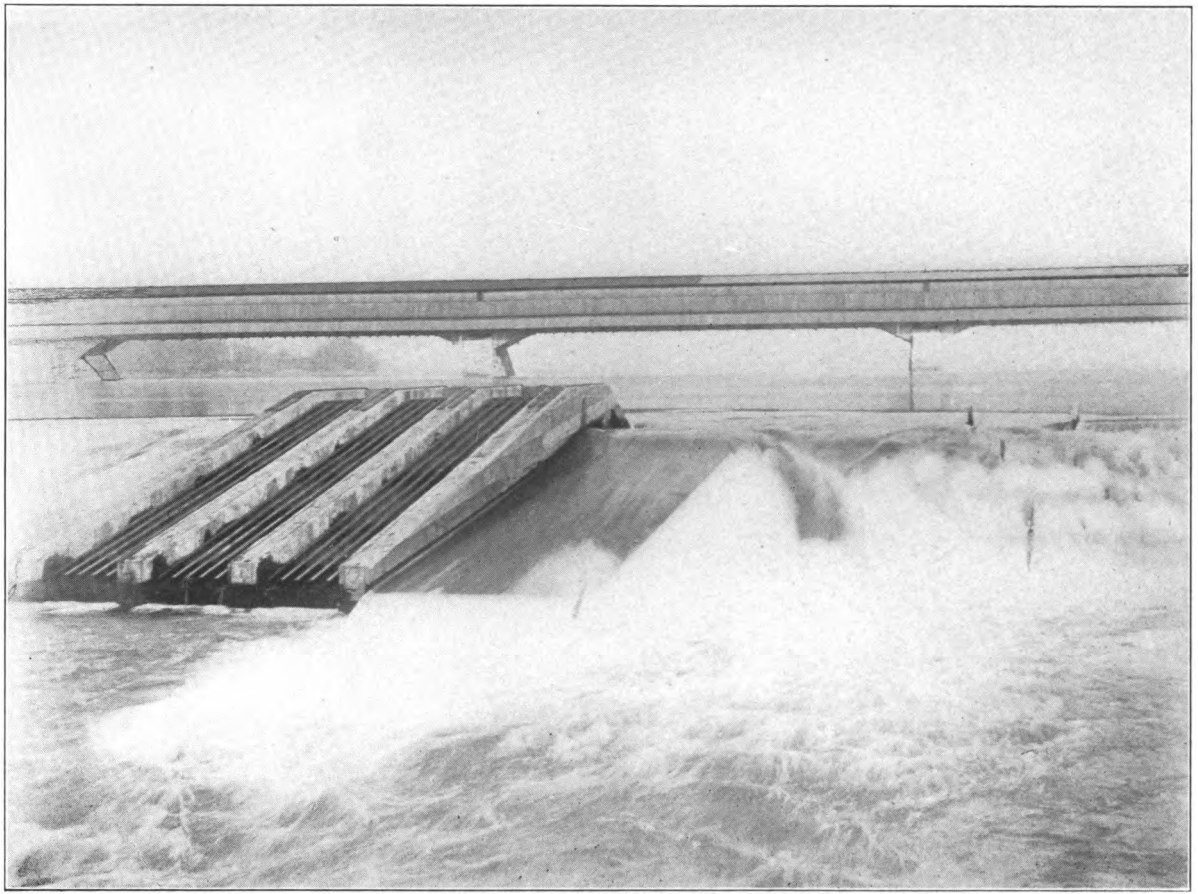

FISHWAYS IN CLARK'S FERRY DAM IN THE SUSQUEHANNA RIVER.
(View No. 3. Built 1904.)

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SHAD.

Among the commercial fishermen on the Susquehanna and the Delaware rivers interest centres chiefly on the shad. From colonial days to the present time it has been regarded as the best and most valuable food fish in those two waters and their tributaries. The building of dams on the Susquehanna river many years ago destroyed the industry on the Susquehanna above Columbia, and destructive methods of fishing impaired the industry below. The Susquehanna shad fisheries were at one time far more valuable than that of the Delaware, but the fisheries on the latter stream were nursed by the fishermen themselves and within the New Jersey and Pennsylvania limits the fish protective laws were supported by these men. In addition on account of a treaty which exists between New Jersey and Pennsylvania, requiring concurrent legislation on affairs concerning the Delaware river, it became impossible to erect any dams thereon and in consequence the fisheries of the Delaware increased vastly, which those on the Susquehanna decreased in the same proportion. Artificial propagation of shad was carried on for both rivers. The fisheries of the Delaware grew to average from a quarter and a half million dollars a year in value to the fishermen, while those of the Susquehanna sank to at one time less than $50,000. The destruction of the Columbia dam by ice a few years ago allowed the shad to ascend the river free as far as Clark's Ferry dam and up the Juniata to above Newport. The destruction of dams on the Juniata have cleared the way for the fish and for many miles above for the past two of three years shad have been caught annually in increasing numbers. There is no doubt that if the destructive methods of fishing which are in use in the State of Maryland could be done away with the Susquehanna and Juniata shad fisheries would very shortly be more valuable than they were fifty years ago.

The Department has had gratifying evidence that shad have succeeded in working up through the raft chute at Clark's Ferry dam in some numbers within the last two years. Early in the Autumn of 1903 there were found in a number of nets seized at Nanticoke dam forty to fifty young shad. As no young shad has been planted by either the United States or Pennsylvania in that part of the river, it was evident that mature shad had passed, not only above Clark's Ferry dam, but through the chute at the Nanticoke dam also and spawned somewhere in the river above. This may be taken as a fact for the reason that the nets in which the young shad were found were taken from the vast waters just below the Nanticoke dam and in a spot where the young shad could not have gone of their own volition, because of their lack of strength. They must have been carried down from above the dam. Again in the autumn of 1904 reports were sent to the office of thousands of young shad in the Susquehanna river above Selinsgrove. For the same reasons these fish must have been hatched from mature fish that had passed above Clark's Ferry dam and above the wrecked dam at Sunbury.

As accumulative evidence, Warden Holland reports that on the West Branch of the Susquehanna between Muncy and Williamsport dams a number of mature dead spent shad were found. It has generally been supposed that there were no shad whatever above

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Clark's Ferry dam. The reports received show conclusively that this is an error, though they might not have been in sufficient numbers to warrant the use of seines or dip nets for their capture. It is hoped, however, that the fishways which have been built in the Clark's Ferry dam will cause this valuable food fish to pass up in numbers sufficient to make fishing for them profitable. Too much reliance, however, must not be placed in these fishways for two or three years until they have become water worn and the sills covered with green. The shad is an exceedingly timid fish and experience has shown that in all fishways hitherto placed in dams seem to be regarded by shad as traps and they do not ascend them freely. The fishways in Clark's Ferry dam are of a different pattern and so arranged as to make a more natural passageway and it may be that the shad will not hesitate to pass through as they have in some of the other forms of fishways.

The shad fisheries on the Delaware river during the spring of 1904, while a little better than the fisheries of the previous years it is stated was not up to the average catch in the years previous. Much of this is attributed to the inability of the Fish Commission on account of the lack of money to propagate shad for the Delaware river since 1898.

It has been a matter of surprise to the Department that the herring industry on the Delaware river is not of greater proportions. Relatively it is not as large as it was fifty years ago, although the actual annual receipts are greater. There has been no diminution whatever in the supply of herring. Every spring the Delaware is alive with them as far north as Trenton. It is said to be nothing uncommon for a net fisherman to return thousands to the water, for which no market could be found. There is an entirely different story to be told of the herring industry on the lower Susquehanna. For every herring that can be captured a market can be found. It is claimed by the Susquehanna river herring fishermen that their fish is of better quality and firmer flesh than those on the Delaware. There may or not be any truth in this assertion, but it is doubtful, since what were known as Burlington herring were a few years ago in good favor in the markets. Whatever the reason may be it is certain that the supply of herring in the Delaware river far exceeds the local demand.

There are indications that the striped bass are again increasing in numbers in the Delaware river. A few years ago there was a vast supply and at some of the fisheries there were as many striped bass or rock fish caught as shad, but for some unexplainable reason which cannot be attributed to overfishing, they decreased in numbers and very few large fish were found above Penns Grove on the New Jersey shore, but within the last two or three years quite a number have been taken in the nets and by hooks and lines as far north as Lambertville, New Jersey. It is said that the eggs and milt of rockfish cannot be obtained in the Delaware river, but from some intelligence which has been received by the Department of Fisheries, I am inclined to think that this is a mistake, and it is my intention, as soon as there is money available, to make a thorough and exhaustive search for "mamy" or large rock fish in the lower Delaware. It is claimed by some that they are to be found in

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the shoals in the neighborhood of Bayside on the Jersey side of the river and if they are found, to hatch the eggs at the Torresdale hatchery.

PIKE PERCH.

There are a few people who still doubt the efficacy of artificial propagation as a means for restoring depleted streams with fish, but the results which have been obtained are of the most convincing character in the country. Equally convincing have been the results obtained from the artificial propagation of pike-perch, sometimes called wall-eyed pike or Susquehanna salmon. There are comparatively few waters in the Commonwealth which are suited to this fine game and food fish. The most notable waters which are so suited are the Allegheny, Monongahela, the Susquehanna and its branches, the Juniata, the Venango, the Delaware and the Schuylkill. In all of these streams hundreds of thousands of young pike-perch have been planted every year for the last twenty years and with the possible exception of one or two of the suitable waters in which they have been planted the pike-perch are now exceedingly abundant. Indeed as already stated it is declared that there are more pike-perch caught in the Susquehanna river at the present time than black bass. Unfortunately outside of the Susquehanna, Juniata and Allegheny regions the people do not seem to understand how to fish for them. There is little doubt that the Delaware river teems with pike-perch, but they are so rarely caught that comparatively few know the fish when they do see it. The pike-perch may be termed as a destructive fish, that is to say, it lives almost exclusively on live food; but its habitat is such that its destructiveness is confined within bounds and like the bass it is such a valuable food and game fish, its table qualities are so high that we can forgive its destructiveness and encourage its propagation.

TROUT.

The trout naturally is a fish to which the Department of Fisheries, and before that the Fish Commission, has given special attention on account of its beauty, its fine food qualities and its superior gameness, which makes it easily one of the leading game fishes. Many hundred thousand are undoubtedly caught every year from the pure mountain and meadow streams of Pennsylvania, and thousands of dollars are expended by visiting anglers in search of the game trout. There have been complaints made that the trout are decreasing in Pennsylvania waters, but the facts as reported by the wardens do not bear out the complaints. It is true that there are sections of the State in which streams have been made barren, or which contain fewer trout than formerly. On the other hand there are hundreds of creeks in which the supply is fairly well maintained and in some of the counties trout are appreciably on the increase. According to the reports of the wardens, that is noticeably the case in Wayne, Pike, Tioga, Potter and contiguous counties. Warden White of Wayne county declares that the trout fishing in that county is better to-day than it was thirty-five years ago. A personal inspection of a number of the streams in Wayne county leads

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me to believe that his claim is well founded. The little runs emptying into the main streams were during the past summer filled with fry.

It must be confessed that it is all the department can do to maintain the bulk of the streams and to cause an increase. For there are to-day one hundred anglers to one which whipped the streams thirty-five or forty years ago, and there is likely a greater number who fish for trout illegally. Despite a widespread opinion to the contrary the brook trout is one of the easiest of fish to catch, and it is a comparatively easy task for three or four persons to completely clean out a meadow of trout in two or three years at the most. Until last year the annual output of trout was only from three and one-half to four million and it must be regretfully said that a large proportion of these were improperly planted, the applicants not paying strict attention to the instructions sent. Last year the usual output was nearly double and there is reason to believe that a greater proportion was properly planted.

There are many people who have an idea that it is a mistake for the State to send out trout in the spring in the form of fry and they believe that the fish should be retained until the fall of the year, when they have obtained fingerling size. Curious enough this sentiment is not scattered but is generally held in communities. It almost invariably has been that on investigation, where it is found that the bulk of people of a community hold that greater success may be achieved by planting fingerling trout are those who are in a community where the instructions for planting fry are generally disregarded.

My experience, which covers a period of at least twenty years, proves to me conclusively that where properly planted trout fry placed in the waters early in the spring, yield far better results than fish which are kept in hatching troughs or necessary ponds until the fall. Apart from any personal experience there are several cogent reasons which favor spring planting, as against retaining ponds until autumn.

In the first place, when fry are planted in small spring runs early in the spring they find an abundance of natural food awaiting them and which they may get without any trouble whatever, and they turn to it from the artificial food in the hatchery naturally and without any trouble. Trout which are kept in the hatchery during the summer months learn to herd together and to rely entirely upon man for their food. When they are distributed in the fall into the streams the habit of herding is likely to remain with them some time. Naturally food in the streams is also scarce and their habit of being fed has not led them to seek food for themselves. The consequence is they become weak and thin and when the spring opens they fall an easy prey to the trout fisherman. Moreover it would be inexpedient and in fact practically impossible for the State to appropriate a sufficient sum of money to establish, operate and maintain hatcheries that could turn out as many fingerling fish as can be turned out with a small sum of money in the fry stage. The fact of the matter is that wherever the instructions of the Department of Fisheries is strictly carried out there is marked success in stocking the streams in which the water is suitable for trout life.

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According to reports from wardens the trout season of last Spring in the greater part of the State was generally favorable and most of the trout caught were said to be in a very fine condition.

Although the Department of Fisheries has doubled the annual output it is not satisfied and believes that in order to meet the annual increased number of anglers and to successfully maintain the streams that the new output of six millions is not nearly adequate. It is therefore exerting itself to the utmost to increase the number. As already stated the troughs in the different hatcheries have been changed to the Clark-Williamson system, the nursery pond system, introduced into the Corry, Bellefonte and Wayne county hatcheries, and a large number of additional ponds either built, under construction, or contemplation. In addition to this an unusual heavy stock of fry was retained last year, and if nothing happens by 1906 the output should be double what it was last season.

There were not enough breeding fish to stock the existing ponds in the Bellefonte and Wayne county hatcheries this year and the Department not wishing the supply of fry for next spring to be less than it was last year again sought the co-operation of some private hatcheries in the State, the result of which was that the Penn Forest Brook Trout Company, of Mauch Chunk, and the Blooming Grove Park Association once more generously give their surplus trout eggs, amounting to several millions. The Department desires to retain, if possible, nearly 300,000 of fry, which will be hatched this winter for breeding purposes, and these will produce eggs in the fall of 1906 in vast quantities.

In connection with the trout work of the State I feel it my duty to call attention to the fact that in the Forestry Reserves there are large numbers of magnificent trout streams. Last year the Department of Fisheries and the Department of Forestry made every effort to plant trout fry in these waters. Unfortunately they are both handicapped for lack of money, which could be applied to this purpose. The Department of Fisheries could ship the fish to the railroad stations nearest the streams in the Forestry Reserves, but had not money or facilities for planting the fry in the waters. The Department of Forestry had no money which could be expended for transporting the fish from the railroad station to the streams. The most it could do was to supply men to plant them. Some of the difficulties were overcome last winter through the Pennsylvania Fish Protective Associations, and the Norristown Fish and Game Protective Associations coming forward and voting money to pay for the transportation of fish where individual sportsmen could not be found to carry the fish to the Forestry Reserves at their own expense.

While it is eminently proper that sportsmen should pay the expense of transporting fish for which they themselves apply to be planted in public waters in which they are particularly interested, it is not just, and it seems to me that the State should not ask either individual sportsmen or State Fish Protective Associations to spend their private funds for planting trout in the streams in the Forestry Reserves. It is a duty I feel which should devolve entirely upon the State and I trust that a small appropriation be made at the coming session of the Legislature for the express purpose of planting fish in the Forestry Reserves.

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EELS, CATFISH AND BULLHEADS.

The result of legalizing fish baskets in the waters of this Commonwealth for the capture of eels has been a complete surprise to the Department of Fisheries and to a large number of people interested in the fisheries throughout the State. The fish basket is undoubtedly a dangerous device for catching fish. There are none in fact as dangerous, with the exception of the explosives or poison, nets fastened to wingwalls and gigging. It is so dangerous a device that it was prohibited by law in Pennsylvania for more than one hundred and twenty-five years. For many years bills were introduced into the Legislature to legalize the device, but Fish Commissioners and anglers objected so strenuously that the bills regularly failed of passage. The bills were very properly defeated, because no safeguards were placed around them and under the provisions of those bills had they been legalized the destruction of the fish in the streams would have inevitably followed. In 1903, however, an act was passed which seems to throw reasonable safeguards around the baskets and a measure was enacted to permit eels being captured by that means. After two seasons' experience I am of the opinion that with some slight changes in the law the fish basket should be allowed to remain a legal device. Through its establishment an important industry has been established, an industry which promises to increase year by year and attain a position nearly as important as the shad. From figures obtained from sixty-five baskets licensed in the winter of 1903 there were 44,750 pounds of eels caught, which realized at least $3,132.50 to the fishermen and the State realized $1,030.50 from licensing the fish baskets. From the returns from the sixty-five baskets it is fair to assume that if the eels caught from the 141 additional baskets for 1903 would have been at least 141,308 pounds with a value exceeding $9,891.00. While the figures for this year are not yet made up, I am quite satisfied that the catch of the fall of 1904 will be at least three or four times as large as it was in 1903. First, because the conditions of the river were more favorable, and second, because there were 100 baskets more licensed. Such an industry should be encouraged, especially since the bulk of the fishermen appear disposed to obey the law. The legalizing of the fish basket for the capture of eels has also undoubtedly created a better sentiment along the Susquehanna Valley towards the work of fish protection than anything which has been done for several years.

I feel, however, that the law should be amended. In addition to eels the law should permit the capture of carp and suckers in the device. The slats in the bottom should be rounded. The name of the licensee should be painted on the side of the device. And there should also be one or two other amendments of a like nature.

While there is no doubt in the minds of the Department that a person who violates any of the provisions of the fish basket law is liable to the penalty provided for under Section 2 of the act of May 29, 1901, or of Section 15 of the same act, several county courts have held that there is no penalty, at least under Section 2. Therefore, it is important that at least in this particular the bill be amended and a specific penalty provided.

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The Department notes with some concern that it is said there is a decrease in catfish and bullheads, excepting the latter, in the mountain lakes. Both fish are highly esteemed for food and the Department proposes as quickly as it can to be provided with facilities to undertake the propagation of these two fishes. It also feels that in the catfish and the bullhead there is an opportunity for the farmers to utilize waste swamp land and small ponds by their cultivation. The white catfish brings steadily from four to five cents a pound dressed in the markets and the bullheads nearly as much. The fecundity of the two fish is enormous and they require absolutely no attention. All that it would be necessary for a farmer to do would be to place a supply of catfish and bullheads in a pond, which he might build and occasionally feed them with cut liver, and in every other manner the catfish and the bullhead will care for himself. They will hunt their own spawning bed, hatched their own eggs and rear their own young. It is unlike the carp which was years presented in such glowing colors as a fine table fish, the fish of the catfish rarely having a muddy taste. It is also a fact that where catfish are taken from polluted waters (and they will grow and thrive in pollution), and placed in clear spring water for a couple of months, they will lose every particle of taint which may be in the flesh.

PROTECTION.

The work of fish protection has been conducted with the same vigor and given the same attention that was devoted to fish culture. Indeed it is just as important a phase of the work of the Department of Fisheries as fish culture. Almost immediately after the establishment of the Department it became evident that the work of fish protection was going to assume very large proportions and this branch has largely under the supervision of my chief clerk, Major Barton D. Evans, while all the responsibility was assumed by me.

There are three important sub-divisions in this branch of the service, namely: the purification of the waters, the abolition of illegal and destructive fishing and the establishment of fishways in dams, where the migration of fish are obstructed. By far the most important of the three is the task of getting rid of the water pollution.

The contamination of the streams in the Commonwealth has become one of the most serious and vital questions which to-day confront the people. Begun, without doubt, by individuals and corporations the extent of pollution of our waters has become greater every year, until to-day not only the existence of the fish, but the health of the people are becoming seriously endangered. Streams which once teemed with finny life are now, owing to filth and chemical waste, entirely bare of both fish and vegetable life, and in addition many of these streams are so badly polluted that it is declared cattle have died from drinking the water and people with small wounds bathing therein have had their wounds turned into dreadful sores.

Public sentiment long dormant on this question of water pollution is becoming strongly aroused not only against its further ex-

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tension, but in a demand for the purification of the waters both in the interest of fish and public health. Strong and numerous appeals have been made to the Department of Fisheries to lend its aid to the abatement of this great and growing evil. Unfortunately the existing laws which relate to fish and fish protection and which refer to water-pollution are few and totally inadequate to meet the issue. I have given very much time and attention to this subject and I feel that it is one of the greatest and most difficult problems to solve given to any official. While public sentiment is very strong and is daily growing stronger in favor of the abolition of water pollution there is a very strong element resisting any change in the present conditions. When the subject is broached and manufacturers are asked to abate the pollution, and the question of the enactment of laws looking to that end are discussed many of them place themselves in violent opposition and that is especially the case where the fisheries interests are brought forward. They point out the great value of their particular industry to the State and themselves and minimize the value of the fisheries industry. To quote one man, "What are the value of a few fish as compared with the millions of dollars which our manufacturies produce every year?" Fortunately the number of those who are standing out against any law whatever to abate the water pollution nuisance does not appear to be as great as formerly. There are many large thoughtful manufacturers who admit the evil and express their willingness to take any action towards stopping pollution, which lies within their power and which will not prevent their carrying on their business. I have investigated a large number of cases of water pollution and I find many of them cannot be abated excepting at practically a prohibitive expense. I have not been in full sympathy with many of the bills which have in past years been presented for the abolition of water pollution, for I am convinced that if some of them had become laws they would have been the means of wiping out many valuable industries. I recognize the right and need for industries to prosper and I feel that the Commonwealth should not enact any measure which will destroy any existing industry. On the other hand I believe that no existing industry should be allowed to destroy the fish or injure public health or animal health. Much of my time since my appointment as Commissioner has been given to an effort to devise some means by which a law will be enacted which will not injure existing industries and at the same time protect the fish from water pollution. It is certain that some legislation is necessary to abate the growing evil of water pollution.

FISH WAYS, ETC.

Another question of serious import confronts me, namely, the large number of obstructions to the migration of fish which exists in the streams of the Commonwealth through the existence of dams. It is recognized as a fact that the dams are oftentimes necessary in the industrial development of many industries in Pennsylvania. Many manufacturies require the damming of water for their business and there has come into existence within the last few years a new and important industry namely, the furnishing of light and power by means of elec-

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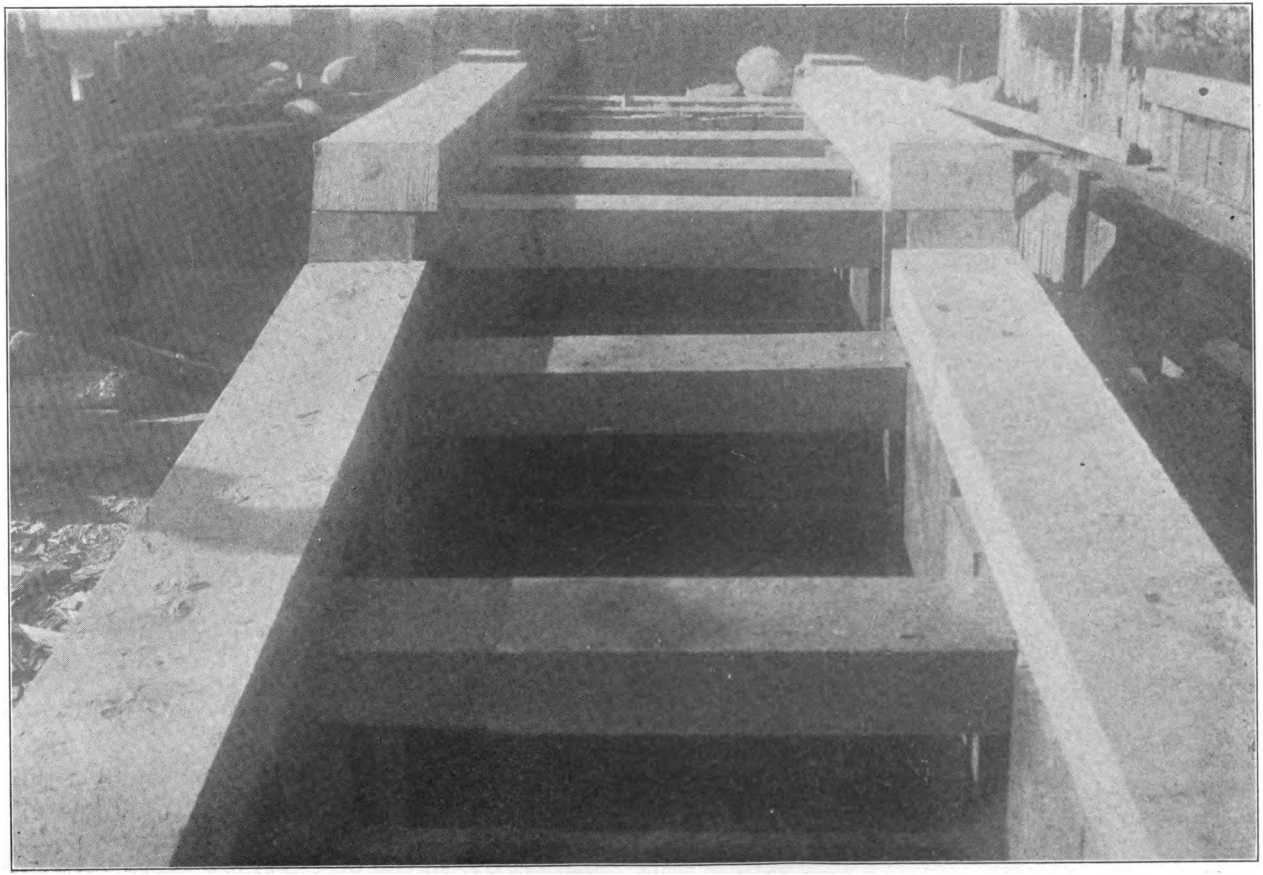

FISHWAY, VENANGO RIVER, TOP SHOWING BRACES AND BULKHEADS.

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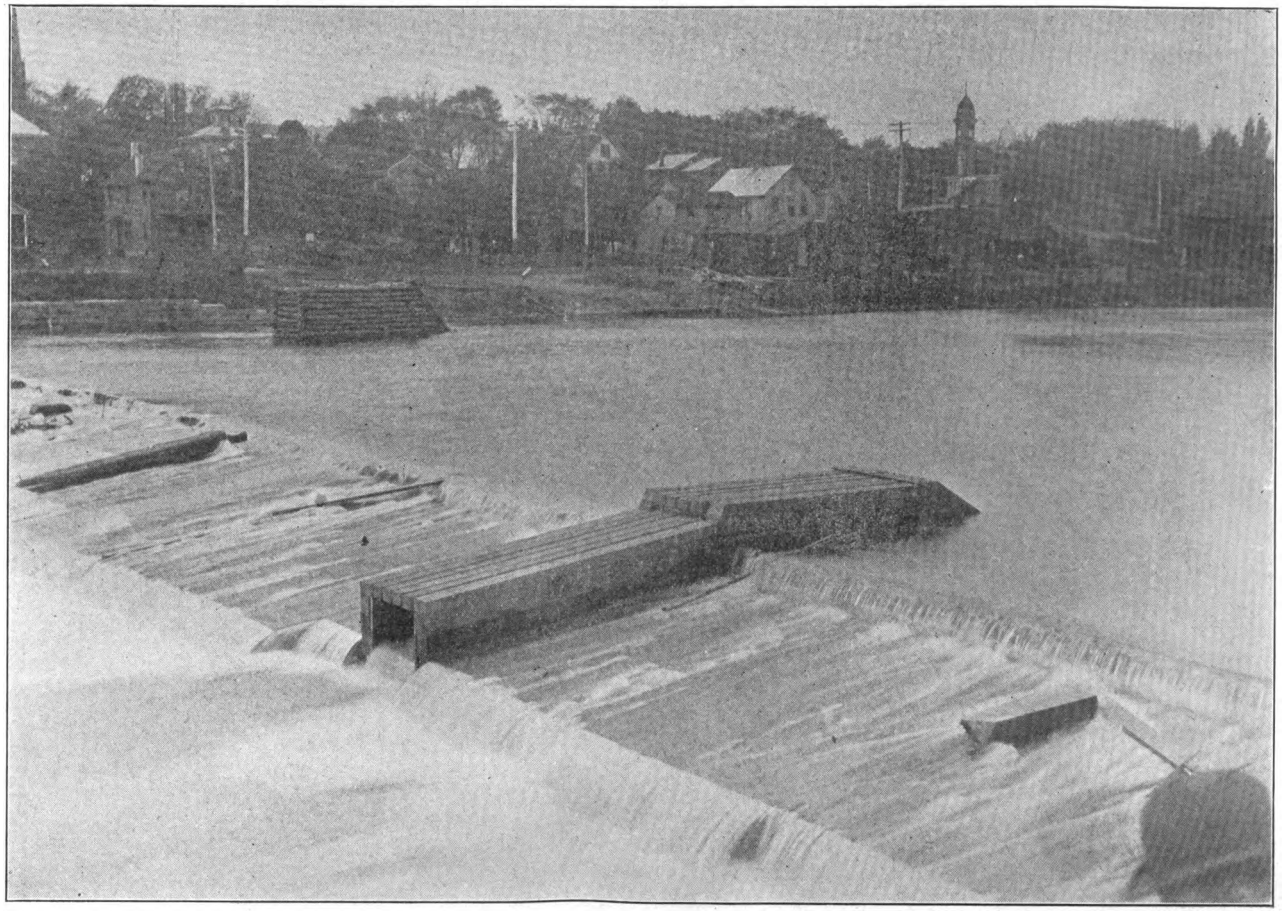

FISHWAY, VENANGO RIVER, FRANKLIN, FINISHED. BUILT 1904.

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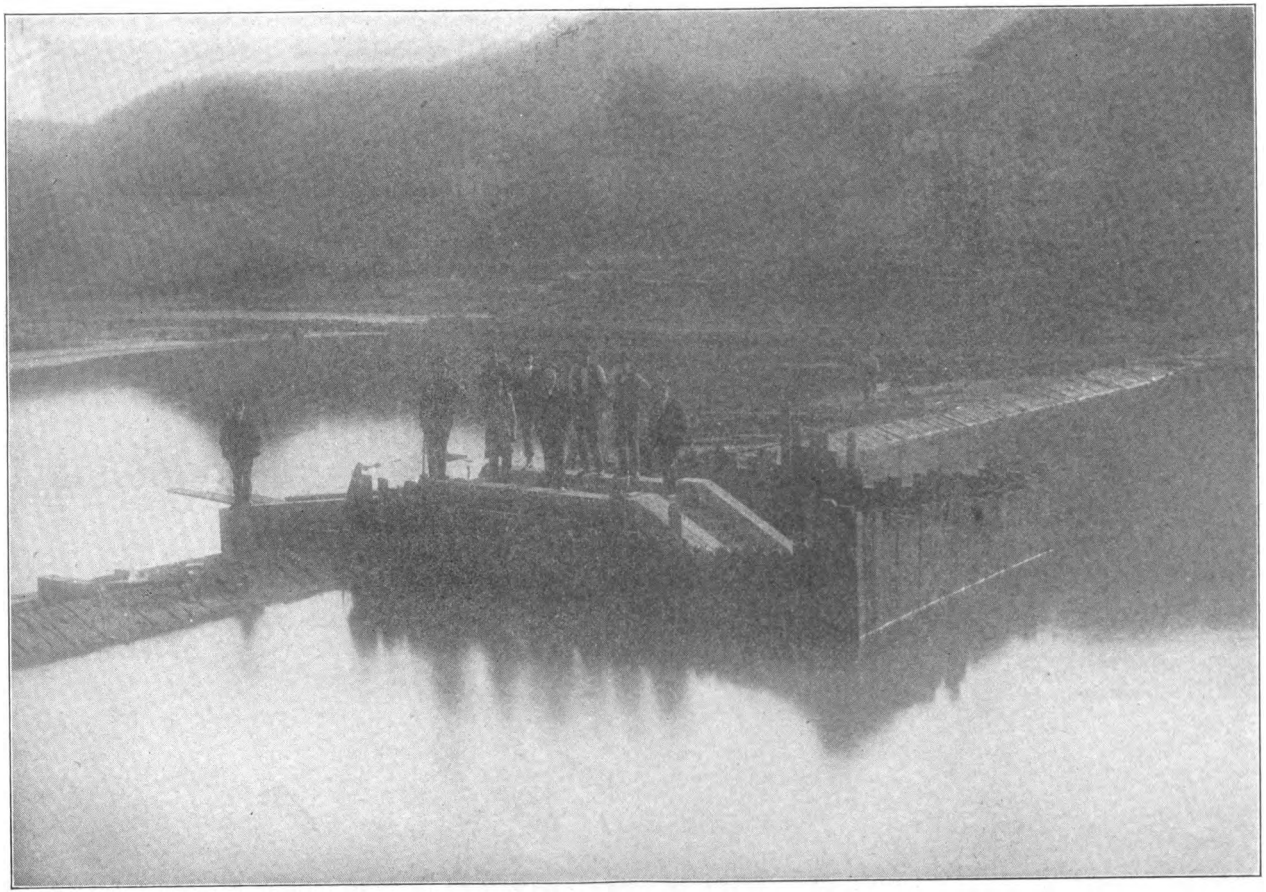

FISHWAY, VENANGO RIVER AT FRANKLIN, SHOWING COFFER DAM.

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tricity, and it often happens that the power for generating the electricity can be best had by means of water either from natural fall or by means of damming the stream. These conditions of course must be recognized and met. Under Section 13 of the act of May 29, 1901, it is obligatory on any person or corporation who should thereafter erect any dam to place therein a fishway on demand of the Department of Fisheries and in case of refusal the Department is empowered to enter upon such dam and place such fishway, chute of slope as may be deemed necessary and charge the construction of the same to the owner. As under the decision of the Supreme Court persons who erect dams prior to the passage of the act could not be compelled to build fishways, slopes or chutes at their expenses. The same section provides that where such devices are needed they may be built by the Department of Fisheries from any unexpended balances in the State Treasury.

A number of complaints were received at the office of this Department that manufacturers and others were not conforming to this law. An investigation was made in each case and wherever the complaint was shown to be well founded the owners were ordered to erect the fishway. There were found to be seven or eight cases in which the owners were believed to be responsible and notices were therefore sent to each. All gave affirmative answers and most of the fishways have either been completed or are stated to be under construction. The patterns were not all alike. The width of the stream, the character of the dam and other conditions were taken into consideration. In a dam in Brodheads creek and McMichaels creek chutes were permitted and other modifications of what is known as the Cail fishway were adopted.

Among the complaints received for the lack of fishways in dams were where the dams were built many years ago. Of these two seemed to demand early consideration. One was in the Venango river, at Franklin, the property of Johnson & Co., the other was in Clarks Ferry dam, on the Susquehanna river, the property of the Pennsylvania Railroad Company. Petitions aggregating several thousands of names for the erection of the fishway in these two structures were sent to this office. The first dam selected was the one at Franklin in the Venango River, sometimes called French Creek. Not desiring to antagonize the owners the Department entered into correspondence with Johnson & Co., and had personal interviews with them, and the result was that they gave their assent to a fishway being constructed in the dam without interposing any legal obstacle. Bids were asked for in the summer of 1903, but when they were opened it seemed to me that even the lowest bid was excessive, it being in the neighborhood of $3,500. I, therefore, rejected all the bids and the matter was laid over until the succeeding year. I do not believe that the State should be called upon to pay any more than private individuals should pay for the same kind of work. In the summer of 1904 I again advertised for bids and awarded the contract to a Meadville firm for the sum of $1,900 on special plans drawn of a fishway closely resembling a Cail fishway, a device adopted by the United States Government. Work was commenced about the first of September and the structure was completed before the middle of October.

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Following the same course that I pursued with Johnson & Co., having received a petition of nearly two thousand names to build fishways in the Clark's Ferry dam I negotiated with the Pennsylvania Railroad Company. As soon as officials were satisfied that the State would do all in its power to safeguard the integrity of the structure a cordial assent was given to the proposition and engineers of the Railroad Company were directed at my request to draw plans and specifications for three fishways to be set side by side in the Clark's Ferry dam. The plans and specifications followed closely the Cail fishway. Bids were advertised for and a contract was awarded to a Philadelphia firm for $4,237.50. The work was to be completed within sixty days. In accordance with an understanding with the Pennsylvania Railroad Company, I appointed Mr. T. W. Weirman inspector of the work. Before it had progressed far it was found that the specifications under the plans as furnished by the United States Government were in some respects inadequate to provide a perfectly safe structure in a river like the Susquehanna where winter ice gorges form and create a power which is almost irresistable in destructiveness. Accordingly some changes were authorized to strengthen the device adding some $663 to the cost. The work was finished a week later than the fishway in the Venango river. I inspected the fishway personally after the inspector had made his report, and I concur in his judgment that all the requirements of the specifications had been faithfully carried out; and the bills of both contractors were paid by the State Treasurer.

In former years the few fishways that were erected were of the Rodgers pattern of ladders, under rights conferred by the inventor. But after examination a number of other devices invented since, I felt that the Cail fishway adopted by the United States met the requirements of migratory fish much better than the devices hitherto used by Pennsylvania. Instead of a ladder, which formed zig zag currents the Cail fishway consists of a series of boxes set staggered obliquely across the fishway. There were square holes at the bottoms at alternate corners and the entrance holes were so gaged that water also flowed over the top of the box, thus permitting the fish to either swim from box to box through the holes or leap over the top. By staggering each compartment the water was made to swirl in such a manner as to form eddies and almost still water, so that the weakest fish could find no difficulty in passing up one of the fishways. The structure on the Clark's Ferry dam and the dam at Franklin were made of heavy timbers, securely bolted into the dam, which were cut for the purpose. The work was done so well in the Clark's Ferry dam that experts declare their belief that the dam has actually been strengthened and that other parts would be torn out before that on either side of the fishway. The structure in the dam at Franklin is I feel equally well built and it is inconceivable to me that either can possibly be torn out. Since the fishway was finished in the dam at Franklin people have reported seeing large numbers of fish working their way up. The fishway at Franklin was designed primarily to permit the game fishes to go up from the Allegheny river or to go down from the Venango river. That in the Susquehanna was primarily intended for shad, and the experiment will be watched with great interest. The shad is an exceedingly timid fish and it seems to look upon former types of

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fishways as traps, naturally, when they were new and few would venture to enter them until after they had become old, weather-worn and covered with green.

The pattern of the Cail fishway, however, is so different from that of former contrivances that I feel encouraged to believe that they will be freely used by the shad as soon as the timber becomes darkened and stained by the water and water plant growth. Should it appear in the spring that these hopes are verified it is my intention to build similar fishways in the dam at Muncy and the one at Williamsport on the West Branch, thus allowing the shad to reach the upper reaches of that river and thus re-establish the shad industry in that section of Pennsylvania.

There are a large number of dams in the State in which fishways should be built, but I feel that the power which is vested in me to erect such structures should be used conservatively and my feeling is to build no more than one or two fishways a year, and then only after becoming convinced entirely of their efficiency.

Section 14 of the act of May 29, 1901, authorizes the Department to order screens placed at the head of raceways where it is advisable to do so in order to prevent fish from entering and being ground up in water wheels. Fully 200 complaints were received during the first year and a half of the existence of the Department. I am sorry to say that investigation showed that a large number of the complaints were due to personal antagonism towards the owner of the raceway and the complaints were apparently more by a desire to use the State as a means to "get even," than to protect the fish. In most of these cases it was found that either very few fish entered the raceway or that the owner already had screens at the foot of the raceway instead of the head, screens which generally answered the purpose of the law if not exactly the letter. In such cases the Department declined to interfere. There were found, however, four cases in which the owners had made no provision for the protection of the fish and where fish were being destroyed. In those cases notices were served and the screen built.

DYNAMITE FOR ENGINEERING PURPOSES.

Between June 1st, 1903, and December 31st, 1904, there were five applications made to the Department for permission to use dynamite for engineering purposes, as follows:

The Monroe Power and Supply Co., Stroudsburg, to destroy a dam.

Dr. Joseph Kalbfus, to remove rock in Susquehanna river at Perdix, Perry county, obstructing navigation.

Through Will J. Keffer, fish warden, removing rock in a quarry pond near Wernersville.

Rivermen's Association of Harrisburg, for the removing rock in Susquehanna river near Steelton, etc., obstructing navigation.

West Fairview and Harrisburg Steam Ferry Co., removing rocks from the Susquehanna river near West Fairview, obstructing navigation.

In each case in giving the permit the Department provided that due care was to be taken in destroying no more fish than necessary and that any fish which might be destroyed should be transferred to some charitable institution.

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In the autumn of 1903 two men undertook to dynamite the Susquehanna river near Middletown, claiming that it was for the purpose of clearing away rock for a shad battery. The men had applied for no permit, however, and they were promptly arrested. The case was prosecuted and dropped on the parties paying all the costs and promising thereafter to observe the laws.

SUNBURY DAM.

The great ice gorge in the latter part of last winter, 1903-4, destroyed the dam at Sunbury, thus removing one great obstruction to the passage of fish. It is stated by the Pennsylvania Railroad Co., which owns the structure, it is not to be rebuilt. Any shad, therefore which passes beyond Clark's Ferry dam will now find its way clear as far as Nanticoke dam.

It is said, however, that citizens of Sunbury, who desire slack water in front of their town are considering the advisability of rebuilding the dam at their own expense. No confirmation of this report has been received at this office, but if it should transpire that the movement takes form and accomplished, the parties will be required under the law to place fishways therein.

Referring again to water pollution, I desire to call attention to a dangerous practise by some of the coal washeries on the north branch of the Susquehanna river. Many of the companies engaged in washing coal from the culm banks take great precaution to prevent the refuse filth from flowing direct into the river, but I am sorry to say that there are some companies which exhibit no regard whatever for the public in this respect and no care to prevent the refuse material from flowing into the stream is taken. Last autumn it was reported to me that one company near Schickshinny was flowing their refuse culm into the river and rapidly filling the bed with a nasty black deposit. It is stated that where a year ago there was a depth of thirty feet of water there was at the time the complaint was made only about six feet depth. As this is a matter which does not come under the jurisdiction of the Department of Fisheries no personal investigation was made by me. It is not under the jurisdiction of the Department of Fisheries because there is no law on the statute books giving the Department power to interfere. I so advised the complainant and pointed out that action only could be taken by them as citizens and charged them with committing a nuisance. I understand that citizens of the towns along the North Branch of the Susquehanna for a long distance below and above Wilkes-Barre have organized and entered suit against offending companies, with what results I have not heard.

Complaint has also been made to me of the existence of a dam built, I understand, by the York Haven Power Company. It has been stated that the dam has been erected without authority of law, and I was importuned to proceed against the company to have the dam removed or to order fishways built therein.

I am unable to take action in either particular. I investigated the case and found that the dam is a wing dam, which does not extend clear across the river. It does not touch what is known as the channel on the Lancaster side of the river. As the dam is a wing dam only and as the passage way is left open on the Lancaster

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county shore, I am of the opinion that I have no authority to interfere. It is my duty to see that there is no obstruction in the passage of the fish and as long as the structure does not extend clear across the river and obstruction of the migration of fish cannot be claimed, and I think would not hold good in the courts for the same reason. I do not think I am justified in ordering fishways placed in the wing dams and I doubt my power to collect the bill from the company should I build fishways therein, or compel the company to pay the bills should I order it to do so. It does not seem to be within my province as Commissioner of Fisheries to consider whether or not the wing dam is there in accordance with the law.

Complaint was also made against the Power Company that their turbine wheel ground up tons of fish. Although I investigated the matter personally, I was unable to verify this charge. The company, however, at my request, placed screens in the raceway where the water leaves to enter the wheel. It would be a physical impossibility to build the screen at the head of the raceway, as provided for in the act. Apart from other considerations I can imagine no screen could be built of sufficient strength to withstand the rush of water entering the raceway, the width being several hundred feet. Moreover the raceway, it is said, is frequently used by boats passing down to the paper mill.

WARDEN SERVICE.

The Department of Fisheries is charged with the enforcement of all the laws relating to fish and fishing in this Commonwealth. To enable it to do so the Legislature has provided two classes of wardens, one class known as fish wardens, who shall be paid a regular salary, and expenses; and the other class, known as special fish wardens to whom the Department is not liable to pay compensation or expenses, but they are expected to rely on one-half of the fines imposed and received from persons who they arrest for violations of the fish laws, for their compensation.

The number of salaried fish wardens which may be appointed is limited to twelve, but it is within the power of the Department to appoint as many special wardens as in its judgment it is desirable to have either on its own volition or on the written application of a properly organized fish protective association, or of any association of individuals with established hatching houses. The commissions of the regular salaried wardens hold at the pleasure of the Department. The commission of all the special wardens expire on the 31st of each May.

The appropriation made at the last session of the Legislature for salaried wardens and their expenses for the two years was $10,000. To this should be added whatever moneys might be received from license fees for eel baskets, and this sum amounted to a little over $2,600.00 during 1903-4. Hence the sum available for warden service was a trifle over $12,000.

The sum was entirely too small to permit the appointment of full twelve wardens and consequently only five were commissioned. Even then the expenses did not warrant paying them for the entire twelve months. In the winter of 1903 the salaries of all but two had been discontinued, and in November 1904, all but one.

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Through recommendations and other authorities as provided in the act from June 1, 1903, to December 31st, 1904, the Department appointed 145 special wardens covering most of the counties in the State. I am sorry to say that less than one-half of the total number appointed have exhibited any great activity. On May 31, 1904, when the Commissions of the first lot appointed expired, I dropped most of those who had done absolutely nothing and from time to time appointed others in their places, sometimes with success and sometimes with no better results. I have found it extremely difficult to secure active special wardens in the western, southern and northeastern parts of Pennsylvania. There were many men apparently anxious to serve but few who once appointed did anything. There have of course been a few notable exceptions. I am, however, convinced that the chief reliance of the Department must be placed on the special wardens. The greatest results by far have been achieved by them, as will be seen by a subjoining table. As far as I have been able to ascertain the bulk of the men appointed as special wardens or regular wardens, even where they have not performed any active duty, having done nothing calculated to bring discredit on the Department, and it is creditable to the force as a whole that only in five instances have any charges been made of improper conduct. In each of these five instances a rigid investigation was made. In two cases it was found that the charges were absolutely without foundation. In two other cases, however, I regret to say the charges were only too true. In both, the Department ordered warrants sworn out for their arrest on charge of extortion and embezzlement.

One, the case of Harry F. Shoop, a special fish warden for Mifflin county and adjoining counties, was charged with having taken money imposed for fines and appropriated it to his own use. Other reports of proceedings not creditable to himself and calculated to bring discredit on the Department were reported. The Department, however, proceeded against him only on one special charge. He was tried before the Mifflin county court on November 16th, and after a full hearing the jury convicted him of extortion as an officer, but recommended him to the mercy of the court.

The Department felt that the utmost severity should be shown these culprits. A fifth case was one of gross impropriety rather than criminal action. In this instance by the talk of the warden the Department was likely to be held up as prosecuting cases for the sake of revenue, rather than for the purpose of suppressing illegal fishing. In addition the warden put the Department rather in the attitude of persecution than prosecution, by taking his prisoners a long distance and compelling to pay excessive costs, when they might have been taken to a nearby justice of the peace where the cases could have been as creditably heard. In this instance the Department contented itself with summary dismissing the warden.

Although as will be seen by the sub-joining table that wardens exhibited great activity, and caused the arrest of a phenominally large number of illegal fishermen, I am happy to say that there were but two cases in which the Department felt that had it been advised prosecution would have been dropped. In these cases while there had been a clear violation of the law there was apparently no intention whatever. Unfortunately the cases were not reported

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until too late. That is to say, until after the money had been paid into the hands of the justice of the peace and apportioned according to the act. In all other cases as far as the Department has been able to determine the parties arrested were rightfully punished, and a large number of them might have been fined for much heavier fines than they were.

RECORD OF ARRESTS FOR ILLEGAL FISHING.

The following is a record of the arrests made from June 1st, 1903, to December 1st, 1904, with the causes and final dispositions thereof:

Total number of arrests,	783
Total number of acquittals,	79
Total number of convictions,	704
Total number of boats confiscated,	12
Total number of nets confiscated,	31
Total number of wardens making arrests,	74
Total number of wardens,	116
Total amount of fines collected and paid into the treasury,	$4,568.51

The above-named moneys are five per cent. less than one-half the total amount originally paid by the convicted parties to the justices of the peace. One-half the original fine moneys were paid to the wardens and five per cent. of the other half were retained by the county treasurers as their fees. Therefore, the sum total of fines collected to November 30th, was nearly $9,600.00.

The following statement shows the number of arrests for the various character of offences:

Having short trout in possession,	61
Gigging or spearing,	33
Using illegal devices,	55
Using outlines illegally,	47
Using dynamite,	47
Illegal fyke nets,	11
Set devices,	1
Tip-ups,	4
Having game fish out of season,	63
Seine in trout stream,	11
Short bass in possession,	7
Cast nets,	21
Dip nets, illegally,	33
Illegal eel baskets,	85
Fish baskets in Delaware river,	4
Sunday fishing,	27
Resisting an officer,	7
Constable refusing to obey request,	1
Sturgeon out of season,	2
Seining illegally,	36

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Shooting fish,	5
Pollution,	1
Nets in wing walls,	19
Game fish in eel baskets,	1
Justice of the peace,	1
Stir nets,	31
Quick lime,	5
Assault and battery,	11
Failure of constable to prosecute,	1
Snaring,	5
Drawing off dams,	41
Short trout for eel bait,	3
Buying trout,	2
Selling trout,	4
Larceny of fish,	1
Netting sturgeon out of season,	2
Obstructing immigration,	8
Refusing to testify,	1
Gill net without license,	1
Hand lines,	2
Bass in lake,	1
Trap net in lake,	1
Extortion as an officer (fish warden),	1
Total,	783

The following is the statement of the expenses of the various hatcheries by quarters:

	Allentown.	Bellefonte.	Corry.	Erie.	Bristol.	Wayne.
1893.						
August 31,	$912 59	$39 91	$1,523 71	$840 22	$37 50	.....
November 30,	962 68	370 25	1,233 52	577 38	67 50	.....
1904.						
February 29,	830 31	1,162 14	899 18	1,615 90	37 50	.....
May 31,	818 34	1,401 56	1,409 22	831 78	37 50	.....
Total,	$3,523 92	$2,973 86	$5,065 63	$3,865 28	$180 00	.....

The total cost of the hatcheries for the year ending May 31, 1903, was,	$15,608 69
Office expenses,	735 81
Commissioners' expenses,	360 21
Commissioner's traveling expenses,	388 72
Total,	$17,093 43

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	Allentown.	Bellefonte.	Corry.	Erie.	Torresdale.	Wayne.
1904.						
August 31,	$137 50	$1,814 74	$1,207 57	$794 46	.....	$43 00
November 30,	.....	1,898 72	1,012 21	1,758 45	$417 88	1,357 53
Total,	$137 50	$3,713 46	$2,219 78	$2,552 91	$417 88	$1,400 53

The total cost of the hatcheries for the six months ending November 30, 1904, was $10,442 06
Office expenses, ... 587 42
Commissioners' expenses, ... 210 00
Commissioner's traveling expenses, ... 323 20

Total, ... $11,562 78

The office expenses and the expenses of the Commissioners were as follows:

	Office.	Commissioners.	W. E. Meehan.
1903.			
August 31,	$252 74	.....	$100 93
November 30,	203 95	$146 50	84 19
1904.			
February 29,	159 70	136 19	114 53
May 31,	119 42	77 52	89 07
Total,	$735 81	$360 21	$388 72
1904.			
August 31,	$326 93	$190 63	$235 92
November 30,	260 49	19 47	87 28
Total,	$587 42	$210 10	$323 20

Of this money expended for hatcheries, office and commissioner's expenses $4,178.08 was for money received from fines and $3,642.06 was from Lake Erie licenses.

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The following are the amounts paid for wardens service and fish protection and the sources from which the money was derived:

	Warden appropriation.	Eel licenses.
1903.		
November 30,	$859 19	.....
November 30,	1,155 58	$757 45
1904.		
February 29,	973 17	116 57
May 31,	2,006 38	75 00
Total,	$4,994 32	$949 02
1904.		
August 31,	$1,556 50	$75 00
November 30,	930 83	1,415 82
Total,	$2,487 33	$1,490 82

During the year ending May 31, 1904, 206 licenses were issued for eel baskets.

During the year ending May 31, 1905, 316 licenses were issued.

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Received from State Treasury for the hatcheries and general expenses of the Department for year ending May 31, 1904,		$12,500 00	
Received from Lake Erie licenses for the year ending May 31, 1904,	$1,939 93		
Received from old commission,	1,267 14		
		3,207 07	
Received from fines for the year ending May 31, 1904,	$2,258 37		
Received from old Commission,	217 07		
		2,475 44	
			$18,182 51
Received from State Treasury, for hatcheries, etc., for the six months ending November 30, 1904,	$6,250 00		
Received from State Treasury for hatcheries, etc., for quarter ending February 28, 1905,	3,125 00		
		$9,375 00	
Received from Lake Erie licenses for six months ending November 30, 1904,		748 00	
Received from fines for six months ending November 30, 1904,		2,558 55	
			$12,681 55
Received from State Treasury for the payment of wardens for the year ending May 31, 1904,		$5,000 00	
Received from eel basket licenses for the year ending May 31, 1904,		1,037 00	
			$6,030 00
Received from State Treasury for wardens for six months ending November 30, 1904,		$2,500 00	
Received from fines for six months ending November 30, 1904,		1,580 25	
			$4,080 25
NEW HATCHERIES.			
Received from the State Treasury for the purpose of purchasing and erecting new hatcheries,			$15,000 00
Paid for the hatchery at Bellefonte:			
For house and ground,	$2,600 00		
For hatching house, ponds, etc.,	5,480 24		
		$8,080 24	
Paid for the hatchery in Wayne county:			
For house and ground,	$2,000 00		
For hatching house, ponds, etc.,	2,943 04		
		4,943 04	
Paid for hatchery at Torresdale:			
For hatchery and ponds,		1,976 72	
			$15,000 00
FISHWAYS.			
Received from State Treasury for erection of fishways, under the provisions of Section 13 of the Act of May 29, 1901,			$6,733 48
Paid for fishway at Franklin:			
For advertising,	$14 60		
For erecting fishway,	1,800 00		
		$1,814 60	
Paid for fishway at Clark's Ferry dam:			
For advertising,	$17 45		
For erecting fishway,	4,801 43		
		4,918 88	
			$6,733 48

The output of fish from the various hatcheries from June 1st, 1903, to December 31st, 1904, is as follows:

Trout fry,	5,367,500
Trout fingerlings,	9,000
Black bass, matured,	429
Black bass fingerlings,	17,500
Rock bass,	600
Frogs,	33,900
Bullheads,	75
Spotted catfish,	10
Grass pike,	3
Carp (for breeder food for hatchery),	60
Suckers, (for breeder food for hatchery),	60

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Calico bass,	20
Yellow perch,	43,200
Sunfish,	1,170
Large mouth bass, fingerlings,	80
Wall-eyed pike,	26,660,000
Whitefish,	39,200,000
Lake herring,	5,600,000
Blue pike,	2,000,000
Loch Levan trout,	50,000
Goldfish,	300
Transferred from one water to another under the supervision of wardens:	
Catfish,	950
Yellow perch,	559
Sunfish,	365
Rock bass,	68
Trout,	18
Total,	78,985,867

Number of hatcheries is five, in operation, and the number from which fish were distributed is three.

Number of applications for brook trout received and filled, 3,024.

WORK OF FISH PROTECTIVE ASSOCIATIONS.

I have always believed thoroughly in the effectiveness of the Fish Protective Associations, Rod and Gun Clubs and Sportsmen's Associations in assisting in fish protective and fish cultural work. But it has always seemed to me important and indeed essential that these organizations should be brought together into one head, or central organization. There are many cogent reasons. Country clubs by themselves, while they have strength and influence in the county, in which the organization might be, would necessarily be restricted in its influence. With one or two exceptions, notably the Pennsylvania Fish Protective Association, and the branches of the State Sportsmen's Association, and the League of American Sportsmen, the influence could not extend far beyond a county or two. Moreover one association can not under ordinary circumstances, be thoroughly cognizant of what was going on in another organization, and it might easily happen that the two associations, with the same laudible object in view, might pull in the opposite directions. Furthemore county organizations by themselves could not be in as close touch with the Department of Fisheries as it is desirable they should be. It was sometimes difficult for the Department of Fisheries to get into close touch with individual county organizations. It is a well known fact that when small organizations unite in a central body the power for good can be vastly augmented.

Impelled by these considerations soon after my appointment as Commissioner of Fisheries I entered into correspondence with the officers of all the county organizations, whose names I possessed, requesting their views on the formation of a State organization composed of representatives from each county organization. I was much gratified by the almost unanimous stand and cordial sup-

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port of the proposition. I then took up the matter methodically and on March 24, 1904, there was begun a two day convention in Harrisburg.

Your Excellency gave countenance to the proceedings and opened them with an address of welcome. The convention lasted two days and it was decided to organize into a chartered body to be known as the "State Fisheries Association of Pennsylvania" with the following objects:

First. To aid in the enforcement of the laws concerning fish and fishing in Pennsylvania.

Second. The preservation and increase of food and game fishes in the Commonwealth.

Third. To increase public interest in the Fisheries of Pennsylvania.

Fourth. To give support and assistance to the Department of Fisheries of Pennsylvania.

Fifth. To encourage the formation of fish protective organizations in each county of the State.

It was decided that each association having one hundred members or less should be entitled to one delegate and one additional delegate for each additional one hundred members or fraction thereof. Officers were elected and a number of valuable papers were read on fish culture and fish protective subjects.

The delegates evinced much enthusiasm and there is every reason to believe that the new organization, which is in the nature of annual convention of associations will prove a great success and be a vast benefit to the fisheries interests of Pennsylvania. The purposes of the organization are so manifestly for the benefit of Pennsylvania's fisheries and so closely associated with the Fisheries Department that I feel that the proceedings should be made part of this report and I have therefore appended the full minutes and the papers which were presented.

Since my incumbency the Department has received far more support from all quarters of the Commonwealth than I expected. Everywhere individual corporation and association seems to feel that the Department of Fisheries should have their co-operation and support. Fish protective associations have especially given valuable assistance. The Blair county branch of the League of American Sportsmen, the Bellewood Rod and Gun Club, the Warren County Fish Protective Association, the Bradford County Fish Protective Association, the Pennsylvania Fish Protective Association, the Norristown Protective Association, and the McAdoo Rod and Gun Club have been especially prominent in their labors in behalf of fish protection and propagation.

I particularly desire to express my appreciation also of the cordial attitude of the railroad companies. Without exception these corporations have done everything in their power to facilitate the transportation of fish from the hatcheries to the applicants. Several of the railroad companies have issued special orders to their employes to give particular attention to the transportation of fish, and to render every assistance possible to the messengers who are in charge. It is true that railroad companies have a direct interest in the maintenance of fish life in the streams of Pennsylvania; but

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fourths of the material would have to be supplied by the plants operated by the Department of Fisheries and the exhibit after being installed would have to be cared for by employes of the Department, skilled in fish culture for skilled fish culturists are very scarce. Under these conditions I felt it was my duty to accede to the request of the Pennsylvania Commission to the Louisiana Purchase Exposition, and do my utmost to make a display which would be a credit to this great Commonwealth and properly set forth the important fishery interests.

I notified the Commissioners of my willingness to take personal charge of the collection of material, the installation of the exhibit, and the care after being put in place. The Commission set aside ten thousand dollars ($10,000) for my use in the work. Application was made to the Exposition authorities for space in the Forestry, Fish and Game Palace, and nearly 4,000 square feet were alloted at the north end of the building. It extended from near the east entrance to half way to the west entrance at a distance of 97 feet on each side of a fifteen foot aisle and at the east end about 40 feet southwardly to another aisle, and nearly the same distance west ward to a space allotted to the State of Missouri.

I decided to make an exhibit apportioned as follows:

1. Prominent example of live game, food, inferior and destructive fishes of Pennsylvania.
2. Mounted specimens of extraordinary large examples of Pennsylvania game, food and inferior fishes.
3. Mounted specimens of animals, birds and reptiles which prey on fish.
4. Of nets confiscated under the laws of Pennsylvania for being of illegal construction or illegally used.
5. A series of large photographs completely illustrating the methods employed by Pennsylvania in rearing brook trout.
6. Water-color drawings of the more important Pennsylvania fishes.
7. A complete collection of appliances used by anglers not merely for show or of extraordinary value, but such as would be exhibited by dealers in sporting goods and purchased by anglers.
8. Photographic transparencies illustrating picturesque fishing waters of the State.
9. Display of photographs of live animals.

Contributions to the above were made as follows:

Water-color drawings, by the Pennsylvania Fish Protective Association, Frank W. Taylor, Margaret J. Mellinger and W. E. Meehan.

Mounted specimens of large fish, by William Baird, of Cambridge Springs, Ernst Weisbrod, Philadelphia, and Edward Freedman, of Norristown.

Photographs of live wild animals by the Hon. George Shiras, of Allegheny.

Collection of anglers' appliances by E. K. Tryon, Jr., & Co., Philadelphia.

A contract was awarded to a Philadelphia taxadermist for mounted specimens of mammals, birds and reptiles which prey on fish, also

A contract for the erection of grotto of yellow pine over the fifteen foot aisle for the ninety feet extending from east to west and

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for the installation on the space allotted on each side of massive stagings for the placing of the heavy iron tanks for the accommodation of the live fish.

Space was provided for the thirty-five tanks for aquaria; sixteen of which were six feet long, three feet wide and three feet deep; five were five feet long and two feet ten inches high and two feet ten inches wide, and fourteen were four feet long, two and one-half feet wide, and two and one-half feet deep. The glass of the two largest sized tanks were five-eights of an inch thick, for the small tanks, three eighths of an inch thick.

It was held by a number of the exhibitors, before the aquaria were placed, that the glass to be used was not of sufficient thickness to stand the tremendous pressure of water in the tanks; but long before the Department and the Superintendent had studied the problem very carefully and experimented on a large scale, and arrived at the determination that the thickness decided on was quite sufficient, provided plenty of play was given. The results fully justified the findings of the Department and its Superintendent. Throughout the entire seven months of the fall only one pane of glass was broken, and that was caused not by water pressure, but by a slight settling in the floor of the Forestry Fish and Game Palace. I understand, indeed, that the only state which failed to have a glass broken by water pressure was Pennsylvania, and the other states making live fish exhibits used one inch glass, but did not give abundant play to the glass.

The tanks were placed on the massive trestles before mentioned, three and one-half feet from the floor, with the glass front facing the aisle, and they were then surrounded by pine boarding to conform to that used in the building of the grotto. The fullest amount of light possible was thrown into the water of the tanks so that people walking through the grotto could plainly observe the movements of the fish. Over the top of each tank was a paper label neatly framed and fronted by glass, giving the common and the scientific name of the exhibit, together with a brief data of its value arranged in chacteristics.

On each side of the label a transparency of fishing streams were set in frames. When this was all completed the grotto, the transparencies and living fish formed a scene of great beauty and attracted enormous crowds. Indeed at times it became necessary for guards to walk westwardly along the aquaria to the end and then eastwardly on the other side.

At the east end of the space extending southward is constructed a circular pool, twelve feet in diameter and five feet deep, fed by water falling over an eight foot cascade at the east end of the aquarium, and along a winding stream bordered by living evergreens, ferns, cat-tails and vines. The stream contained live fish and in the pool were huge specimens of some of the inferior fishes of Pennsylvania, weighing from twenty to thirty pounds each. The pool attracted scarcely less attention than the aquaria itself. All day long the projecting railing was overhung by large and curious crowds, who watched with interest the movements of the huge fish.

The confiscated nets and the mounted fish on panels were artistically displayed on a board petition twelve feet high and natural wood oiled. The photographs and water color drawings were dis-

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played on a neat wall of oiled yellow pine, guarded by the wings of a huge trap-net set upon the floor. In the centre of the space was a large railed inclosure completely filled by two huge specimens of sturgeon and a porpoise caught and killed in the Delaware river. The angling appliances and mounted specimens of birds, mammals and reptiles which prey on fish were inclosed in handsome quartered oak cases on the southern side of the exhibit. Subsequently a magnificent aquarium of aluminum, glass and marble was placed in the exhibit space on the request of the Chief of the Forestry, Fish and Game Palace for ornamental and not exhibition purposes.

The water for the tanks was supplied free by the Exposition officials through a two-inch pipe extending above the tanks on each side of the aisle and for the full length of the exhibit space. The water flowed through four-quarter inch pet-cocks for each tank, and from thence through a rubber tubing terminating with brass sprayers with such force that the water was driven clear to the bottom of the tank, even when it was full of water. Thus the most perfect form of aeration was given. Sometime in August a refrigerating tank was installed by the Exposition authorities, free of charge, to furnish chilled water for the fish. Unfortunately the refrigerating plant did not supply chilled water through all the tanks, but only to a small proportion. Hence the temperature during the entire summer was much too high for most of the fish in the greater number of tanks.

The work of installing the exhibit began on the 15th of March, and, by hard work, despite many great difficulties, and extortionate prices made by labor, both skilled and unskilled, and unreasonable exactions by these people, on the morning of the 29th of April the work was concluded and ready for live fish. On the afternoon of the 29th the live fish arrived from Corry in the Department Car Pennsylvania, in charge of Nathan R. Buller, Superintendent of the Wayne County Hatchery, with four assistants.

I was assisted in the work of installation by Mr. William Buller, the Superintendent of the Corry Hatchery, and at this point I wish to express my deepest appreciation of the splendid service he rendered. Day after day he was on the exhibit space hours before the laborers arrived and hard at work. He was the last to leave at night. He scarcely took time for his meals, such was his anxiety and concern for the success of the exhibit. For the last five or six days he worked every night until after midnight and for the remaining hours of darkness slept on the space.

On the day before the opening of the Exposition, when the fish arrived, he worked for the whole twenty-four hours. It seems to me that such devotion deserves the fullest publicity and recognition.

Nearly five thousand fish were brought in the first shipment and it was attributed to the skill of Mr. Nathan R. Buller that on that one thousand two hundred miles journey only three died. It is to be regretted that this condition could not continue, but they were scarcely placed in the tanks before my fears of the unsuitable character of the water furnished by the Exposition authorities were realized. The water instead of being clarified by subsidence as it should have been was filtered first by the city of St. Louis with lime and again on the Exposition grounds by means of alum water; water

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filtered by any process is not well adapted for the maintenance of fish life and that which was supplied was so heavily impregnated with lime and alum as to form a heavy deposit on the iron pipes, was necessarily fatal to nearly all the high-grade fishes. The trout, pike-perch, whitefish and blue-pike died within twenty-four hours. Yellow perch and several other species, notably blue catfish, died within a few days. At the expiration of ten days there were not more than fifteen species of fish alive, although curiously enough among those which seemed able to accept filtered water were several thousand lake Erie minnows. Under the circumstances I felt it my duty to refuse to send another load of fish until the water was put in a better condition. After several weeks this was done by materially reducing the quantity of alum. I then shipped the second load, taking charge of the car myself. This was early in June, although the water was very warm, less than one dozen fish were lost in transportation. I regret to say that on my arrival I found that the Exposition officials had not kept their pledge to install the refrigerating plant to supply clear water. The consequence was when the fish arrived the water in the tanks had a temperature of over eighty degrees. The trout and many of the lake fishes consequently died very quickly. The refrigerating plant was installed in August and on the 18th of August Mr. A. G. Buller, Superintendent of the Erie hatchery brought down a third lot, losing less than a dozen on the way. Owing to the chilled water in several of the tanks and by heavily icing the water in other tanks we were able to carry no less than thirty-six specie of Pennsylvania fishes until the middle of September. This was the last carload sent, because the appropriation would not permit the expense of sending more. Each trip cost in the neighborhood of three hundred dollars. Notwithstanding the difficulties which were encountered with the water, I think I can confidently and truly say that the exhibit was a credit to the resources and work of Pennsylvania. From the opening to the closing day there was constantly a dense crowd of people in front of the aquaria and around the pool and the exhibit space was nearly always comfortably full.

The judges of the Exposition awarded the exhibit one grand prize and four gold medals, or for everything which was distinctly classified, with the exception of the display of the confiscated nets.

The prizes were as follows:

Grand prize, for aquaria of live fish and accompaniments.

Gold medal, for angling appliances of E. K. Tryon, Jr., & Co.

Gold medal, for mounted specimens of mammals, birds and reptiles which prey upon fish.

Gold medal, display of photographs of wild animals by Hon. George Shiras, III.

Gold medal for Pennsylvania woods by Philadelphia Lumberman's Exchange.

The Fair closed on the afternoon of December 1st, and within fifteen minutes the work of packing the exhibit for return to Pennsylvania was begun under my direction and by the 14th everything was completed and given into the hands of the freight companies for shipment.

I have endeavored since my inception in office to keep within the money which has been appropriated to the Department. The new

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system inaugurated by the last Legislature and the passage of an act creating our Department has been most cordially received by the citizens of the Commonwealth and many tasks have been imposed upon the Department, the execution of which was meritorious. I am unable to say in nearly every instance it has resulted in good to the fisheries interests of the State. Extra-ordinary labor was imposed and has been imposed upon every warden that I was enabled to employ. But I am sure that a careful examination of their work will at least justify the expenditure of every penny it has taken to operate that branch of the Department.

A final review of the Pennsylvania fisheries work shows, in the main, them to be, I think, in a very satisfactory condition. Whenever the Department was not embarrassed by storms on Lake Erie the take of eggs of all classes of fish which have been propagated for years was largely increased, a decrease showing only in wall-eyed pike, blue pike and yellow perch. The old established hatcheries are in better repair and the new hatcheries at Wayne and Bellefonte are to-day in good working condition. The Torresdale hatchery it is hoped will be ready for good work in the spring.

There are some difficulties and obscurities in the existing fish laws, but none which are not impossible to be remedied. The work of the great majority of the fish wardens has been satisfactory and some of extraordinary merit. Public sentiment in favor of enforcement of the fish laws has grown and shows signs of increase. With the appropriation adequate to the proper operation of the hatcheries, there is no room to doubt a rapid increase in the number of fish in the streams of the Commonwealth.

Respectfully submitted,

W. E. MEEHAN,
Commissioner of Fisheries.

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CORRY HATCHERY.

REPORT OF WILLIAM BULLLER, SUPERINTENDENT.

To the Department of Fisheries:

Gentlemen: I beg to submit this my annual report from June 1st, 1903, to June 1st, 1904. I stated in my previous report there were yet several hundred thousand brook trout fry in the house to be distributed. These were shipped in the fore part of June. The pond on west side of grounds known as the carp pond, was filled with sunfish for breeding. In the month of June they spawned, but when the pond was drained in the fall there were only one thousand young fry, which were removed and shipped to Dauphin and Cumberland counties. I had constructed three large bass ponds. They are about five feet deep at one end and shallow at the other. The bottoms were covered with five inches of gravel, both fine and coarse, also had water plants in the pond. The spawning fish were put in the ponds in the fall and in the spring before spawning time I placed a number of boxes in one pond, built on the same plan as those used by the Michigan Fish Commission, for the fish to build their nests in. I had gravel in each box for the fish to work upon, but I could never see any of the fish working in the boxes, and I have my doubts as to their using them while the two ponds without the artificial nest boxes were alive with small fry. This leads me to think I have my ponds properly constructed, and that the fish prefer building their nests to their own liking. When I discovered the pond filled with small fish I felt well satisfied with the results. They worked along the shallow part of the ponds and around the plants. It was my intention to remove the large bass in a few days after noticing the fry, but before I could find time to attend to it there was an unusual heavy rain, causing a large amount of surface water to flow into the ponds from the hill, resulting in the ponds overflowing, carrying away the fry, of which were many thousands. I now have a large ditch along the north side of ponds to carry off any surface water in the future. I now know it is possible to hatch the fish in large numbers, and hope we will not meet with any misfortune this coming season.

Mr. Meehan had requested me to make a special effort to hatch gold fish, as he wished to supply the different public schools in the State for the purpose of helping scholars to understand fish culture more fully. We were not able to make a large showing in this work as we only possessed a few spawning fish which were in pond east of hatching house No. 2. After the fish had spawned they were removed to the aquarium. The fry remained in a healthy condition until they were of sufficient size to ship, which was in January.

Late in the fall Mr. Meehan secured fifty Japanese fantail gold fish, and we hope to be able to have a larger supply of young fish

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the coming year. The trout fry which we retained to stock our ponds were assorted according to size and placed in different ponds.

The spawning trout were healthy and strong during the entire season.

Owing to my hand being in a disabled condition, my efficient assistant Wm. F. Haas attended to the taking of brook trout eggs. The spawning began about the usual time and the amount of eggs taken this season was larger than any previous year, being 4,000,000. The percentage of eggs lost during hatching period was very small. I attribute the success to the additional ponds, which afford us better facilities for holding a larger amount of breeding trout. Eggs began hatching on November 29th, and continued during the month of December and January. The fry remained in fine condition from beginning until shipped.

The first shipment was made on March 15th, the counties being divided into two districts; Bellefonte Station to fill the applications in one district and Corry the other. On account of Bellefonte Station being recently established, it was not able to fill its entire consignment of applications, so after Corry Station had shipped its district, applications from the Bellefonte Station were filled, making a total amount of fry distributed 3,392,400, besides having about 150,000 fry to be shipped after June 1st, 1904.

By request of Mr. Meehan, I have retained 100,000 to supply my own stock and furnish the other hatcheries if necessary.

On December 1st I received word from my brother at the Erie Station, to be prepared for lake trout eggs, as arrangements had been made to collect eggs at Dunkirk, N. Y. From that time until December 9th there were 1,500,000 eggs gathered. I also received 200,000 eggs from the United States Commission. On account of the interest and willing help the fishermen gave in collecting the eggs at Dunkirk, Mr. Meehan considered it advisable and just to plant a portion of the fry in Lake Erie at that point, while the balance was planted at Erie, with the exception of 162,000 which were distributed to suitable lakes in the State. When the fry were received at Dunkirk, the Co-Operative Fish Co. furnished their own team and tug in planting the fish without charge to the Department, which proves the interest taken in the matter.

The improvements made at this station during the year are as follows: 300 feet of 6-inch tile pipe was laid from spring to reservoir at No. 3 hatching house; a concrete floor was also put in the same building, and four new ponds around the building, which were boarded on the sides and heavily graveled on bottom. There was a gravel walk built from No. 3 building to meat house, with bridges crossing ponds, the ground around the buildings was graded and trees planted to improve the appearance and also to help furnish shade for the ponds. There was a course of 8-inch tile blocks placed under No. 2 building, also new uprights. The main pond, known as the show pond, was tiled around the sides, which adds to the appearance There was concrete sides put into pond on left side of main pond. Also a new frog pond built east of the barn. There were also a few necessary alterations made at the dwelling house.

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On April 4th, I started for St. Louis to get the exhibit in shape for the opening of the World's Fair, leaving my assistant Wm. F. Haas in charge of the hatchery.

Trusting the work done at this hatchery during the year will be satisfactory,

I am, respectfully yours,

WM. BULLER,
Superintendent.

LAKE TROUT FRY PLANTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Counties.	No. shipped.
June 1, 1903-04,	Crawford,	17,000
June 1, 1903-04,	Lackawanna,	67,500
June 1, 1903-04,	Luzerne,	24,000
June 1, 1903-04,	Pike,	24,000
June 1, 1903-04,	Wyoming,	24,000
June 1, 1903-04,	Wayne,	13,000
June 1, 1903-04,	Planted in Lake Erie,	1,200,000
	Total,	1,369,500

GOLD FISH FURNISHED TO PUBLIC SCHOOLS FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name of School.	Where Located.	No. shipped.
Jan. 11,	First Ward School,	Towanda, Pa.,	15
Jan. 11,	Millville Borough Public School,	Millville, Pa.,	20
Jan. 11,	Paschalville,	Paschalville, Pa.,	25
Jan. 11,	Landreths,	Philadelphia, Pa.,	50
Jan. 11,	Special School No. 5,	Philadelphia, Pa.,	20
Jan. 11,	Daniel Webster,	Philadelphia, Pa.,	20
Jan. 11,	Webster's Primary,	Philadelphia, Pa.,	20
Jan. 11,	Belview,	Germantown Jct.,	25
Jan. 11,	F. D. Pastorius,	Germantown, Pa.,	50
Jan. 11,	Andrew G. Curtin,	Germantown, Pa.,	55
	Total,		300

SUN FISH DISTRIBUTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name.	Postoffice Address.	No. shipped.
1904.			
Jan. 11,	Wm. J. Rose,	Harrisburg, Dauphin county,	500
Jan. 11,	Wm. H. Earnest,	Hummelstown, Dauphin county,	500
	Total,		1,000

LOCH LEVEN TROUT FRY PLANTED JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Counties.	No. shipped.
June 1, 1903-04,	Philadelphia,	50,000

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BROOK TROUT FRY DISTRIBUTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Counties.		No. shipped.
June 1, 1903-04,	Allegheny,		13,000
June 1, 1903-04,	Armstrong,		13,000
June 1, 1903-04,	Adams,		2,000
June 1, 1903-04,	Butler,		4,000
June 1, 1903-04,	Beaver,		22,000
June 1, 1903-04,	Berks,		7,000
June 1, 1903-04,	Bradford,		58,900
June 1, 1903-04,	Bedford,		27,000
June 1, 1903-04,	Blair,		13,500
June 1, 1903-04,	Columbia,		36,100
June 1, 1903-04,	Cameron,	3,900	
June 1, 1903-04,	Cameron, for Department of Forestry,	13,000	
			16,900
June 1, 1903-04,	Cambria,		56,200
June 1, 1903-04,	Clearfield,		40,300
June 1, 1903-04,	Crawford,		32,300
June 1, 1903-04,	Chester,		24,000
June 1, 1903-04,	Cumberland,		5,000
June 1, 1903-04,	Clinton,		129,100
June 1, 1903-04,	Carbon,		31,000
June 1, 1903-04,	Clarion,		62,400
June 1, 1903-04,	Delaware,		3,000
June 1, 1903-04,	Dauphin,		12,000
June 1, 1903-04,	Erie,		108,000
June 1, 1903-04,	Elk,		39,500
June 1, 1903-04,	Fayette,		37,000
June 1, 1903-04,	Fulton,		3,000
June 1, 1903-04,	Forest,		9,100
June 1, 1903-04,	Indiana,		3,900
June 1, 1903-04,	Juniata,		2,000
June 1, 1903-04,	Jefferson,		16,900
June 1, 1903-04,	Luzerne,		314,400
June 1, 1903-04,	Lawrence,		6,900
June 1, 1903-04,	Lackawanna,		115,200
June 1, 1903-04,	Lancaster,		11,000
June 1, 1903-04,	Lycoming,		94,300
June 1, 1903-04,	Mifflin,		1,000
June 1, 1903-04,	Monroe,		231,800
June 1, 1903-04,	Montgomery,		16,000
June 1, 1903-04,	Montour,		35,100
June 1, 1903-04,	McKean,		143,000
June 1, 1903-04,	Northumberland,		86,500
June 1, 1903-04,	Northampton,		31,900
June 1, 1903-04,	Potter,	173,500	
June 1, 1903-04,	Potter, for Department of Forestry,	208,000	
			381,500
June 1, 1903-04,	Perry,		4,000
June 1, 1903-04,	Philadelphia,		6,300
June 1, 1903-04,	Pike,	34,000	
June 1, 1903-04,	Pike, for Department of Forestry,	7,800	
			41,800
June 1, 1903-04,	Somerset,		74,400
June 1, 1903-04,	Susquehanna,		106,300
June 1, 1903-04,	Sullivan,		42,900
June 1, 1903-04,	Schuylkill,		134,000
June 1, 1903-04,	Tioga,	139,400	
June 1, 1903-04,	Tioga, for Department of Forestry,	13,000	
			152,400
June 1, 1903-04,	Union,		3,000
June 1, 1903-04,	Venango,		61,800
June 1, 1903-04,	Washington,		5,200
June 1, 1903-04,	Warren,		191,300
June 1, 1903-04,	Wayne,		199,700
June 1, 1903-04,	Wyoming,		38,600
June 1, 1903-04,	Westmoreland,		53,700
June 1, 1903-04,	York,		12,000
	Total,		3,412,500

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WAYNE COUNTY FISH HATCHERY.

NATHAN R. BULLER, SUPERINTENDENT.

Hon. Wm E. Meehan, Commissioner of Fisheries, Harrisburg, Pa.:

Sir: The following is my report of work done at the Wayne County Fish Hatchery, from June 2, 1904, to January 1, 1905.

I was appointed Superintendent of the Wayne County Fish Hatchery, in October, 1903, but owing to my being acting superintendent of the Bellefonte Station during its construction and other labors you had for me to perform, I was unable to begin operations at this station until June 2d.

Upon my arrival I went over the grounds with you very carefully, locating the hatchery, the house for brook trout and pools for the breeding of perch, pickerel and black bass. After locating and getting the tools for our different operations, I started to work on walling up and developing the spring and building the hatching house, which was completed in August. I consider that we have a model house. Whilst it is not so large in proportion as the houses at the other stations, it is equipped with the Clark-Williamson troughs, and while being in dimensions only sixty (60) feet by twenty (20), still has a capacity for developing 7,000,000 brook trout eggs.

I advised against building the house any larger, as I prefer to place the fry in small pools out of doors as soon as hatched, considering that by using that method, I can grow a larger percentage of the fish hatched than if they were kept inside the building.

The plot that the building is on, is surrounded by about one acre of ground, admirably adapted for nursery work. I have discovered a spring in our main stream larger than the spring now furnishing the house. I would respectfully suggest that you allow me to pipe the water of this spring a distance of two hundred (200) feet into the spring we are now using for the hatchery. This would double our capacity for raising fry.

I would also advise and suggest to you, to allow me to extend pipe line, six inches in diameter, from the main stream, following the mountain to the hatchery, which in addition to our spring will furnish an ample supply of water for all hatching and nursery purposes. By going a distance of 900 feet from the hatchery, we give a fall of eleven feet, which will furnish us water for our contemplated battery and at the same time will furnish water for all trout and salmon work.

After we are finished shipping trout and salmon, these same nursery pools, used for the propagation of trout and salmon, if the spring water be cut out, can be utilized for the rearing of perch,

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pickerel and bass, the creek pipe line alone furnishing the water. The rearing of pickerel, perch and bass is still in its infancy, but by employing the method I have spoken of to you, I feel assured the work will turn out successfully and satisfactorily.

There has been to date constructed for trout work, a hatchery house, with a capacity of 7,000,000 eggs, three nursery pools and three pools for adult trout, sixty feet long by twenty-five feet wide. Our next line of work was on perch pools, three of which I have completed and consider them models for the purposes they are to be used. Their size is 150 feet long by 45 feet wide.

I am very much interested in the perch work. You are well aware that all of your superintendents have been experimenting to ascertain the best and most economical method of hatching yellow perch. Of course, an economy in this matter is necessary on account of the limited sum of money at our disposal. I have decided the most economical way to hatch these fish is by pond culture. The method I propose to pursue, is to use one of the three ponds for the purpose of collecting the eggs, which will be done by planting branches of trees thickly through the pond, leaving the tops extend at least a foot above the water.

After the eggs are deposited on these branches, I propose to move them to the other ponds, free from the parent fish. The object in having the branches a foot above the water is to let the wind sway them gently and keep the eggs free from sediment. The fish when first hatched are almost microscopic, and unless planted intelligently, would be sure to be devoured by minnows and other small fish, and as we have the facilities for keeping the fish, I would suggest that they be not planted until fall, as I feel assured I have a method of feeding that will produce great results.

I regard perch culture as a very necessary feature of fish work from now on, as many of our streams in the southwestern part of the State are practically denuded of trout, and on account of the destruction of timber, the waters have become of such a temperature, that perch will be the coming fish.

The perch is not only a gamey fish, but will become of great commercial value.

Our next work was on black bass breeding pools, one of which I have completed, covering one and one-third acres. Another I have under way, is an acre and a half in area. Of all the stations I have visited in various parts of the United States, none has anything to compare in extent and water supply, with the black bass pools, we shall have at the Wayne County Station.

The artificial propagation of black bass is also in its initial stage. Under the method I intend to pursue, the rearing of the fry will not be begun until the fall of the year. Of its successful outcome, I am so confident, that I invite all fish culturists, interested in the propagation of bass, to visit our plant.

I have also under way, within a few days of completion, a pickerel pool, covering half an acre. In this pool I am especially interested. It is an experiment, but a most facinating one to lovers of fish culture. While I shall try these different methods to hatch the eggs, I feel confident that eventually we must have a battery station to produce pickerel successfully.

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In this connection I would emphasize the necessity for the creek pipe line. By having this we can make our trout pools perform duplicate service. That is to say, after the trout fry has been shipped by the end of May, we can empty the trout pools of spring water, and introduce through the pipe line creek water of a proper temperature for propagation of pickerel, perch and bass.

Conditions prevailing with the advent of cold weather, convince me that a supply dam is an absolutely necessary equipment for the Wayne Hatchery, situated as it is, in the northeastern and coldest part of the State. Observation has taught that the intense cold which prevails forms pin ice on the creek and freezes up our runways, making it imperative to have an underground source of supply for the pools.

As the question of feeding pickerel, after they are first hatched, is one that has not yet been solved, I propose to use the same method as with perch. This, I believe, will prove satisfactory.

The pickerel problem is a very important one. Especially to the northeastern portion of our State. Wayne county alone has 103 lakes, all suitable for pickerel, and waiting only to be planted to make them alive with the desirable fish.

Another interesting experiment will be the attempt to raise Atlantic salmon, for stocking the Delaware river. I got 3,000 eggs last March from the U. S. Fish Commission, shipped from the hatchery in Maine to our Bellefonte Station. These I hatched there very successfully, and on last September 1,500 of the fry were shipped to the Wayne Hatchery. So far they have done very nicely, averaging three inches, and their vitality is astonishing. So far as I have observed, not one has died. I am feeding them like brook trout, but after the plant is in full operation, I propose to use a different food, which I have every reason to believe will make them grow faster. This experiment to raise Atlantic salmon is one I am watching very carefully, and is one I have great hopes for. I believe it will make a splendid commercial fish for the Delaware river, and this river can be made to vie with the Kennebec as a salmon stream. It takes four years to mature an Atlantic salmon, but since then it weighs 15 to 20 pounds, it is a fish worth having.

I expect to have at least 20 of the brook trout pools completed by spring, half the number necessary for the plant. When we stop to consider the roughness of the ground and the many disadvantages we had to contend with, as well as the small appropriation available for this plant, I feel proud of the work accomplished.

The site to-day consists of 23 acres, all available for pond purposes, and practically all a gift from public-spirited citizens of Wayne county. For the results it is intended to show, it is magnificently located and most beneficently endowed by nature. Situated but three miles from the source of the Lackawaxen, it enjoys all the benefits of the marvelously pure water of that stream. It is far enough from the headwater springs to allow the water to come to a warmth proper for the culture of bass, pickerel and perch, while the colder water necessary for trout and salmon, is furnished by springs on the spot, which have a temperature of 47 degrees.

Your action in buying a twelve room house on a four acre lot, at the entrance to the grounds donated by citizens, was most commend-

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able. The house will make a desirable home for the superintendent, and being located below the springs, there is admirable opportunity for the establishment of fountains and aquariums.

Mount Pleasant has long been an educational centre, a fact in which the citizens take great pride. I would suggest that with the establishment of a hatchery at this place, a museum go with it, of which the aquariums and fountains would be a part. In addition, I would request you to have several rooms of the house set aside for the exhibition of fish and appurtenances; the whole to form a valuable object lesson in fish culture and fish protection.

The plans you have already formulated in regard to the Wayne Hatchery, are admirable, and those you have in view, are all in line with making this the banner station in Pennsylvania, equalled by few and surpassed by none in the United States. That your plans for the extension of fish culture by the adoption of new species in addition to trout, will bring excellent results, I verily believe.

The following is a summary of the stock at the Wayne Hatchery.

1,227,000 brook trout eggs; 23,000 fingerling trout; 350 three-year-old trout, 200 pickerel, 400 black bass, 200 yellow perch and 900 rock bass.

Respectfully submitted,

NATHAN R. BULLER,
Superintendent Wayne County Hatchery.

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REPORT OF CORRY STATION FROM JUNE 1 TO DECEMBER 31, 1904.

WM. BULLER, SUPERINTENDENT.

Gentlemen of the Department of Fisheries:

Dear Sirs: I wish to submit this my report from June 1st to December 31st, 1904. The number of fish distributed during this period was 248,108, 10,108 of this number were sent to the Wayne County Hatchery for breeding purposes. Following are the different species of fish which were sent: Brook trout, black bass, rock bass, bullheads, spotted cat-fish, grass pike, German carp, and suckers. The two last named fish will be hatched to supply food for black bass.

Mr. Meehan decided to have the bass transferred to the Wayne county hatchery, as the bass work is to be one of the special features of that station.

The ponds which were used for black bass work will in the future contain yellow perch and rock bass.

On November 30th I shipped 2,000 tadpoles. I was compelled to use tadpoles for feeding bass at times, otherwise the output would have been larger. Minnows are the usual food for bass, but it is impossible to secure them at all seasons of the year.

After the shipping of trout fry was finished, we began to make repairs on different ponds. We widened several of the spawning races in order to give more space, and it also makes it more attractive for the fish to enter. We replaced the sides of pond, which were in bad condition, with tile. I have always boarded the sides of ponds, but find tile will last longer and is more substantial, as we have replaced boards every few years. We also built three ponds on the additional ground purchased some time ago, which are to be used for holding fry, the fence which encloses the grounds was white washed, roofs of all the buildings were given one coat of tar, new shades were built over show pond, and new cover over reservoir. We then began to get the hatching house in shape for the take of trout eggs.

The trout began to spawn at the usual time. There were 4,500,000 brook trout eggs taken this fall. This is the largest amount of eggs taken on record at this station. The eggs began to hatch on December 1st, and up to the present time there are as yet only a few eggs to be hatched. The fry are in a strong and healthy condition. We had made arrangements and fully expected to take a large amount of lake trout eggs at Dunkirk, but on account of continued high winds at the time of spawning season, the fishermen would not risk setting their nets on the reef. We experienced quite a disappointment in not being able to get them, as we anticipated adding a few million eggs to the already large number.

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We have lately received encouraging news from Mr. Meehan, who has made arrangements with the U. S. Fish Commission, stating they will supply us with 1,000,000 lake trout eggs. I realize the good success we have had in the large collection of eggs, is largely due to Mr. Meehan's suggestions and foresight on all matters.

On November 29th I started for St. Louis, being directed by Mr. Meehan to attend to packing the exhibit which was sent to Philadelphia. During my absence my able assistants Wm. F. Haas and J. R. Berkhous attended properly and with care to the work. I feel they are entitled to a great deal of credit for their close attention during my absence. I deem myself fortunate in having good, reliable men, and owe a good portion of the success to the continued interest taken by them in the work.

We have met with many pleasant and interested visitors during the season. The number of visitors who have registered their names in the book is 3,562. This surely proves the interest the people of this vicinity take in the hatchery. We know there were a great many who did not register their names.

I find we are in need of more help. With the work we have to do, it is impossible to keep the grounds in proper condition. There are many things around the place which need care and attention, but with the help I now have we cannot take time to attend to all things necessary. If we had sufficient help it would be a great relief to me.

Since the additional ground has been added to the hatchery one horse is not sufficient to do the work. During shipping season it is quite an expense to hire the hauling done, as we must do, one horse not being able to do the work. We are also badly in need of a new wagon.

There are repairs that should be attended to. Number one and two hatching houses are in a dangerous condition. I have spoken before of the dilapidated condition of the barn which is really not worth repairing, and is quite unsafe in its present condition.

We are in need of lumber to replace a number of shades over the ponds, and many of the ponds require new sides. I should like to suggest using tile, as I know it will be more durable than boards, but with little more expense.

When the new ground was purchased several years ago, there was more land in the plot than the Commission felt they could afford to purchase at that time. As I had a little ready money, I agreed to buy three acres. I felt that later on the Commission would need the land and probably buy it from me at the same price I paid for it. I should like to ask the members of the Department to kindly give this matter their consideration.

A new house for the superintendent has been suggested, the present one to be used by the assistant, who would board the men. Having the help close at hand would be so much more convenient. It is impossible to secure a boarding place close to the hatchery. I appreciate the fact of our having a busy and successful season, and hope to have good results with the young fry. Hoping this report will meet with your approval,

I am, respectfully,

WM. BULLER,
Superintendent.

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DISTRIBUTION OF TROUT FRY FROM JUNE 1, 1904, TO DEC. 31, 1904.

Date.	Counties.		No. shipped.
1904.			
June 1,	Bedford,		21,000
June 1,	Blair,		21,000
June 10,	Bradford,		1,000
June 10,	Clinton,		10,000
June 2,	Columbia,		2,000
June 10,	Lycoming,	16,000	
June 14,	Lycoming,	8,000	
			24,000
June 2,	Mifflin,		12,000
June 6,	Potter,	29,000	
June 7,	Potter,	25,000	
June 8,	Potter,	33,000	
			87,000
June 2,	Snyder,		26,000
June 10,	Sullivan,		1,000
June 3,	Union,		32,000
June 10,	Warren,		1,000
	Total,		238,000

DISTRIBUTION OF TADPOLES FROM JUNE 1, 1904, TO DECEMBER 31, 1904.

Date.	Name.	Postoffice Address.	No. shipped.
1904.			
Nov. 30,	E. B. Hendricks,	Philadelphia, Philadelphia county,	500
Nov. 30,	G. H. Kobler, M. D.,	Philadelphia, Philadelphia county,	500
Nov. 30,	Edward Hess, Jr.,	Philadelphia, Philadelphia county,	500
Nov. 30,	J. Simms Wilson,	Philadelphia, Philadelphia county,	500
	Total,		2,000

NUMBER OF SPAWNING FISH IN PONDS.

1,500 Four year old brook trout.
3,000 Three year old brook trout.
2,800 two year old brook trout.
7,000 Year old brook trout.
75 Yellow perch.
100 Rock bass.
35 Gold fish.

FISH SENT TO WAYNE COUNTY HATCHERY.

9,000 Fingerling brook trout.
200 Large black bass.
200 Fingerling black bass.
500 Rock bass, large fry.
60 Large German carp.
60 Large suckers.
75 Bullheads.
10 Spotted catfish.
3 Grass pike.

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BELLEFONTE HATCHERY.

REPORT OF N. R. BULLER, ACTING SUPERINTENDENT.

(From June 1, 1903, to May 31, 1904.)

To Hon. W. E. Meehan, Commissioner of Fisheries:

Sir: In making my report of the work done while I was acting superintendent of the new Bellefonte Hatchery, I have the honor to state that I took charge August 21, 1903, having been directed by you to go there from the Corry Hatchery. At that time what is now a superb hatchery was simply a site beautiful for one which had been donated to the Commonwealth by public spirited citizens of Centre county. After looking over the ground with yourself, it was decided to use the Hoy spring as the basis of operation, which has a capacity of 500 gallons of water a minute. It was also decided to tap the Schugert spring, lying on the northwest side of the Pennsylvania Railroad, 12 inch conduit being laid under the tracks. The use of the water from the Schugert spring, which is a splendid source of supply with a capacity of 800 gallons a minute, was the personal gift to the State of Mr. John Schugert, cashier of the Centre County Banking Company. His generosity is in line with his enthusiasm as a fisherman, and with the patriotism of his family, Mr. Schugert being closely related to the late ex-governor Andrew G. Curtin.

The joining of the waters of these two springs made a reservoir of considerable size on the site of the Hoy spring, there being 1,300 gallons of water a minute. That being deemed sufficient for immediate needs, we began work on the hatching house and nursery pools, which it was required to complete by October 13, 1903. This requirement was complied with by the time mentioned, when the house was ready for the reception of the eggs. The hatching house, I consider a model, being 125 feet long by 40 feet wide and of neat architecture. Its equipment, including a solid concrete floor, first class hatching troughs, and thirteen nursery pools attached, the last new feature, I consider superior to any other hatching house in the State. Each nursery pool is fed independently from the main supply trough in the buildings. The pools are each eight by thirty feet, twenty-eight inches deep and every one has a concrete bottom and sides, and is furnished with an automatic feeding arrangement. Each of these ponds has a capacity to feed from 150,000 to 200,000 trout until the fish are four months old. While doing this work, we also made pools for the reception of breeding trout from the Allentown hatchery, then about to be abandoned.

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In this connection, I wish to record the thanks of the Fisheries Department for the kindness of the faculty of the State College, whose students under the charge of Professor Shattuck, gratuitously surveyed the site and placed the stakes for the various pools and other improvements, besides furnishing a complete and most satisfactory draft.

Three of the breeding pools which are each 250 feet long by 40 feet wide and four feet deep, with concrete bottom and sides, were finished by November 15th, when cold weather forced a suspension of operations.

By this time an increased water supply was required and we availed ourselves of the use of the water of the Ross spring, with a capacity of 300 gallons a minute. It was also deemed advisable to secure a home for the superintendent. This was done by your buying the S. H. Hoy property, which then had a very comfortable eight-room house, which was improved to all that could be desired, by enlarging the kitchen, adding a laundry and installing a bath room, besides being repapered and repainted.

While this improvement was in progress you made a most admirable move, showing commendable foresight, by leasing for 99 years the magnificent Blue Spring with a capacity of about 8,000 gallons of water a minute. By laying a 20-inch conduit this will furnish an inexhaustible supply of water for this hatchery, no matter to what extent it is enlarged. The fall being 20 feet, the water can be conducted to any part of the property and the supply will always be sufficient for the bass, and the salmon pools and other extensions contemplated.

On October 26, the day the hatchery was dedicated, the first consignment of 5,000 eggs was placed in the troughs.

Of the dedication, which was attended by a large delegation of fish culturists and several hundred neighbors and citizens, it is unnecessary for me speak, as that occasion is historic from the fact that it recorded the formal opening of the first hatchery built on donated ground. From that time on, until November 17th, we were extremely busy preparing the place for receiving eggs in quantity, and the active work of hatching From the Allentown Hatchery there were received fifteen different shipments, aggregating 1,500,000 eggs. Owing to the extremely cold weather and the carelessness of the express companies, I regret to state that about a half million of these eggs were lost, being frozen in transit.

Through the generosity of the Penn Forest Brook Trout Company, we received a donation of 1,000,000 eggs, and the Blooming Grove Park Association, likewise donated 150,000. These two companies deserve and have the sincere thanks of the Department for this act of good will towards the State. The period during the hatching of the eggs and the care of the fry up to the time of distribution in March, in an exceptionally severe winter, was a season of very hard work. I found after we began feeding the fry that the loss was greater from the eggs which came from the Allentown Hatchery than from those donated as aforementioned. This fact I attributed to the aenemic condition of the parent fish, since the loss of a total of about 300,000 fry was almost entirely among those hatched from the Allentown eggs. The period of shipment began March 8th, continuing until May 20th. The distribution of fry by counties is shown in the following tabulated statement:

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Cumberland,	24,500
York,	79,000
Fulton,	6,000
Schuylkill,	136,500
Philadelphia,	19,500
Lehigh,	25,500
Clearfield,	54,000
Union,	259,000
Montgomery,	4,500
Blair,	84,000
Lebanon,	45,000
Center,	411,000
Dauphin,	21,000
Berks,	73,000
Franklin,	42,000
Huntingdon,	78,000
Bedford,	100,500
Franklin,	111,000
Northampton,	24,000
Chester,	6,000
Carbon,	120,000
Lancaster,	3,000
Total,	1,727,000

But for the eggs received frozen and those from fish improperly conditioned, the loss of fry in developing process would have been less than 10 per cent., showing that this plant is favored with an exceptionally excellent quality of water.

With the end of the first season of shipment my connection with the Bellefonte Hatchery ceased, since by your direction, I was transferred to become superintendent of the new Wayne County Hatchery.

The outlook for the Bellefonte Hatchery I regard as little short of brilliant. Established under your wise administration, and far-seeing policy on the broadest scientific and practical basis, and situated in an ideal location, its possibilities are limitless.

For trout hatching I pronounce it unequalled and black bass should be propagated with distinguished success. I am,

Your obedient servant,

NATHAN R. BULLER,
Superintendent.

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REPORT OF THE BELLEFONTE HATCHERY.

HOWARD M. BULLER, SUPERINTENDENT.

(From June 1 to December 1, 1904.)

To the Hon. W. E. Meehan, Commissioner of Fisheries:

Dear Sir: I beg herewith to submit my first report as Superintendent of the Bellefonte Hatchery from the first of June to the first of December, 1904. On the first named date I received my appointment from you as Superintendent, having previously served your Department and the Fish Commission as an assistant, first at Allentown and then at Bellefonte, for a period of two years and a half.

When I took charge of the hatchery the trout fry for 1904 had all been shipped and the troughs empty. In the nursery ponds attached to the house there were about 21,000 fry which had been reserved for breeding purposes, both for this hatchery and the Wayne county hatchery. In addition to the eleven nursery ponds just spoken of, there was one large pond between the hatching house and the spring, 150 feet long and 40 feet wide, and a partially completed pond a little below the hatching house and a little to the left, 154 feet long and 40 feet wide. I immediately began the completion of this pond and then believing it too large, divided it into four ponds, each 77 feet long and 22 feet wide. From time to time I built other breeder and fry ponds, until at the close of the year there was a total of 18 ponds, five of which may only be called temporary, although they can be used for an indefinite period of time. In addition to the eighteen mentioned, there are the nursery ponds which are large enough at a pinch to carry breeder fish in small numbers until the summer, making a grand total of ponds at the Bellefonte Hatchery twenty-nine.

The nursery ponds are fitted out with automatic feeders, so that when fry are placed therein, it is not necessary for the men to feed them, as the food is being supplied constantly by the automatic jars. The general ponds are constructed of concrete and the walls of ten have concrete sides and ends and one has two ends and the others have earthen sides with either concrete or board ends.

In these ponds there were at the close of the year 8,620 breeder fish, 7,620 of which are brook trout and 1,000 California trout. In addition there are over 12,000 fingerlings held for breeding purposes. With those already in the ponds they should yield a good crop of eggs next fall.

Besides the brook trout, there are 65 plain and fantail gold fish, which should breed next summer. Had it not been for the fact that I had no established pond until autumn they would have bred last August. Among the fish at the hatchery when I took charge there

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BELLEFONTE FISH HATCHERY, BUILT 1904.

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were 1,000 Atlantic salmon fry, but these, together with 3,000 fingerling trout, were shipped on your order in September to the Wayne County Hatchery to assist in stocking the ponds in that place with breeding fish.

When I took charge the only completed pond and the hatching house were supplied from the hatchery and Sugard springs, and the four ponds which I completed below the hatching house as well as the five temporary ponds are to be supplied from that source, also the eleven nursery ponds. A small spring near the house I utilized for the gold fish pond.

I opened and developed a large spring in a swampy piece of ground above the hatching spring and built around it an octogonal cement wall. The waters from this spring I used to supply three pounds. The remaining ponds receive their supply from the raceway leased from S. H. Hoy, running from Logan Branch Run.

While on the question of water supply for the hatchery, I would respectfully urge you to take the earliest opportunity of increasing it from the Logan Branch Run through the raceway, and if possible from one of the springs above the head of the raceway. Although there is usually an abundant supply of water from the hatchery spring and the Sugard spring, there are times when both are insufficient. This was the case last fall. Everywhere springs fell off. At one time the water supply became so low from the hatchery spring that I was forced to remove the large trout from the pond between the hatching house and spring and utilize all the water in the hatchery. In fact, even at the present time, there should be more water flowing through the troughs than is available.

The twelve thousand fingerlings now in the ponds will next fall need additional quarters. Owing to the shortage of the water supply, I lost at least one million trout eggs this fall, the most of which would undoubtedly have hatched had it not been for the reason I have given. Since then I have experienced a shortage of water with a resultant loss of at least three hundred thousand trout fry, nearly all during the sac stage. There is water enough in Logan Branch Run and in the springs above to run half a dozen hatcheries of the capacity of Bellefonte, and with the raceway, which you with great foresight leased from Mr. Hoy, in full operation, there will be abundant water for all our needs.

Most of the time during the summer months was naturally devoted to the building of ponds, but whenever I had a little spare time I devoted it to beautify the place. In around the group of ponds between the hatching house and the railroad I seeded with grass and planted with trees presented to the hatchery by Mr. John Fisher, of Bellefonte, or taken from other parts of the property. I also planted along the front and side of the dwelling house and sodded it. I built a new fence around the barnyard. Also raised the stable a foot and equipped it with stalls for horses and cemented the walls. I concreted the cellar of the house and concreted the floor. I also built a shed for the storage of wagons and shipping cans. I also ran a water pipe from the house to the spring and made a number of other minor improvements.

I regret to say that seven shipping cans were not returned by the people who received them with fish and all efforts to get them back have failed. I also completed the car barn. The car was returned

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to the barn from Corry in December, it having been employed during the summer in conveying fish from the Corry Hatchery to the World's Fair in St. Louis, and in taking fish from the Erie and Corry Hatcheries to the Hatchery in Wayne county. It was returned to the barn in good condition. There were several tanks missing from the car, but my brother William Buller, Superintendent of the Corry Station, told me that with your permission he had retained them at his hatchery for the purpose of using them for holding ripe trout, or the eggs which were ready to be taken.

The Hatchery at Bellefonte has proved to be a source of great attraction to the people living in the neighborhood. The railroad station on the hatchery grounds and the fine highway leading to Bellefonte have afforded fine opportunities for scores of people to satisfy their curiosity to visit the hatchery. From the first day of May until the close of the season, 2,792 people registered, and that is probably less than one-half the number who have actually been to the hatchery within the period named, for many came to the grounds without signing the visitors book. While by far the greater number of visitors were Pennsylvanians, there were many from other states. There was one from Tokio, Japan, two from Russia, one from Dawson City, Klondike, and one from London, England. Some from other states named as residences of the visitors were Indiana, Ohio, Illinois, New York, California, Texas, New Jersey and Tennessee. It is safe to say that at least 5,000 people have visited the Bellefonte Hatchery during the last six months. It is noteworthy that as the hatchery has developed by the increase of the number of ponds and breeding fish and as it becomes better known the number of visitors have increased.

On the 19th of November, Governor Samuel W. Pennypacker with Mrs. Pennypacker, paid an official visit to the hatchery with yourself and Fishery Commissioner Charles L. Miller, of Altoona. The Governor inspected the hatchery minutely and was shown the process of taking and fertilizing trout eggs, filling the trays and placing the eggs in the troughs. In fact the whole process of the early stages of the hatching, including the cleaning of the eggs was shown him. The Governor expressed himself as well pleased with the condition of the hatchery and dined in the hatchery dwelling.

About the 1st of October I was notified by you that the Penn Forest Brook Trout Company had presented its surplus eggs to the Department of Fisheries and that the bulk of them would be sent to the Bellefonte Hatchery, and that Mr. John P. Creveling, my predecessor in the superintendency, would take the eggs and ship them over. I began taking eggs from my own fish about October 17th, and secured in all about 700,000. The Penn Forest eggs began to arrive on the 14th of November and the boxes arrived in rapid succession, until when the last shipment was made there was received from Penn Forest about 3,180,000 eggs. The eggs from the first shipment and the last shipment spoiled on the journey, about 180,000 eggs in all. Then the hatchery was stocked with about 3,700,000 eggs. I lost a number of eggs through the failure of the water supply, but all the loss was not due to that cause as a large percentage was due to the transporting of green eggs. There is always a considerable loss in such eggs.

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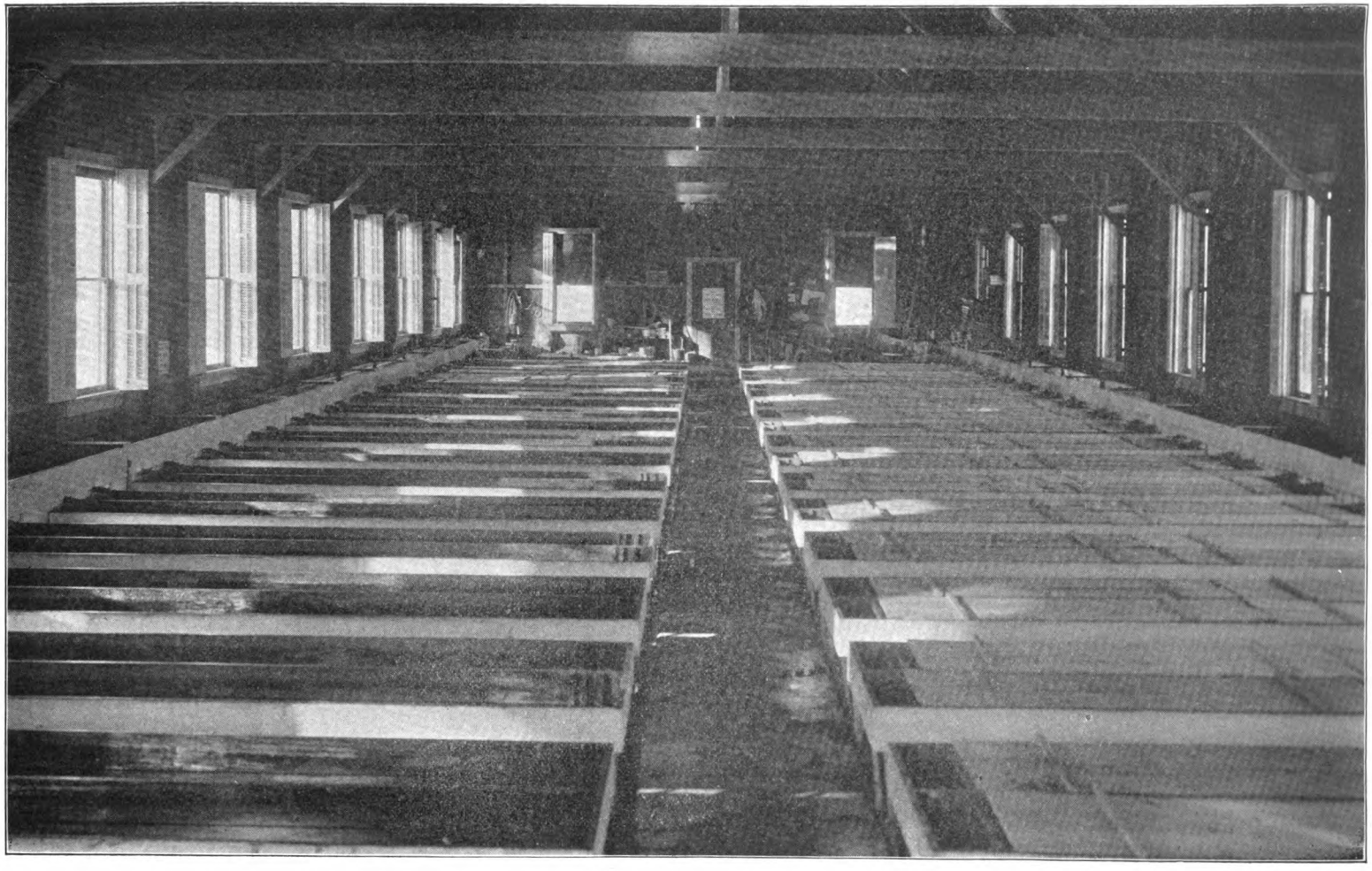

BELLEFONTE FISH HATCHERY—INTERIOR SHOWING HATCHING TROUGHS.

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BELLEFONTE FISH HATCHERY—SPRING AND PONDS.

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The eggs began hatching in forty-five days. Most of them hatched in that time and none exceeded fifty days. The temperature of the spring water is admirably adapted for the hatching of trout. The temperature is an even 50 degrees all the year round, and the summer temperature of the Logan Branch Run is the same, while the winter temperature is so little below that of the summer that it requires the very coldest weather to freeze a scum of ice, and nothing better can be said of the ponds supplied from the spring excepting that the freezing is confined to the lower ends. After subtracting the eggs which were lost and the small fish which died at the end of the year, I have about two million trout in the troughs and nursery ponds ready for distributing in the spring.

I have been bothered a great deal by kingfishers and house rats, these two enemies of the fish hatcheries fairly swarming around the place. It seems to me that all the kingfishers for miles around gathered about the hatchery. I have killed as many as four and five kingfishers in one day. I know of few birds in this neighborhood that are as destructive to the small trout as the kingfisher. A good healthy kingfisher will certainly get away with at least 100 trout in a day. Taking his size into consideration he can do more damage in a hatchery pond than a crane. He is only matched in my experience at other hatcheries by the night heron. The bittern, herons and cranes are scarce here as I have scarcely seen one-half dozen of these birds since I have had charge of the hatchery. The house rat has caused me a great deal of trouble. They seek the ponds and have caught a great many fish. Few people realize what expert fishermen the house rats are. They have sought the hatchery grounds in such numbers that in one day we caught twenty in traps. Altogether we have caught in the neighborhood of one hundred. Fortunately I have been able to keep the pests from the trout eggs, of which they are passionately fond. Mr. Creveling informed me that while he was superintendent at the hatchery at Allentown he lost large numbers of brown trout, some California trout and a few brook trout through the lightning. I am sorry to say that I have lost quite a number of brook trout from the hatchery from the same cause. During one storm I lost 37, and during another an even two dozen. On each occasion it was the largest trout which were killed, and most of these were females, and in none of the storms did the ightning strike the water.

On one occasion the lightning, which killed the fish, struck a tree on a hill about four hundred yards from the hatchery. I do not know where the lightning struck on the other occasion, but it was I believe still further away. The fish that were killed were all fish that were resting on the bottom or near the bottom, and few of these were killed outright. They seemed to be stunned or paralyzed. Some died within an hour, and some lived nearly a week. Some of them would lie on their sides, swimming irregularly in that manner, while others would lie motionless or nearly so on the bottom. I believe you gave a good explanation of the causes of being killed by lightning in one of the annual reports of the Fish Commission, I think about 1898. If I remember rightly you said then that in the cases where the fish were struck, the fish were near a stone or touching a stone at the moment the lightning struck the ground near the pond and then completed the circuit and it was for that

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reason that the fish that were swimming free in the pond were unharmed. Under those circumstances it was not strange that the greater number of the fish that Mr. Creveling lost in that manner were brown trout, because that fish has a habit of resting on the bottom of the pond, but brook trout when in full vigor never rest on the bottom, but swim free. As I have noted, nearly all those which were killed by lightning during the fall were old fish, and when brook trout reach a certain age, that is to say have passed the prime of life, they become sluggish and follow the example of the brown trout and rest quietly on the bottom.

I feel I should not close my report without some reference to the young men who are employed on the hatchery. They are intelligent, active and painstaking young men who seem to be desirous of learning the business thoroughly. In all the months they have been with me, I have never had a complaint from any of them. No matter how severe or long continued the work might be, I always found them ready in every emergency which arose, to help me to the best of their ability. It happened on more than one occasion, when the trout eggs arrived from Penn Forest, after these men had left for their homes, they came back to the hatchery and worked far into the night until all the eggs were safely placed in the trays or in the troughs. One of them has so far advanced that in another six months I think you would be justified in promoting him to the position of first assistant, which position is at present vacant.

I would suggest that before the spring work of the hatchery begins that another horse be purchased. No doubt you have noticed from the vouchers I have rendered you that I have frequently had to hire extra teams. An additional horse would pay for himself before the summer is over. In view of the number of ponds which must be built in 1905, to accommodate the large number of trout which are accumulating for breeding purposes, another horse would pay for himself before the summer has fairly begun. Besides, the additional horse would certainly save the employment of one man, at least, through the summer, and oftentimes two. I take pleasure in submitting the above report.

Respectfully,

HOWARD M. BULLER,
Superintendent.

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REPORT OF ERIE STATION FROM JUNE 1, 1903, TO JUNE 1, 1904.

A. G. BULLER, SUPERINTENDENT.

To the Department of Fisheries:

Gentlemen: I beg to submit this my annual report, beginning June 1st, 1903. The species of fish distributed from this Station were as follows: Yellow perch, black bass, sunfish, whitefish, herring, wall-eyed pike and blue pike. In many respects the work has been an improvement over the previous year, owing to the ponds being in continual use during the season. The value of having the ponds on the hatchery grounds has been proved. This has been the first season we have distributed fingerling yellow perch from our own hatching. I find better results are obtained by holding the fish until they are several months old.

I have distributed 33,300 fingerlings during the months of July and August. I have also used the ponds to hold small black bass until they become of sufficient size to distribute in September and October.

There were 5,600 healthy young bass taken from the pond, running in size from three to three and one-half inches, and planted in suitable waters.

After this work was completed, I began to make improvements around the hatchery. I gave the one side of building two coats of paint, also painted the batteries and fry tanks, placing new faucets in batteries, and other small necessary improvements towards getting the house in proper shape to receive whitefish and herring eggs.

From November 17th until December 6th I received 46,280,000 white fish eggs.

The arrangements for collecting the eggs were the same as the previous year, and the ova were of a good quality. I was able to secure 11,360,000 herring eggs from the boats fishing out of Erie. After receiving these eggs I had then filled all the jars that were in the hatchery. The batteries as they now are will hold 488 jars; the number of jars on hand are 380. It is important that the number to complete the batteries be installed.

During the months of January and February, I made fifteen egg cases, to be used in transporting eggs from spawning grounds to the hatchery. The cases were made on the same plan as those used by the U. S. Bureau of Fisheries. The eggs are received in better condition than when shipped in cases: I have been wanting to adopt this plan for some time, and the Commission have given permission to do so, as it is of great importance to the Department. I feel it will materially add to our work.

The whitefish and herring eggs began to hatch on the 14th day of

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March. The bay at that time was covered with ice, preventing our getting out with a boat. We took the fish cans on sleds some distance out on the lake and planted the fry through the ice. By March the 22d the ice had left the bay, we were then able to plant the balance by taking them out with a tug. The total number of whitefish planted was 39,200,000 and 5,600,000 herring.

Early in the fall I was instructed by Mr. Meehan to collect the different species of lake fish for the fish exhibit at St. Louis.

A three hundred foot seine was purchased, to be used for catching the fish. We made several efforts to secure them, but were not successful, as at that season of the year the weeds prevent using the seine, so we decided to defer the work until spring. As soon as the bay was free of ice in the spring we again took up the work.

I wish to speak here of the excellent service my assistant Philip H. Hartman has rendered the Department. He is familiar with the lake and knows where the different species can be found. He gives his untiring attention to work at all times, and I appreciate the value of his services.

The sufficient number of fish were secured and sent to the hatchery at Corry, where they were retained until needed at St. Louis.

The last of November I noticed an article in the Fishing Gazette stating the Co-Operative Fish Co. of Dunkirk, N. Y., were making larger catches of lake trout. Knowing the Department of Fisheries was desirous of obtaining lake trout eggs, I at once communicated with Mr. Gunther, the manager, and learned I could secure the spawn. I then informed Mr. Meehan who instructed me to secure as many as possible. I sent a man to Dunkirk, who attended to collecting the eggs, which were sent to the Corry hatchery. The amount collected was 1,500,000. Owing to the continued high winds, they were only able to lift the nets four times while the fish were spawning. Had the weather been more favorable we would have been able to secure a larger amount of eggs, as there were spawning fish among those caught. This is our first season for collecting lake trout eggs, and we feel encouraged with what has been done.

The fishermen were very enthusiastic over the interest the Department was taking, and expressed their willingness to do all they could to assist us, as they feel that in time it will benefit them.

On April 19th the first wall-eyed pike eggs were received. The spawn was collected by the U. S. Fish Commission, at Toledo, O. The arrangements being the same as in previous years. The total amount received was 35,000,000. The cases which I had made during the winter, were used for the first time in transporting these eggs. I have found better results than when eggs are shipped in cans with water. The size of the cases is twenty inches square. Each case contains eighteen trays covered with heavy canton flannel. About two quarts of eggs are spread evenly on each tray. The top tray in the case contains a sufficient amount of crushed ice which melts gradually keeping the eggs in a moist condition until they reach the hatchery. Eggs are not as apt to smother carried in this way. Out of the total amount of eggs received, 27,740,000 eggs were hatched, 23,810,000 were planted in Lake Erie, and the balance distributed to suitable waters in the State.

In May I filled one of the ponds with yellow perch ready to spawn. The fish were watched closely and as soon as eggs were deposited

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they were removed to another pond, which had previously been supplied with branches upon which the eggs clung until hatched. The fry have a healthy and strong appearance. They will be retained in the pond until fall, by that time they will be advanced sufficiently in size to distribute.

I take pleasure in referring to the large amount of tadpoles I now have in one of the ponds. This is the first season I have undertaken to hatch frogs. I feel very well satisfied with the results. Until the tadpoles become frogs they take dead food readily. I feed them principally on dead fish. It is quite interesting to watch their habits. When first hatched they feed upon the mass of apparent gelatine substance which surrounds the eggs. When that is gone, they separate and look for other food. A minute after food is given to them it will be entirely covered with the little fellows feeding upon it. They have attracted unusual attention to the Station.

On May 9th, the fishermen at Erie began to take blue pike eggs. The catch of blue pike was very light this year, during the spawning season. Consequently few boats were fishing. We were only able to secure 3,000,000 eggs.

An unusual noticeable feature was the large amount of ripe male fish in the catch, and very few females. As a rule it is a hard matter to secure a sufficient number of ripe male fish to fertilize the eggs. Out of the three million eggs taken, two million were hatched and planted in Lake Erie.

Mr. Meehan requested me to hold a few whitefish fry to be sent to St. Louis. After shipping there were about one hundred left in the tank, which I placed in a pond about the first of May. They were then about five weeks old. There was little change in their growth from the time they were hatched, they are now about nine weeks old and measure from one to one and one-half inches in length.

It is my true belief that if a portion of the whitefish hatched were retained in sufficiently large ponds until fall, it would pay the Department to care for them until that time, as they would be of sufficient size to better care for themselves, and I am positive that in a very short time the catch of white fish would be greatly increased. To begin this work it would be necessary to have more space, as it would require several large ponds. The fishermen feel it would be to the general interest if a portion of the fry could be so retained until they become a larger size. The fry are of immature size, but as yet there has been no other way provided for their care, and we are compelled to plant them as soon as hatched.

I should like to speak of the sturgeon which is one of the most valuable fish on the market. The amount of sturgeon caught is diminishing each year. I have made repeated efforts to secure eggs, but have failed, as it has been impossible to obtain ripe male and female at the same time.

A remarkable incident occurred a short time ago at A. Booth & Co.'s fish house which gives one an idea of the vitality of the sturgeon. A sturgeon twenty inches in length had been caught in a gill net, remaining in center of large box of whitefish. Supposed to have been dead before being placed in box. Probably seven hours later while lying on the fish house floor, Mr. Spran, the foreman noticed there was life in the fish. He put the sturgeon in tank with running water and later gave it to me, a revived strong fish, which I sent to Corry to be placed in pond.

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The register which has been placed in the hatchery but a short time ago, contains three hundred names. There were many who were indifferent about the matter, and did not register, but it has been generally approved. The building is in good condition, but the fence on the north and west side of grounds is badly in need of repair. I hope this report will meet with your approval.

Very respectfully,

A. G. BULLER,
Superintendent.

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WALL EYED PIKE FRY DISTRIBUTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name.	Postoffice Address.	No. shipped.
1904.			
May 16,	P. Donelley,	Cannelton, Butler county,	75,000
May 13,	John Keister,	Keister, Butler county,	15,000
May 13,	J. S. Matson, Supt., P. B. & L. E. Railroad,	Conneaut Lake, Crawford county,	165,000
May 14,	Robt. Humes,	Cambridge Springs, Crawford county,	30,000
May 14,	Miles Crosley,	Cambridge Springs, Crawford county,	30,000
May 14,	Wm. Baird,	Cambridge Springs, Crawford county,	60,000
May 14,	F. M. Siggins,	Meadville, Crawford county,	30,000
May 14,	J. H. Dickson,	Meadville, Crawford county,	30,000
May 14,	Wm. Heckley,	Meadville, Crawford county,	30,000
May 14,	Theo. Moyer,	Meadville, Crawford county,	30,000
May 16,	L. A. Fleck,	Little Cooley, Crawford county,	30,000
May 17,	John Kirk,	New Cumberland, Cumberland county,	350,000
May 17,	J. W. Gross,	Harrisburg, Dauphin county,	120,000
May 17,	A. Fletcher,	Steelton, Dauphin county,	15,000
May 17,	G. W. Devoe,	Steelton, Dauphin county,	15,000
May 17,	E. G. Brandt,	Steelton, Dauphin county,	15,000
May 17,	Ed. V. Leeds,	Steelton, Dauphin county,	15,000
May 17,	J. L. Grove,	Steelton, Dauphin county,	15,000
May 18,	John Pettigrew,	Hickory, Forest county,	15,000
May 18,	J. A. Anderson,	Hickory, Forest county,	15,000
May 18,	Gus B. Evans,	Hickory, Forest county,	15,000
May 18,	James McCrea,	Tionesta, Forest county,	30,000
May 17,	A. J. Fore,	Burnt Cabins, Fulton county,	15,000
May 17,	A. V. Kelly,	Burnt Cabins, Fulton county,	15,000
May 12,	W. H. Myers, P. R. R. Co.,	Williamsport, Lycoming county,	400,000
May 13,	H. F. Dickson,	Sharon, Mercer county,	65,000
May 12,	M. Z. Steininger,	Middleburg, Snyder county,	15,000
May 12,	P. S. Ritter,	Middleburg, Snyder county,	15,000
May 12,	J. F. Stetler,	Middleburg, Snyder county,	15,000
May 12,	G. M. Shindle,	Middleburg, Snyder county,	15,000
May 12,	Thos. Rathfon,	Paxtonville, Snyder county,	15,000
May 16,	G. C. Howell,	New Milford, Susquehanna county,	65,000
May 16,	H. F. Esterbrook,	Harford, Susquehanna county,	30,000
May 16,	Wm. Main,	Silver Lake, Susquehanna county,	15,000
May 16,	R. H. Rose,	Silver Lake, Susquehanna county,	45,000
May 16,	A. B. Burns,	Montrose, Susquehanna county,	15,000
May 16,	G. N. Watrases,	Montrose, Susquehanna county,	15,000
May 16,	N. A. Warner,	Montrose, Susquehanna county,	15,000
May 16,	David Gardner,	Montrose, Susquehanna county,	15,000
May 16,	Geo. Woodruf,	Montrose, Susquehanna county,	15,000
May 16,	Wm. Bouk,	Montrose, Susquehanna county,	15,000
May 16,	A. Bastrick,	Montrose, Susquehanna county,	15,000
May 12,	A. G. Greiff,	Milton, Union county,	120,000
May 14,	F. Miller,	Oil City, Venango county,	65,000
May 18,	W. Lowry,	Oil City, Venango county,	30,000
May 18,	G. W. Roess,	Oil City, Venango county,	30,000
May 18,	Jac. Saltzman,	Oil City, Venango county,	30,000
May 18,	B. C. Simpson,	Oil City, Venango county,	30,000
May 18,	P. L. McCrea,	Eagle Rock, Venango county,	30,000
May 18,	F. Snodgrass,	President, Venango county,	30,000
May 14,	J. S. Strong,	Kinzua, Warren county,	30,000
May 14,	J. E. English,	Kinzua, Warren county,	30,000
May 14,	E. Groat,	Kinzua, Warren county,	30,000
May 14,	M. Groat,	Kinzua, Warren county,	30,000
May 14,	R. Varnarsdale,	Kinzua, Warren county,	30,000
May 14,	S. Blackmore,	Kinzua, Warren county,	30,000
May 18,	H. A. Fuellhart,	Tidioute, Warren county,	15,000
May 18,	R. L. Dunn,	Tidioute, Warren county,	15,000
May 14,	G. F. Bowman,	Tidioute, Warren county,	15,000
May 18,	R. W. Smutz,	Tidioute, Warren county,	15,000
May 18,	W. H. Tarner,	Tidioute, Warren county,	15,000
May 18,	N. W. Shugert,	Tidioute, Warren county,	15,000
May 18,	G. A. Siddins,	Tidioute, Warren county,	15,000
May 18,	A. Anderson,	Tidioute, Warren county,	15,000
May 18,	A. J. Brown,	Tidioute, Warren county,	15,000
May 18,	J. R. Binder,	Tidioute, Warren county,	15,000
May 18,	L. J. Gibb,	Tidioute, Warren county,	15,000
May 18,	W. W. Kember,	Tidioute, Warren county,	15,000
May 18,	Jno. Shonly,	Tidioute, Warren county,	15,000
May 17,	Hon. J. A. Dale,	York, York county,	150,000
	Dept. of Fishery,	Lake Erie,	23,810,000
	Total,		26,660,000

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WALL-EYED PIKE PLANTED IN LAKE ERIE FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Place.	Number.
1904. May,	Planted in Lake Erie,	23,810,000

WHITE FISH FRY PLANTED IN LAKE ERIE FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Place.	Number.
1904. March,	Planted in Lake Erie,	39,200,000

LAKE HERRING PLANTED IN LAKE ERIE FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Place.	Number.
1904. March,	Planted in Lake Erie,	5,600,000

YELLOW PERCH FINGERLINGS DISTRIBUTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name.	Postoffice Address.	No. shipped.
1903.			
July 14,	Moses Bare,	Gettysburg, Adams county,	1,000
July 14,	C. W. Holtzworth,	Gettysburg, Adams county,	1,000
July 14,	Wm. DeGroft,	Gettysburg, Adams county,	1,000
July 14,	J. L. Sheads,	Gettysburg, Adams county,	1,000
July 14,	C. W. Myers,	Gettysburg, Adams county,	1,000
July 14,	Dr. H. Stewart,	Gettysburg, Adams county,	1,000
July 23,	Bromley Wharton,	Bristol, Bucks county,	1,200
July 14,	Dr. S. E. Ralston,	Zelienople, Butler county,	2,500
Oct. 1,	Fred. Ikeler,	Bloomsburg, Columbia county,	1,600
July 14,	H. J. Bruckerhoff,	Leesburg, Cumberland county,	1,500
July 14,	W. R. Entrikin,	Shippensburg, Cumberland county,	1,500
July 13,	J. H. Beardsley,	St. Marys, Elk county,	1,000
July 13,	A. R. Kerner,	St. Marys, Elk county,	1,000
July 13,	Joseph Hanes,	St. Marys, Elk county,	1,000
July 13,	D. J. Driscoll,	St. Marys, Elk county,	1,000
July 13,	W. C. Hanes,	St. Marys, Elk county,	1,000
July 22,	H. E. Culbertson,	Edinboro, Erie county,	1,000
July 13,	Thos. Brown,	Scranton, Lackawanna county,	1,000
July 13,	M. E. O'Malloy,	Scranton, Lackawanna county,	1,000
July 13,	F. D. McGowan,	Scranton, Lackawanna county,	1,000
July 13,	J. E. White,	Scranton, Lackawanna county,	1,000
July 27,	Frank E. Boyle,	Scranton, Lackawanna county,	1,000
July 27,	F. D. McGowan,	Scranton, Lackawanna county,	1,000
July 27,	F. W. Barday,	Haverford, Montgomery county,	1,000
July 23,	James M. McKee,	New Bloomfield, Perry county,	2,000
July 23,	Hon. H. C. Cox,	Wellsboro, Tioga county,	2,000
July 27,	Hon. H. C. Cox,	Wellsboro, Tioga county,	2,000
	Total,		33,300

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BLACK BASS FINGERLINGS DISTRIBUTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name.	Postoffice Address.	No shipped.
1903.			
Oct. 7,	F. A. Seitz,	Freeport, Armstrong county,	500
July 23,	Bromley Wharton,	Bristol, Bucks county,	300
Sept. 14,	Bromley Wharton,	Bristol, Bucks county,	600
Oct. 1,	Fred. Ikeler,	Bloomsburg, Columbia county,	300
Sept. 14,	D. Sharp,	Phoenixville, Chester county,	900
Sept. 14,	Geo. E. Minor,	Waynesburg, Greene county,	800
Sept. 14,	A. K. Spurrier,	Lancaster, Lancaster county,	600
Sept. 14,	Gov. S. W. Pennypacker,	Schwenksville, Montgomery county,	1,000
Sept. 14,	Robt. M. Snyder,	Holmesburg, Philadelphia county,	600
	Total,		5,600

LARGE SUN FISH SHIPPED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Name.	Postoffice Address.	No shipped.
1904. April 15,	Hiram Peoples,	New Providence, Lancaster county,	20

BLUE PIKE FRY PLANTED FROM JUNE 1, 1903, TO JUNE 1, 1904.

Date.	Place.	Number.
1904. May 31,	Planted in Lake Erie,	2,000,000

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REPORT OF ERIE STATION FROM JUNE 1 TO DECEMBER 31, 1904.

A. G. BULLER, SUPERINTENDENT.

To the Members of the Department of Fisheries:

Dear Sirs: Following is my report from June 1st to December 1st, 1904. The number of fish distributed during this time was 32,179, namely, black bass and yellow perch, also 31,900 tadpoles. I did not begin to ship the small bass until October. I find there is considerable loss in holding them any length of time, as I have stated in my previous report. The loss is largely due to cannibalism. The loss would naturally be greater in small ponds, as large ponds will afford better protection.

There were 11,700 bass distributed to different parts of the State, ranging in size from two to five inches in length.

It is interesting to watch them feed as they seem to have a continuous appetite, and learn to know those who are accustomed to feeding them. One of the ponds was used for yellow perch fry which were put in, in May and remained until the latter part of September, when I began shipping. The last distribution was on November 4th.

I find there is less loss in retaining perch fry than there is with bass fry; they take ground fish quite readily, but do not require food as often as the bass.

The number of perch fry shipped to different parts of the State was 9,900, running in length from 2 to 3½ inches.

This is the first year I have been successful in obtaining frog spawn. The spawn was gathered on the 23d of April in marsh land on the opposite side of the bay. It being my first experience with frog spawn, my estimate of the amount of egg was rather high, for when I shipped the tadpoles in August I found the amount very much less than I have estimated.

I placed as much spawn in the pond as I thought could be conveniently carried, but from my experience in the work I find I will be able to place double the amount of spawn we carried this year in the pond, and have the same good results, if we are successful in obtaining spawn next spring.

Hatching the spawn and taking care of tadpoles when hatched is very simple and interesting. After they became frogs I placed boards in the ponds for the little fellows to rest upon. Also put two-foot wide mosquito netting around the pond in order to prevent their getting away. After they became frogs they require live food, principally insects, I began to distribute in August, had in all 31,700. From the large amount of applications I received from Mr. Meehan to be filled, there is a large demand for frogs. I hope I will be successful in securing a large quantity of eggs next spring.

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Mr. Meehan directed me to get by hook and line, a number of black bass, also a few different species if possible, to be sent to the Wayne County Hatchery for breeding purposes. There were 345 fish caught, also 154 black bass confiscated, which had been caught illegally by fishermen near Moorheadville. Fifty fish of those caught by hook and line were planted in a lake in Susquehanna county.

The usual amount of work was begun at the hatchery preparatory to receive whitefish and lake herring spawn. The first consignment of whitefish eggs was received on November 16th, and lake herring eggs on November 19th. There was an extremely severe blow when the spawning season was at its height, causing considerable damage to the nets, and driving the fish from the spawning grounds into deep water. There was consequently some fear of a small amount of eggs. The spawn received previous seasons has been collected at Port Clinton, Ohio. On account of the storm the amount of eggs taken at that point was small. Mr. S. W. Downing, Supt. Put-in-Bay Station, kindly made arrangement to give us a liberal supply of both white fish and herring eggs from his station. There was an unusual amount of eggs received this year. There were 4,800,000 lake herring eggs taken from boats fishing off Erie Port. On account of the scarcity of ripe males we lost a lot of spawn, not being able to fertilize eggs.

The total amount of white fish eggs received was 44,652,000, and 41,680,000 lake herring making a grand total of 86,332,000. We feel this has been a banner year for collecting eggs.

When I found we were getting the large supply of eggs, I notified Mr. Meehan who instructed me to fill the jars we had in the hatchery and send the balance, which was 3,096,000 white fish and 15,760,000 lake herring eggs to Torresdale Station, to be hatched there, and the fry to be returned to Lake Erie. He considered this plan preferable to having the jars transferred to this station, as they will be needed for the spring hatching at Torresdale.

I should like to speak of the few white fish we have been successful in raising from last spring's hatching. I placed a small number of fry in the pond with the tadpoles, this being the only pond convenient to be used. Later on I transferred the little fellows to one of the fry tanks in the hatchery, where they still remain. I notice a difference in their way of feeding from other fish.

As a rule, fish will remain in the same place while feeding them until their hunger has been satisfied, but the whitefish take the food gradually while moving around in the pond. Some have reached the length of six inches. If they were maturing in a larger body of water they would naturally be larger in size. As I have stated before, had we a pond of sufficient size to hold the fry for several months before planting them in the lake, I feel positive the loss would not be as great as when planted as soon as hatched, and the catch of whitefish would surely be multiplied in a few years.

I must not forget to give my able assistant Phil. H. Hartman credit for a large portion of the success we have had this year. I consider myself fortunate in securing a trustworthy man. He manifests a great interest in the work, and is always ready and willing to do the work assigned him.

There is a noticeable interest taken by the people of Erie, in the hatchery this year as we have had numerous visitors. There are

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670 names registered and many call who do not care to register. During the summer months there are few callers, as it is generally known work at the hatchery is quiet at that time. I will mention a few repairs and changes needed at the hatchery. Part of the fence enclosing grounds needs repairing. The building and also the fence should have a coat of paint.

We are also badly in need of more light in the hatchery. By placing a window in west end of building the difficulty would be overcome. I have spoken before of the lack of working space, and suggested the removal of porch on south side of building, which would afford us ample space inside. I feel rather encouraged with the work done at the hatchery this season, and hope my service has proved satisfactory.

Respectfully,

A. G. BULLER,
Superintendent.

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DISTRIBUTION OF TADPOLES FROM JUNE 1, 1904, TO DECEMBER 31, 1904.

Date.	Name.	Postoffice Address.	No shipped.
1904.			
Aug. 11,	S. A. Hamilton,	Roaring Springs, Blair county,	300
Aug. 11,	H. B. Aaron,	Loysburg, Bedford county,	300
Aug. 11,	J. S. Brown & Son,	Loysburg, Bedford county,	300
Aug. 31,	J. M. Shappell,	Hamburg, Berks county,	300
Aug. 31,	R. W. McLenegan,	Reading, Berks county,	300
Aug. 31,	W. K. Shalter,	Reading, Berks county,	300
Aug. 31,	E. E. Squibb,	Birdsboro, Berks county,	300
Aug. 31,	C. A. Miller,	Fleetwood, Berks county,	300
Aug. 31,	Robsonia Iron Co., Ltd.,	Robesonia, Berks county,	300
Sept. 9,	Hon. Wm. P. Snyder,	Spring City, Chester county,	1,000
Aug. 9,	E. H. Wachner,	Meadville, Crawford county,	300
Aug. 9,	H. H. Steffon,	Meadville, Crawford county,	300
Aug. 9,	Cassius Smith,	Meadville, Crawford county,	300
Aug. 9,	W. E. Smith,	Cambridge Springs, Crawford county,	300
Aug. 30,	N. W. Eby,	Woodward, Centre county,	300
Aug. 30,	D. A. Boozer,	Centre Hall, Centre county,	300
Aug. 30,	H. F. McManaway,	Wolf's Store, Centre county,	300
Aug. 30,	W. S. Williams,	Martha Furnace, Centre county,	300
Aug. 30,	H. J. Schuchart,	Snow Shoe, Centre county,	300
Aug. 30,	O. J. Harm,	Snow Shoe, Centre county,	300
Aug. 30,	J. H. Crandall,	Snow Shoe, Centre county,	300
Aug. 30,	J. B. Yarnell,	Snow Shoe, Centre county,	300
Aug. 30,	D. H. Meredith,	Snow Shoe, Centre county,	300
Aug. 30,	H. E. Leathers,	Snow Shoe, Centre county,	300
Aug. 30,	H. W. Faus,	Snow Shoe, Centre county,	300
Aug. 30,	R. E. Kecle,	Snow Shoe, Centre county,	300
Aug. 30,	W. A. Sickel,	Snow Shoe, Centre county,	300
Aug. 30,	J. W. Neff,	Snow Shoe, Centre county,	300
Aug. 30,	A. S. Kech,	Snow Shoe, Centre county,	300
Aug. 30,	R. E. Gilliland,	Snow Shoe, Centre county,	300
Aug. 30,	S. N. Brown,	Spring Mills, Centre county,	300
Aug. 30,	E. Bartley,	Spring Mills, Centre county,	300
Aug. 30,	C. C. Bartges,	Spring Mills, Centre county,	300
Aug. 30,	W. C. Gramley,	Spring Mills, Centre county,	300
Aug. 30,	S. Sowers, Jr.,	Spring Mills, Centre county,	300
Aug. 30,	R. Katherman,	Spring Mills, Centre county,	300
Aug. 30,	W. Smith,	Spring Mills, Centre county,	300
Aug. 30,	John Smith,	Spring Mills, Centre county,	300
Aug. 30,	W. E. Ream,	Spring Mills, Centre county,	300
Aug. 30,	T. M. Granley,	Spring Mills, Centre county,	300
Aug. 30,	J. P. Osman,	Spring Mills, Centre county,	300
Aug. 30,	S. Ward Gramley,	Spring Mills, Centre county,	300
Aug. 29,	C. W. Brown,	Catawissa, Columbia county,	300
Aug. 11,	J. K. Light,	Lock Haven, Clinton county,	300
Aug. 11,	D. F. Spangler,	Renovo, Clinton county,	300
Aug. 13,	C. B. Chidester, M. D.,	Erie, Erie county,	100
Aug. 13,	Daniel Widler,	Erie, Erie county,	100
Sept. 13,	Carl M. Gage, Gen. Mgr. H. & B. T. R. R.	Huntingdon, Huntingdon county,	700
Aug. 13,	W. S. Opp,	Opp, Lycoming county,	300
Aug. 31,	J. L. Miller,	Montgomery, Lycoming county,	300
Aug. 13,	Mrs. A. B. Koons,	Montgomery, Lycoming county,	300
Aug. 31,	W. A. Everitt,	Allenwood, Lycoming county,	300
Aug. 31,	Mrs. Ann Scaife,	Montoursville, Lycoming county,	300
Aug. 29,	Pittston Ice Co.,	Pittston, Luzerne county,	600
Aug. 29,	C. B. Johnson,	West Moor, Luzerne county,	300
Aug. 29,	Megargee Bros.,	Scranton, Lackawanna county,	300
Aug. 29,	F. E. Boyle,	Scranton, Lackawanna county,	300
Aug. 29,	H. Kennedy,	Scranton, Lackawanna county,	300
Aug. 29,	M. E. O'Malley,	Scranton, Lackawanna county,	300
Aug. 29,	Morgan Lewis,	Scranton, Lackawanna county,	300
Aug. 29,	Thos. Brown,	Scranton, Lackawanna county,	300
Aug. 29,	R. Robertson,	Scranton, Lackawanna county,	300
Aug. 29,	C. S. Lowery,	Scranton, Lackawanna county,	300
Aug. 29,	J. C. Blatter,	Scranton, Lackawanna county,	300
Aug. 29,	J. E. White,	Scranton, Lackawanna county,	300
Aug. 31,	W. C. Haupton,	Abrams, Montgomery county,	300
Aug. 31,	A. L. Cranmer,	Anise, Montgomery county,	300
Aug. 29,	H. W. Kistler,	Long Pond, Monroe county,	300
Aug. 29,	W. C. Henry,	Park Side, Monroe, county,	300
Aug. 11,	A. F. Taylor,	Lewistown, Mifflin county,	300
Aug. 11,	Geo. Fertig,	Northumberland, Northumberland Co.,	300
Aug. 11,	Geo. P. Kessler,	Northumberland, Northumberland Co.,	300
Aug. 11,	Geo. W. Smith,	Northumberland, Northumberland Co.,	300
Aug. 11,	A. Walker,	Northumberland, Northumberland Co.,	300
Aug. 11,	E. C. Claney,	Northumberland, Northumberland Co.,	300
Aug. 11,	G. H. Keefer,	Northumberland, Northumberland Co.,	300
Aug. 29,	F. Martin,	Northumberland, Northumberland Co.,	300
Aug. 29,	M. K. Watkins,	Mt. Carmel, Northumberland county,	300
Aug. 29,	E. E. White,	Mt. Carmel, Northumberland county,	300
Aug. 29,	M. A. Marshall,	Shamokin, Northumberland county,	300
Aug. 29,	L. Schock,	Stone Church, Northampton county,	300

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TADPOLES—Continued.

Date.	Name.	Postoffice Address.	No shipped.
Aug. 13,	H. W. Rosengarten,	Pottsville, Schuylkill county,	300
Aug. 31,	Lyman Norton,	Hillsgrove, Sullivan county,	300
Aug. 31,	F. McCann,	Hillsgrove, Sullivan county,	300
Aug. 31,	Edw. Holcomb,	Hillsgrove, Sullivan county,	300
Aug. 31,	Ed. McCann,	Hillsgrove, Sullivan county,	300
Aug. 31,	S. T. Galough,	Hillsgrove, Sullivan county,	300
Aug. 31,	Chas. Haas,	Hillsgrove, Sullivan county,	300
Aug. 30,	Chas. R. Ruhl,	Millmont, Union county,	300
Aug. 30,	D. L. Miller,	Millmont, Union county,	300
Aug. 9,	S. N. Ramage,	Oil City, Venango county,	300
Aug. 9,	C. M. Holbrook,	Oil City, Venango county,	300
Aug. 9,	E. W. Ingraham,	Oil City, Venango county,	300
Aug. 9,	W. W. Splane,	Oil City, Venango county,	300
Aug. 9,	Thos. M. Blockwell,	Oil City, Venango county,	300
Aug. 9,	B. C. Simpson,	Oil City, Venango county,	300
Aug. 29,	L. H. Eilenberger,	Gouldsboro, Wayne county,	300
Aug. 29,	D. V. Eilenberger,	Gouldsboro, Wayne county,	300
Aug. 29,	W. L. Harvey,	Gouldsboro, Wayne county,	300
Aug. 29,	C. E. Eilenberger, D. D. S.,	Gouldsboro, Wayne county,	300
Aug. 29,	W. M. Foster,	Gouldsboro, Wayne county,	300
Aug. 29,	R. W. Drake,	Gouldsboro, Wayne county,	300
Aug. 29,	T. R. Harvey, D. D. S.,	Gouldsboro, Wayne county,	300
	Total,		31,900

YELLOW PERCH FINGERLINGS DISTRIBUTED JUNE 1, 1904, TO DECEMBER 31, 1904.

Date.	Counties.		No. shipped.
1904.			
Oct. 17,	Adams,		225
Nov. 4,	Allegheny,		300
Sep. 7,	Bucks,		1,000
Oct. 17,	Berks,		300
Oct. 17,	Carbon,		225
Oct. 19,	Centre,		400
Oct. 17,	Chester,		675
Oct. 19,	Columbia,		225
Oct. 20,	Crawford,		500
Oct. 17,	Columbia,		600
Nov. 4,	Greene,		250
Oct. 17,	Lancaster,		675
Sep. 28,	Lackawanna,	600	
Oct. 19,	Lackawanna,	200	
			800
Oct. 17,	Lebanon,		300
Oct. 17,	Montgomery,		300
Oct. 17,	Philadelphia,		525
Oct. 19,	Tioga,	1,800	
Oct. 20,	Tioga,	900	
			2,700
	Total,		9,900

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LARGE FINGERLING BLACK BASS DISTRIBUTED FROM JUNE 1, 1904, TO DECEMBER 31, 1904.

Date.	Counties.	No. shipped.
1904.		
Aug. 11,	Blair,	600
Sep. 9,	Bradford,	300
Sep. 7,	Bucks,	1,500
Aug. 31,	Berks,	300
Sep. 7,	Chester,	900
Aug. 9,	Crawford,	1,200
Aug. 11,	Clearfield,	600
Sep. 9,	Erie,	900
Aug. 9,	Forest,	900
Sep. 7,	Lehigh,	500
Aug. 29,	Lackawanna,	300
Aug. 31,	Lycoming,	300
Aug. 11,	Lawrence,	300
Aug. 11,	Mercer,	300
Aug. 31,	Montgomery,	300
Aug. 31,	Northumerland,	300
Aug. 29, Sept. 9,	Pike,	1,900
Aug. 29,	Susquehanna,	300
	Total,	11,700

LARGE BLACK BASS DISTRIBUTED FROM JUNE 1, 1904, TO DECEMBER 31, 1904.

Date.	County.	No. shipped.
Oct. 28,	Lackawanna,	50

FISH SENT TO WAYNE COUNTY HATCHERY.

Date.	Kind of Fish.	Number.
1904.		
Nov. 9,	Large black bass,	25
Nov. 23,	Large black bass,	154
	Total,	179
Nov. 9,	Fingerling large mouth bass,	80
Nov. 9,	Fingerling rock bass,	100
Nov. 9,	Fingerling calico bass,	20
Nov. 9,	Fingerling sunfish,	150

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ALLENTOWN HATCHERY.

REPORT OF JOHN P. CREVELING, SUPERINTENDENT.

To the Department of Fisheries, Hon. W. E. Meehan, Commissioner, Harrisburg, Pa.:

Dear Sir: I herewith respectfully submit my report for the fiscal year ending May 31st, 1904.

About the month of July, 1903, I was notified that the Allentown Hatchery would be abandoned in the spring and the plant removed to the new hatchery at Bellefonte. At the same time I received notice that I was appointed Superintendent of the new station.

At the close of the last fiscal year, I had nearly all the applications for brook trout, on file in the Allentown station, filled, but there was still a large surplus there remaining in the troughs, at least 500,000 fry. The young fish were large, strong and healthy, and required a great deal of food—much care and work to keep the troughs clean. The fry did nicely and developed rapidly until about the first of July. At that time they apparently stopped growing, but at the same time took their food as usual until about August 1st; then in some troughs the fish showed signs of growing weakness and refused to take their food as they had been doing. The troughs had been kept perfectly clean and great care exercised in feeding, as I knew it was a difficult matter to hold the fry in the troughs all summer. I did my very best. There was no relief whatever in the situation, on the contrary every day or two would find the trouble extending to a few more additional troughs. This continued until every trough in the two houses were affected and the fry refused to take their food, as they should. The loss at first was very light, but in a few days those that were first affected commenced to die very rapidly, and as the days passed, the daily loss was still greater.

I prepared seven nursery ponds and placed large numbers of fry therein, thinning from the house troughs, hoping that the change might prove beneficial, though I had serious doubts. My view proved well founded. The decrease could not be checked and the loss in the ponds was about as great as in the house troughs. I took out many of the fry and examined them carefully under a glass, but could not find anything unnatural on the bodies, but all the fish appeared to have very pale gills. It appeared that every fry that refused to feed had light colored gills, showing that the whole trouble originated from a lack of blood.

Professor Millard Marsh, of the United States Bureau of Fisheries, and an expert on fish and their diseases, visited the station and spent six weeks in experimenting. He examined those that died and killed many that were affected. He examined the blood,

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trying to find out the cause of the trouble. He found that the whole trouble originated from unhealthy blood, or weak blood, which did not contain a sufficient amount of red corpuscles. But he could not find out the cause, if I remember.

After considerable trouble, I was able to get out the fry in the ponds, but they continued to die right along, until there was not more than 30,000 living. These, I suppose, were not affected so badly and being in the ponds, got a certain amount of natural food and also took the artificial food better. Consequently they grew to be very strong and healthy fish.

To take care of these fingerlings, which required a great deal of time to feed and remove the dead ones, in fact it took up nearly all the time of myself and men until September 15th. Then I had to get the ponds cleaned, which ponds contained the spawning trout, and graveled the spawning races and generally made ready for the spawning season, which opened October 12th.

It should be remembered that the spawning fish on hand were few in number, but I succeeded in taking about 800,000 eggs, which were placed on the trays as taken and kept in the hatchery until they were nicely eyed. Then as a sufficient number was old enough for shipment, they were packed and shipped to the Bellefonte hatchery.

After taking all the eggs that could be taken at this Station, and being anxious to gather all the spawn I possibly could for the Bellefonte hatchery, I asked permission of Mr. Charles Walters, of Philadelphia, who has a brook trout hatchery at Weissport, Carbon Co., to handle the trout, which permission he readily granted, and about November 20th I visited his station and Mr. Wert, the Superintendent, assisted me in taking eggs. In one day we succeeded in getting about 240,000 eggs, which I brought home the same evening and placed on the hatchery trays to be eyed before shipping to Bellefonte.

My first eggs commenced to show eyes on November 1st, and the eggs were shipped as follows: On November 17th, 80,000; on November 30th, December 4th, 7th, 10th, 15th, 18th, 23d and 25th, I shipped 80,000 each time. On the 29th I shipped 160,000 and on the 30th I shipped 35,000.

The 160,000 eggs shipped on the 29th of December were, through the negligence, or carelessness on the part of the employes of the express company in not following the instructions on the cases, must have been allowed to stand in the open air for some time, for the whole shipment was frozen and the eggs lost.

After the last shipment of eyed eggs, I commenced cleaning up and getting ready to ship the spawning trout, which shipment was delayed on account of the excessive cold weather and I was afraid that after holding at the station in cans, and then put in cold tanks the water would freeze and the fish be lost.

I made arrangements about March 7th to ship the first carload, but was detained again and could not ship on account of the high water and washouts along the road, until two days later. The Reading Railway Company and the Pennsylvania Railroad Company generously gave free transportation for the car over their lines between Allentown and Bellefonte.

There was a great freshet in the Susquehanna river at the time and much ice, and I was advised not to start until the ice had moved

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or the water fallen, which delayed my making shipment one week, until March 21st. On that day I went through the car and made the last shipment on March 25th.

There were a few yearlings left, and these I shipped by messenger on April 1st.

The fish were all moved in good shape and carried with very slight loss. After all the fish were removed to the new station at Bellefonte, most of my time was spent at the new station until May 16th, making shipments of fry and caring for the fish, removing old buildings, digging out the cellar under the dwelling house, etc.

The Allentown Hatchery was formally abandoned as a hatchery on April 1st, when as per arrangement, I assumed charge at Bellefonte. Under the terms of the lease with the owners of the Allentown property 700 two-year old trout were left in the ponds.

Thanking you for courtesies extended, I remain

Respectfully yours,

JOHN P. CREVELING,
Superintendent.

REPORT ON A MORTALITY AMONG YOUNG TROUT AT THE ALLENTOWN STATION OF THE PENNSYLVANIA FISHERY COMMISSION, DURING THE AUTUMN OF 1903.

BY DR. M. C. MARSH, U. S. Bureau of Fisheries.

Under orders of September 24, 1903, the writer proceeded to Allentown and began work on September 30, 1903.

During the summer of 1903, abnormal losses on the brook trout fry held at Allentown Station began to occur in the month of August. For about a month prior to this the fry had not fed as well as usual. In July they numbered 300,000, this representing the number left after the spring distribution of 900,000 to be reared at the station. They had been held in the troughs an unusually long time, about 30,000 being put out in ponds the last of July, 75,000 in August, and the rest in September. During July the fry were noticed to be "off their feed," but the mortality did not begin until August. It began in the troughs and continued in the ponds. Sixty thousand were estimated to be on hand October 1, and therefore counting out a few thousand distributed during July, about 230,000 trout were lost during the first seven weeks of the disease.

Most of the trout fry recently dead of the disease did not have conspicuous external lesions, but might have been taken for fry which had died during health. Some had the protrusion of the eyeball known as "popeye," or locally at the Allentown Station as "frogeye." This was usually associated with some distention of the abdominal cavity. But the more significant appearance was to be seen in dying fry. Their gill showed a diminution of the

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THE BROOK TROUT.

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natural red color of the blood often to a degree so extreme that not a trace of red remained. This anemia in nearly all cases of dying trout and of trout apparently affected by the disease, but resting quietly on the bottom of pond without loss of equilibrium, was too great to be estimated by the Dare hemoglobinometer, being much below 10 per cent., 100 per cent. on this scale representing normal human blood. Even the apparently unaffected fish were below the normal in hemoglobin, nine examples taken at random from the actively feeding brood in the diseased ponds giving reading ranging from 25 to 8, with an average of 16½. Healthy fingerling trout, as represented by six examples from a commercial station at Weissport, Pennsylvania, give readings from 21 to 38, with an average of 29. The whole body of fingerling trout at Allentown may be considered to be anemic, notwithstanding an occasional individual fully up to normal, the degree of anemia varying from the normal down to complete absence of the blood color in the still living gills, this extreme degree representing fish dying or soon to succumb.

Examination of the blood by the Zeiss hemocytometer shows that the anemia is not merely a loss of the hemoglobin from the corpuscle, though this probably occurs, but consists also in an actual falling off in the number of red corpuscles. A normal fingerling brook trout has about one million red cells per cubic millimeter of blood. Of eight examples of the most active Allentown fingerlings only one reached one million, the others ranging down to 503,000, the average 828,000. The inactive, dying and recently dead fingerlings had a much lower count, the lowest observed being 38,000 per cubic millimeter, the gills in life without a tinge of red color. At 200,000 or 300,000 per cubic millimeter the gills begin to show a faint pink.

The only other symptom of importance was the presence, in some of the affected fish, of a pathologic exudate behind the eye, causing the protrusion of the eyeball known as "popeye," or in the abdominal cavity, causing ascites. These conditions were often associated. The exudate was a clear, colorless lymph which presumably comes from the blood.

The dorsal aorta of these ascitic fingerlings with pale gills upon puncture usually gave forth blood abundant in volume, but colorless, or with a slight tinge of red. The low blood count was probably in part due to the dilution of the blood as well as to actual loss of corpuscles.

The "popeye" among these fish should not be confounded with the same appearance occurring in the "gas disease" caused by water supersaturated with air or with one of its constituent gases. In the latter a gas is present and causes the protrusion, while in the other case it is a liquid alone, the lymph or exudate, which pushes the eyeball from its socket. The disease has caused an increased permeability of the blood vessels, allowing the liquid portion of the blood to accumulate in various cavities, and while the eye may be protruded from this cause before death, the accumulation of liquid continues after death and the popeye increases. In fact, any of the anemic fry which die without having developed popeye may be able to acquire this symptom by leaving their bodies in the water for some 24 hours, more or less. Likewise, the living anemic

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fry, without popeye, may be killed and popeye induced by soaking them in water, and even active, red-gilled fry of the diseased brood will act in the same way after a more prolonged immersion. Possibly perfectly healthy fry would to some extent show the same tendency.

Accompanying the anemia there is a certain degree of leucocytosis which can not be very accurately expressed in figures on account of a lack of knowledge of the leucocytes of normal trout. Counting one type only of white cell in fingerlings of the normal number of red cells and in those markedly anemic, the latter have an increased number of white cells. While leucocyte counts were made on only a few examples, it seems fairly certain that there is a real leucocytosis, though not of high degree or as far as known, particularly significant.

The disease is then an anemia, or lack of red blood cells. It was not due to any condition of the water with respect to its aeration. The Allentown spring supply contains no excess of dissolved oxygen or nitrogen. Neither was it deficient in dissolved oxygen. A few hundred of the fingerlings were transferred from the ponds to the raceway close to the supply spring, where they received water direct from the spring and before it had been used upon any other fishes. The death rate continued as in the ponds. A similar lot was transferred to the creek, or Little Lehigh river, which was a little better supplied with oxygen than the spring water, without any amendment in the mortality during some four weeks. Moreover, adult trout upon Allentown spring water were suffering no loss, nor were they anemic.

With a view to collecting observations on the number of bacteria in spring waters supplying hatcheries, whether or not they have any immediate bearing, several plate cultures were made on different days using the spring water. Following are the results in bacteria per cubic centimeter:

	Average.
October 14,	18
October 15,	31
October 17,	101
November 15,	23
November 16,	85
November 17,	290
November 20,	176

There is considerable variation in the count from day to day. The average is about 103 per cubic centimeter, and is not excessive. The Erwin, Tennessee, Station of the Bureau of Fisheries, had an average of about 84 per cubic centimeter. It may be said that the water of the Allentown spring has about the usual bacterial content of cold spring water. The last two observations were made on water on tap inside the hatchery, and, as usual, the water has gained some organisms during its passage thereto.

As anemia is one of the results of infections of various sorts, an organism was sought by microscopical examination and by cultures for bacteria. The culture media usually remained sterile and in the

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few cases where growths resulted they were reasonably due to water bacteria contaminating the abdominal cavity. The cultures were usually made from blood from the dorsal aorta pierced from the abdominal cavity, without searing the site of the puncture. This method does not certainly exclude organisms not present in the blood, yet plates made in this way were usually sterile. Plates were also made from the peritoneal cavity and from the liver. Bacteria not strictly the cause of disease do doubtless gain access to and multiply in the blood of some of these young trout in the last stages of the disease. But there is no infection of aerobic bacteria in most the dying fish. The evidence of the microscope supports that of the cultures in indicating the absence of any bacterial infection.

The question of a protozoan infection or of an infection by any organism not multiplying on ordinary culture medium is not as easily settled. Here the microscope does not give a very definite answer. The white cells of the blood, particularly in the diseased fish, have appearances suggesting the lower animal parasites of the blood. Finding nothing definitely recognizable as such, an inoculation experiment was begun to determine the presence of infection by transferring it from the diseased to healthy fish. Two lots of fingerlings, 15 in each lot, brought from Weissport were placed in separate troughs. One lot was fed ground liver in the ordinary way; the other lot, liver with which was mixed the blood of the dying and dead fry. The diseased blood was fed on 17 different days during a period of about four weeks.

On January 13, 1904, nearly 12 weeks after the beginning of this experiment, 10 trout of the lot inoculated by feeding were still alive, and 12 of the other, or control lot. All the trout which died were without anemia as far as they were observed, and their death appeared to be due to an affection of the tail and caudel peduncle which caused sloughing of the skin and flesh of this region and sometimes the loss of most of the caudel fin. This is possibly due to an external parasite, but has no relation to the disease under discussion. All these experimental trout appeared active and healthy, had thrived and grown well during these 12 weeks, and the lot which had eaten of the blood of the anemic fishes averaged considerably larger than the others, though they were not selected for size at the beginning of the experiment. Of the 12 remaining from the control lot, one was affected with the tail disease and would presently have died, so that the loss may be considered to be 4 on the controls and 5 on the inoculated fish. This leaves no room for supposing that the feeding of the diseased blood had any unfavorable effect upon the fish that ate it. Moreover, it tends to show that there is nothing constant in the nature of the water itself which causes anemia, for both these lots of trout have remained in it for 12 weeks without the slightest sign of anemia. It was not possible to examine them with the aid of the hemoglobinometer at the end of the experiment, but to the unaided eye the gills had every appearance of reaching the standard of redness of normal fry.

Direct inoculation were also made in adult trout, one by injecting the diseased blood beneath the skin, another by placing it behind the eyeball. These were controlled by similar inoculations using blood from healthy trout. None of these fish showed any effects

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from this treatment; the wounds healed and the trout are still alive. Adult trout may of course be insusceptible or less susceptible to the disease than the fingerlings.

The results of these inoculations being negative, failed of thorough conclusiveness, but indicate strongly that an infection is not concerned. Taken together with the evidence of the cultures and the microscope, it makes this conclusion altogether probable. The anemia then is not to be considered among those caused by parasites, or secondary, but as primary, or "causeless," using this latter term in its medical sense as applied to an anemia looked upon as a disease and not a symptom. The usual and frequent causes of anemia have not operated in this case and no immediate cause appears. In fact, the conditions obtaining during the fall among the fish seem to be such as to tend to correct the trouble rather than cause it, for the death rate was gradually diminishing. Looking over the history of these trout, it is found that they have been under unusual conditions. They were kept in the troughs in the hatchery for an usually long time. In July about 300,000 fry were on hand. The transfers to the out-of-door ponds were not made until August and September, save 30,000 which were put out the last of July. The fry began to die in the troughs and continue to die in the ponds. To prolong the period during which fry are confined in troughs is recognized by fish culturists as an unfavorable procedure. During a period of development they are largely deprived of exercise, light, some natural food, and are confined within very narrow bounds. This restriction of the natural instincts and habits has only to be enough prolonged to express itself in some visible way. This may reasonably, but not necessarily, be as an anemia. Even healthy domesticated trout are anemic as compared with wild ones of the same species. The confinement of fry in troughs within a building is the extreme of domestication. It may plausibly be argued, then, that this tendency toward anemia has gone so far in the Allentown fry so long held in troughs as to amount to a disease and cause death.

By this view the brood of anemic trout would be expected to be favorably affected by the removal of the conditions alleged as the cause of the anemia. Precisely this occurred. That the disease and the mortality persisted for some weeks after the transfer to ponds rather bears out this idea than otherwise. For the anemic condition does not occur nor disappear suddenly. The disappearance of corpuscles or diminution of hemoglobin is a gradual process, as is the corresponding regeneration. During September the last transfers of fry from hatchery to ponds were made and by the last of November the mortality was practically at an end, with a considerable remnant of the original stock surviving and with a promise of reaching the adult stage. These fish nearly all had red gills and though not yet up to standard, showed an improvement over the strongest fish examined early in October. On the 13th of January the Allentown hatchery was again visited by the writer and these trout again observed. They were active, feeding well and steadily growing, though rather smaller than usual at this station at this season. The gills of a number were examined and appear as red as those of any healthy domesticated trout. The mortality had entirely ceased and the disease is at an end. These fish will

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make healthy adults and it is not believed that any danger is to be feared from them either in carrying the disease to any other fish or in causing any deterioration in eggs and fry obtained from them.

Attention is called to a great and sudden mortality occurring among Allentown fry during the latter part of the winter of 1899. This was investigated by Mr. W. E. Meehan, Commissioner of Fisheries of Pennsylvania, and Dr. C. M. Blackford, who agree in attributing the loss to long continued inbreeding. This subject was published in the report of the Pennsylvania Commission for this period and appears also in a paper by Mr. Meehan in the Transactions of the American Fisheries Society for 1899. Anemia is mentioned as a prominent symptom among these fry, and it is at least possible that the epidemic of 1899 was caused by the same disease as the present one, although the former progressed far more rapidly. Without taking up the question of inbreeding, save to remark that such imbreeding as usually exists among trout is hardly analogous to that of higher mammals as the term is commonly used, and that it is very difficult to show a relation between a given disease and such inbreeding, it may be said that the present disease is not caused by inbreeding, on the single ground that the fish concerned have a mixed ancestry, the eggs coming partly from Weissport, Pennsylvania, and partly from Allentown Station, while, going back another remove, these Allentown breeders were derived immediately from two or more sources. On this and on general grounds inbreeding is not believed to play any part in the present trouble. And were inbreeding a generally recognized cause of losses among trout, the present instance looked upon as more satisfactorily explained upon the theory of a forcing of some of the necessary but unfavorable conditions which constitute domestication.

The explanation given does not amount to a demonstration, however, and it is highly desirable to determine by experiment whether the anemia can be induced by intentionally reproducing the conditions which are supposed to cause it. The Allentown Station is to be abandoned and the trial can not be tried there. Presumably the same result should occur at any station. The Pennsylvania Commissioner has expressed his willingness to set aside the necessary troughs and fry for this purpose at his new station at Bellefonte. This should also be done, if possible, at some station of the Bureau of Fisheries. The procedure may be about as follows:

Two troughs should be selected in the spring, or at the time of the usual transfer of fry to ponds. These should contain the same number of fry as the other troughs and should have been fed and otherwise treated like all the others. The number of fry in each will presumably be approximately what the flow of water in the troughs will support. These fry are to be left in the troughs when the others are moved to the ponds. They should be thinned only as fast as their growth makes the water supply insufficient, the idea being to keep the flow taxed about to its capacity. As the summer progresses the appearance of the anemia will be looked for. If it does not appear they should be held until fall, or perhaps until it becomes necessary to use the troughs for eggs again, should they survive until then. If a loss not due to anemia begins, an attempt should be made to determine its nature. The writer would desire to observe the progress of this experiment occasion-

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ally. Should the anemia and loss appear it should be studied briefly in comparison with the present Allentown mortality, to pass upon the question of their identity.

The disease here discussed is a very interesting one and has not hitherto been seen by the writer. It will be a distinct gain if it can be plainly shown that it is caused by confinement and is not infectious, for its control will then be more securely in the hands of the fish culturist.

M. C. MARSH.

PROCEEDINGS OF THE STATE FISHERIES ASSOCIATION OF PENNSYLVANIA, AT HARRISBURG, MARCH 24-25, 1904.

The Association in form of a convention was called to order at 11 o'clock A. M. by W. E. Meehan, Commissioner of Fisheries.

Commissioner Meehan then introduced the Governor of the Commonwealth, the Hon. Samuel W. Pennypacker, who welcomed the delegates in the following words:

Mr. Chairman, gentlemen and fishermen, and Mr. Fleitz: It becomes my duty as the Chief Executive of the Commonwealth to give you greeting and to extend to you welcome. I fear I shall not be able to fill the program which apparently has been mapped out for me by the chairman, but I shall endeavor to say a few words to you.

Unfortunately I cannot claim to be one of your crowd. I am very little of a fisherman, and yet it does not need much of the philosophy of Izaak Walton to be able to appreciate the importance of fish and incidentally the importance of fishermen. Man including all men is, as you know, a vertebrate. Now, we are told by the scientists that the earliest vertebrate had its origin in the sea. Some stiff bony thing went pushing its way through the water and the effect of the force of the water was (explaining the movement) in this manner until finally that mass of bone was divided up into fragments and hence we had the origin of all vertebrate, including men and fishermen.

You remember that when our Saviour started out upon his career along the shores of the Sea of Galilee He found Peter and Andrew and the two sons of Zebedee, and they cast aside their nets and followed Him as Apostles. I regret that that early example so set forth has not been more generally followed by fishermen, since, so far as I can learn they have established their reputation of perhaps a vigorousness of language and slight exaggeration in what they have to tell of their achievements.

The history of the world shows that all civilized life came up out of the sea. Long ago the herring were very plentiful in the northern seas and some of the early fellows who were living in Sweden, Norway and Denmark thought it would be a good thing to get the herring and they started out in their boats. Many of them were drowned. Thousands of them went to the bottom of the sea. But they developed a hardiness, force and vigor which made them a power in the world. Like some others it may be said, through their pride they had not the high regard for other people, and they poured

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down upon their localities and took possession of the western coast of France, and there as Normans dwelt in that country and presently came over to England and took possession of that country—and here we are.

Our War with England was a Naval War, the War of 1812. That is where we were successful, and we were successful because from shore lines and our islands the men went out in their boats and sturdily hunted for whale and so they developed a hardiness which made them seamen. So as I have endeavored to point out, the fish and fishermen have been a great importance.

Now here in this State we have undertook to look after the interests of the fishermen. We have a Department with a very energetic, active and intelligent man at the head of it, who is undoubtedly devoted to its interests. According to the reports which are presented to me (and I suppose when a fisherman puts a story into an official report it ought to be accepted) the fishery industries are improving and increasing, and our rivers are far greater and better supplied with fish. I have great confidence in the head of this Department.

Some time ago it was my pleasure to visit one of its hatcheries. On the outside I found a great number of trout swimming around in the water and on the inside of the house I found some ducks swimming in champagne, and the whole thing was attractive and interesting.

The object he has had in view in bringing you together, as I understand it, is to see whether the interest which you manifest cannot be extended and broadened, and you gentlemen, who are actively and interestedly engaged in your work as sportsmen or in your work as preservators of fish, are now organizing as to be a relief to the Department throughout the Commonwealth. It is appealed to you and it cames very strong, I may say, in the interest of the Commonwealth and the community. We are told that men who eat fish have more brains than those who don't. In every way it is a matter of great consequence and I am sure we will apprecite and all the people will appreciate, the Commonwealth, the Government and its executive will appreciate whatever you will be able to formulate to carry out in this work.

At the conclusion of the Governor's address of welcome, Commissioner Meehan spoke briefly on the purposes of the calling of the Convention together at the suggestion of Mr. Chase, President of the Pennsylvania Fish Protective Association, &c.

Mr. Fleitz was introduced and addressed the Convention.

Mr. Howard A. Chase, President of the Pennsylvania Fish Protective Association of Philadelphia, was then nominated as chairman of the Convention and Col. John W. Hague was made secretary, and Williard R. Black stenographer.

In taking the chair Mr. Chase spoke as follows:

Gentlemen: I thank you for the honor you have conferred upon me. As the hour is advancing, what views and remarks I have to make I will defer until our afternoon session. We will proceed now to the completing of our organization.

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I would suggest that at this time a roll be made, each delegate coming forth and giving his name and the organization he represents, if any.

Following is a list of delegates and members of the Convention:

A. J. Feely, Hazleton. Hazleton Game and Fish Protective Association.

Hugh Malloy, Freeland, Luzerne county. Freeland Fish and Game Protective Association.

H. A. Roat, Harrisburg. Harrisburg Rod and Gun Club.

I. N. Gilham, Jr., Philadelphia. Fishwarden.

Charles Wetherill, Esq., Philadelphia. Pohoqualine Fish Protective Association.

G. Dal Fox, (Oakland) Milton. Oakland Rod and Gun Club.

P. F. Fulmer, Dingman's Ferry, Pike Co.

W. H. Reed, Norristown, Norristown Fish and Game Association.

J. M. Mills, Warren; W. C. Watson, Warren. Warren County Fish and Game Association.

E. C. Beck, York; H. A. Zigler, York; J. L. Boose, McAdoo. McAdoo Fish and Game Association.

Maurice C. Eby, Harrisburg. Iroquois Fishing Club.

J. W. Hague, Pittsburg. Western Pennsylvania Fishing Club and Fish Warden.

J. W. Criswell, Steelton, Fishwarden.

Hon. C. L. Miller, Altoona. Pennsylvania Fish Commission. Blair Co. Branch, League of American Sportsmen.

Hon. A. R. Whitaker. Pennsylvania Fish Commission.

Hon. Fred. Fleitz, Scranton.

Frank Flynn, Easton, Fishwarden.

Howard A. Chase, Philadelphia. Pennsylvania Fish Protective Association.

Officers, Pro tem.

Howard A. Chase, President.
A. J. Feely, First Vice President.
W. C. Watson, Second Vice President.
Barton D. Evans, Corresponding Secretary.
W. H. Reed, Treasurer.
Hon. W. E. Meehan, President, ex-officio.
Williard R. Black, Stenographer.

Committee on Organization.

J. W. Hague, Chairman.
Charles Wetherill, Philadelphia.
W. H. Reed, Norristown.
J. M. Mills, Warren.
E. C. Beck, York.
Convention took a recess.

The Committee on Organization met during the recess at noon and recommended the following at the afternoon session, which was called to order at 2 o'clock P. M.

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Name of the Association.

STATE FISHERIES ASSOCIATION OF PENNSYLVANIA.

It was moved by Mr. Malloy, seconded by Mr. Meehan, that the above name be adopted. Agreed to.

Objects of the Association.

1st. To aid in the enforcement of the laws concerning fish and fishing in Pennsylvania. Adopted.

2nd. The preservation, protection and increase of food and game fishes in the Commonwealth of Pennsylvania. Adopted.

3rd. To increase the public interest in the fisheries of Pennsylvania. Adopted.

4th. To give support and assistance to the Department of Fisheries of Pennsylvania. Adopted.

5th. To encourage the formation of Fish Protective Associations in each county of the State of Pennsylvania. Adopted.

Officers of the Association.

1st. President.
2nd. Two Vice Presidents.
3rd. Corresponding Secretary.
5th. Treasurer.

The above officers are to constitute the Executive Committee. The above was adopted.

There shall be a General Committee composed of one member from each Association. Not acted upon.

Duties (as usual).

Membership.

Any regularly organized association having for one of its objects the protection of the fishery interests as one of its objects shall be eligible to membership in this Association.

Each organization shall have one delegate and one additional delegate for each additional one hundred members or fraction thereof. Adopted.

On motion of Mr. Wetherill the officers of the Association named were authorized to apply for a charter in Dauphin county.

Paper read by Mr. Charles Wetherill: "Relation of the Department of Fisheries to the Waters Privately Owned."

Discussion by Mr. Meehan, Mr. Malloy, Mr. Wetherill and Mr. Chas .

Paper by M. Luther Michael, read by Mr. Meehan: "Cause of the Disappearance of the Black Bass in the Delaware River."

Remarks by Messrs. Meehan, Malloy and Dr. Reed.

Convention adjourned to meet Friday morning at 9.30.

Friday, March 25th, 1905.

In the absence of the Chairman, Mr. H. A. Chase, the First Vice President, Mr. Feely was called to the chair.

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The discussion of the disappearance of the black-bass in the Delaware river was continued by Mr. Hague, Mr. Mills, Mr. Miller, Mr. Fox, Mr. Wetherill, Mr. Meehan, Dr. Reed and Mr. Apple.

Mr. Wetherill offered the following resolution:

Resolved: That the Legislature at its next session be respectfully asked to appropriate an adequate sum of money to propagate black bass on the same basis as trout are now propagated and to allow the Department of Fisheries to distribute as many black bass as are distributed of brook trout.

The resolution was adopted unanimously.

Mr. Fox who seconded the motion spoke very strongly in favor of the resolution. He said that all the statements made and the papers read, and the evidence of the Commissioner of Fisheries, show that the black bass are decreasing and must be replenished by hatcheries' work; that it was important that black bass be put on the same basis as trout; that they occupied at least as important a place among the game fishes of the State.

Paper by Mr. W. E. Meehan: "Trout Fry vs. Fingerlings for Planting."

This paper was extensively discussed by Mr. Meehan, Mr. Apple and Mr. Fox.

It was moved by Mr. Apple, seconded by Mr. Fox that the paper read by Mr. Meehan be printed in pamphlet form, and that the Secretary be directed to send a copy of same to all persons interested.

The motion was agreed to.

Paper by Mr. William Buller, Supt. of Corry Hatchery, read by Mr. Meehan: "Experiments in Rearing Black Bass."

Paper read by Hon. Charles L. Miller, written by Nathan R. Buller, Supt. Wayne County Hatchery: "The Fish for the People."

Paper by E. W. Campbell, read by Col. J. W. Hague: "The Causes Leading to the disappearance of the Small-Mouth Black Bass."

Paper by (Anonymous), read by Mr. Fox, of Milton: "Fish Protection."

All the above papers were earnestly discussed and with unusual interest.

On motion the Convention adjourned to meet at the call of the Chairman.

JOHN W. HAGUE,
Secretary.

March 25, 1904.

THE DEPLETION OF OUR STREAMS OF SUNFISH.

BY W. H. REED, M. D.

My paper applies largely to the depletion of streams located in Southeastern Pennsylvania—the neighborhood of my home; and such streams I reach in my nearby fishing trips, and my information comes largely from personal observation.

Through the southwestern portion of Montgomery county, this State, passes the Schuylkill river, and tributary to it on its northeast, and almost totally within the county's borders rises the Perkio-

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men and its numerous branches—all of which from time immemorial have been noted for sunfish and the numbers here found. The natural characteristics of these streams have always been favorable as haunts of this little gamey wonder, and here under natural conditions he grew, thrived and multiplied.

My time for the preparation of this paper being too short to go into the examination of the species of sunfish indigenous to these streams; but suffice to say here he has been found in variety, and under favorable conditions; would remain, prosper and be in abundance providing he would be given an honorable show and receive humane treatment.

The variety of fish native in these streams are favorable to the sunfish's existence, reproduction and multiplication. But since the advent of game fishes from other waters into these streams, vast changes have taken place and somewhat to the detriment and extermination of these little fellows.

With the introduction of these new varieties of game fishes, developed an increased interest in piscatorial sports; with this increased interest came modern and scientific methods of taking the same, and it was not long before the little "sunny" was discovered a wonder in this line; being a ravenous feeder, took the fly, minnow, helgramite, crawfish, etc., readily, and fell a prey to modern methods applied by the angler for larger fish.

As the sunfish is more easily found dispersed throughout the waters when in season, possessing flesh that is pleasing and agreeable to the palate, of a solid and excellent keeping quality; his importance and good qualities were soon discovered by the average angler, and now as such is much sought after by our fisherman, and in many cases, in preference to the bass and other choice varieties of fishes that have been planted in these streams.

Most all new fishes that have been introduced into our streams have been to the detriment of the sunfish. These new species either feed on the spawn, or on the fish, thereby to a certain extent keeping down their propagation and multiplication. This we class as a natural sequence—a provision made by the Almighty, by which certain laws in nature are made to equalize and harmonize. If there would be no such arrangement nature's affairs in time would become very much disarranged. Nature has provided this little fellow too with means of protection and safety; in case of peril if not caught napping, or cornered, he can retreat to a place of safety—being fleet and wary, he readily scents and can escape danger. There are also other natural enemies of the streams which this little fellow suffered from, such as indigenous fish eating fish, water snakes, animals, birds, fowls, etc. But with the advent of the white man—settlement and cultivation of lands—these natural enemies to a large extent have been destroyed and disappeared.

The greatest enemy and which depletes the waters more of the "sunny" than any other one thing in my estimation, is the indiscriminate fisherman—the fisherman that exercises the function of a four legged animal that belongs to pen No. so and so—(as put by the editor of the Recreation.) We have them; they visit our stream in numbers, and it is a wonder to me that there is not some hidden power that does not visit these poor fellows—while engaged in the

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art of destruction—with some sort of restraint or woe. Above all of the natural enemies of this little fish, I believe there are none worse than mankind for their annihilation and extermination, without it be a polluted stream—outside of the Schuylkill river with inky waters at certain seasons—its tributaries with us are, at the present time, I am thankful to say, free of such. This man enemy in the brutal sense has no respect, consideration or humane feeling for this little wonder and his beauty; but with his onslaught propensities, he exercises no wisdom, consideration or forethought, but recklessly prods along the stream, casting both right and left in his effort at destruction and depletion. When these little fellows are in biting humor he is drawn from the waters in wholesale numbers, and the little and the big fellow alike, fall prey unmercifully at the hands of this criminal in this slaughter.

I possibly may be, right here, by the critic, accused of dealing harshly or severely with these enemies and destroyers of this little wonder, but if the facts were familiar to you all, known to you in detail and viewed as I from an unbiased standpoint, you would simply say I am treating the subject lightly and in my criticism have not meted out justice to these indiscriminate fish destroyers. By all fishermen—I now speak of fishermen in a true sense—those of mercy and consideration who spend a day of enchantment in piscatorial sports along our streams, it is but common with them, while on these jaunts, to observe these unscrupulous fishermen at their wholesale destruction of sunfish. Some of these enemies of this fish come with fifteen and twenty pound capacity creels, and into these go everything they draw from the waters—small and large "sunnies"— oftimes including small bass and other game fishes. If chance before the day is over and the creel is full, its contents are emptied on the banks of the stream, the smaller sunfish are weeded out and returned to the stream dead, or left on the banks dead; the larger fish are returned to the creel, thereby giving capacity, and the terrible work of onslaught and destruction is resumed, continued until darkness compels him to relinquish his efforts for the day. Can there be any chivalry in this? As many as one, two and three hundred are thus taken from a stream in a day by a single fisherman. Sometimes a day or two after you read in his home paper something like this: "Mr. Big Hog spent yesterday along the picturesque stream Depletion, and he made a wonderful catch of fish. He succeeded in landing two hundred and thirty-five choice sunfish. He is certainly a master of the art and deserves praise for his eminent success. He is without a doubt Izaak Walton's peer, and as such, is an adept and is always rewarded with fine catches."

The possibilities are that some fishermen who destroys fish so indiscriminately, do so through simple thoughtlessness—a lack of forethought or consideration. With him it is a sort of a superior or personal pride he glories in because he has excelled his friend or neighbor in skill in numbers of fish he has caught; and thus lost in enthusiasm in his work, never stops to think or realize that in this self glorification, he is committing wholesale destruction and annihilation of his little friend, thereby rapidly destroying his future pleasures through this present blind enjoyment. Until education and inculcation through newspapers or other such means, or the

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enforcement of some severe penalty of a suitable law, that will in a general way forcibly impress or teach the unscrupulous to a realization of these facts; this evil of destruction will continue and in a moral or humane sense hard to overcome, and if not checked it will not be long before our streams will be entirely depleted.

The last Legislature of our Commonwealth while in session enacted a new fish law; the law wisely contains a clause making a closed season for sunfish. I am afraid, so far, the law with this fish has not been a success. The public in general is not familiar with its character, particularly to the clause referring to the protection of sunfish. Largely from this lack of knowledge, not with criminal intent by the general public, this feature of the law has not accomplished its intended purpose. This clause is an all-important one to this law, and was wisely incorporated by its promoters; but should be further supplemented with provisions that are more sweeping in their character—such as limiting the size and the number of fish to be taken from the stream in a single day by one person. Penalties should govern these violations the same as that which applies to game fishes already protected. Thus this little wonder, the sunfish, would receive but deserved protection; and have consideration and respect shown him at the hands of all, who ply with rod and line, wherever found in his favorite haunts in our beautiful streams.

FISH PROTECTION.

The most reckless wastefulless and disregard for the future distinguished the first settlers of this country and their posterity. The first colonists found the country covered with magnificent timber, which they promptly set out to cut off, with the result that the lumber problem is now staring the people in the face and denuded mountain sides have become constant menaces of floods, which at last science has set out to remedy and forestry has become a concern of the State. Over the plains of the west roamed immense herds of buffalo, which were exterminated in the same reckless manner that the forests were cut down. Then it was tried to replace them with cattle, but it has been found that the plains will not support nearly as many cattle as they would buffalo, which had been placed there by the master hand of the world. The economic value of the buffalo is now appreciated when it is perhaps too late. A few years ago the writer met on a railroad train a man from Ohio who told a story that well exemplifies the wastefulness of our old methods. During the fifties he had moved to Ohio and taken up one hundred and sixty acres of land. On it were fine groves of walnut trees which he proceeded to destroy by girdling. For over forty years he had worked and struggled to build himself a home farm and to-day the place is worth about ten thousand dollars. On the farm were left standing twenty of the giant walnut trees that once covered the ground and he had just sold them for five thousand dollars. If he had never cut a tree on the place but had

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earned his living by work, no harder than he had done on the farm, the more than two thousand walnut trees on the place would have brought him over a million dollars as compared with the ten thousand he now can sell the farm for.

Wonderful are the stories that are told by the first comers to this country of the immense numbers of fish that dwelt in the waters. That they were not exaggerations anyone who has been to Oregon or Alaska not many years ago and seen the salmon in the streams there will readily concede. With the same disregard of posterity that characterized the sweeping away of the forests and the buffalo, the colonists and their descendents began to exterminate the fish. The most wasteful methods were employed and fishermen vied with each other in devising ingenious nets and traps that destroyed many times as many fish as those that were utilized by the takers. Even dynamite and other forms of explosives were resorted to and streams and lakes were swept bare of every sign of fish or other life. Gradually it began to dawn upon the thinking people that it was time to do something or there would be no fish left in the streams if the fish were not given some chance. Commercial fishermen and anglers took up the matter and Legislatures were appealed to for remedial measures. The result was protective statutes and the recognition of the fact that the fish industry was a most important one. The artificial propagation of fish has been taken up by both the National and State governments and the re-stocking of the depleted streams begun. But for the government to go into the business of hatching all the fish that the people require would be paternalism of the baldest kind, and therefore has sprung up the demand for fish protection that the fish in the streams can do their share of repopulating the waters.

First and foremost came the establishment of close seasons when the fish would have an opportunity to spawn. Then a limit to the size of the fish that could be taken, for it should be manifestly plain to the most ignorant that if the fish planted by the government are not allowed to grow to spawning size the work of replenishing the streams will depend on the government hatcheries. Then the ban has been placed on the destructive devices that destroy far more fish than they take. It is a very selfish man who will use a device that will kill numbers of fish in order that he may get a small mess for his table. But because his grandfather used a destructive net many an American citizen thinks his rights are infringed if he is told that he cannot use the same device. The constable of a neighborhood can rarely be depended upon to enforce the laws in regard to fishing for the chances are he has been a member of a gigging party many times and he does not like to go back on his friends and neighbors. Speaking of gigging, there are few more destructive forms of fishing than this, for the gigger can rarely distinguish the variety of the fish that he is going to strike and once a fish is impaled on the barbs it is idle to talk about putting him back unharmed. A resort must then be had to regular wardens and a State as large as Pennsylvania is a broad field to cover with the amount of funds that is available. The best that can be done is to make arrests here and there and endeavor to impress the violators of the law that there is no telling when a warden may descend upon them.

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Much good has been done by the Department of Fisheries during the past year and the illegal fisherman is getting very wary, which means that his catches are much less than formerly.

But the best fish protection is education, and it is this education that you gentlemen are engaged in disseminating. Impress upon the rising generation why the fish protective laws are made. Teach him that if the young fish are allowed to grow to spawning size, for every pair of fish there will be hundreds of little fellows to take the places of the big ones when they happen to get caught. Teach him the reason for a close season, show him a nest, say of the sunfish, and let him see what it means to catch such fishes when they are nesting and it will not be long before the wisdom of fish protection will be appreciated. The same information should be given to the grown up generation, but it will not fall on such good soil, yet there will be good results. Show a man in the Susquehanna valley who is howling for fishways that the shad may get up the stream and then call his attention to the net that he sets in a wing wall, to catch eels, he says, and it is commendable to catch eels. But show him that net in which he has caught a few eels and point out to him the hundreds of dead small shad that have become entangled in the meshes. He will then see that fishways will avail him little if he is to keep on using a contrivance that decimates the schools of little shad as they try to get down to salt water.

Some of the men who have been arrested and fined for using illegal devices have become the warmest friends of the Department of Fisheries when the reasons for the law has been fully explained to them. The protective measures of the Department have really been in the line of education for they have set people to thinking. With the co-operation of the associations whose representatives are here to-day, the Department hopes to give many more effective lessons until public sentiment is trained to such a pitch that the fish pirate dare not ply his trade any more openly than the thief who plies his trade by night, and will find it as difficult to dispose of his pirated fish as the thief does his booty. When this time comes, there will be no difficulty in having the streams as full of fish as when the first settlers landed, the angler will be sure always to get a string, and the man who wants a mess of fish for supper can go and get them.

RELATION OF THE DEPARTMENT OF FISHERIES TO THE WATERS PRIVATELY OWNED.

BY CHARLES WETHERILL.

This is the second State Convention of Associations devoted to the interests of the fisheries of Pennsylvania for commerce and for sport.

The first convention called by Governor Hastings came to the rescue of the State Fish Commission which by a mistake of the copyist who wrote the general appropriation bill, was left without money with which to carry on its public work.

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At that convention the general opinion was that it would be ungracious and improper to make any suggestions to the Governor or to the Commission as to the interests or the work of the Fisheries , that we came together not to ask for anything either for ourselves or for any one else, but to contribute promptly and gladly as the Governor might suggest. At the same time the hope was expressed on all sides that at some future time, and when it would not be unbecoming to do so, a convention of the fishermen might be called to review the course of the Commission, not with any unkindness of criticism, and deliberate on any suggestions proper to be made.

Pennsylvania stands alone in her course as to the angler. In no other state of the Union has the government called on the sportsman either for financial aid or for kindly advice and counsel, and I, for one, deem it a great and gratifying compliment to the public spirit of the Pennsylvanian fisherman to be called upon, and am happy in the remembrance that I attended the first State convention of fishermen, and that I am here again to-day. We are here in no spirit of unfriendly criticism. We rejoice that recent law has remodelled the Fish Commission, given it an established place in the public service, with a permanent office in the Capitol, and placed its supervision in the care of one official, employing his whole time, and we would express our appreciation of the independence of the Governor, who turned away from the temptation to reward political services and appointed a recognized expert in the science of fish culture, a good fisherman, and a true sportsman, as the head of the remodelled department of the public service.

And what may be asked is the object of this Department of the public service, maintained with such care and expense? Clearly the first object of all is the protection of the commercial interests the improvement of the food supply, the plentiful stocking of the market with good, cheap, wholesome food, within the easy reach of the poor, so as to remove, so far as possible the temptations of want and hunger, and also to give profitable employment to the people.

To this end the propagation on an adequate scale of the standard food fish, such as the whitefish, shad, herring, sturgeon, rock fish and black bass, the placing of a proper supply of them in the public waters and their preservation when planted by proper laws, rigidly enforced, plainly comes first and before all. But it may well be doubted whether the State's duty to the commercial interests ends here. There are in our State many streams and ponds which flow or stand over lands which are privately owned, and on which the owners, generally farmers, pay taxes, but receive little or no return for the outlay, the adjoining fields are tilled with anxious care, but the waters lie idle. We are accustomed to think of the Chinese as an inferior race, but in their country the ponds are as diligently cultivated as the gardens, and yield their crops of marketable produce with the same regularity. If after caring for the existing commercial interests the Fish Commission has any available funds remaining unexpended, it would be well to use at least a fair share of it in conducting experiments looking to the encouragement of the practical cultivation by the farmers of the waters owned by them. The Fish Commission by careful work on this line may add to its present knowledge, the means of successful propagation and rearing

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of fish or animals suitable to the warm water creeks and ponds usual in the farming districts; there are several of these for which there is a steady demand in the market at prices which are sufficiently high to justify the State in experimenting upon them.

Frogs command a high price, and are very justly considered a delicacy, and the eggs can be gathered and allowed to hatch almost without care or expense. If some cheap food could be found for the tadpole and the frog, the small warm water ponds of the State could be made to produce a valuable crop.

The red-legged terrapin of the spring water creeks has a delicacy of flavor which when they are carefully cooked, can hardly be distinguished from that of the famous "diamond back." It commands a good price, and it should not be very difficult to find out how long it takes them to grow to a marketable size; how to protect and hatch the eggs, and what their natural food is. The same experiments might with advantage be tried on the snapping turtle, which while it does not command quite as high a price in the market, is in steady demand, and grows to a much larger size. One very good point about these animals is that they are very tenacious of life, and could be easily and safely carried to market and sold alive. This would not only save the producer the trouble and expense of killing and preparing them for the market, which is a serious item as to the ordinary domestic animals and fowls, but it would insure to the consumer the fact that the meat purchased is absolutely fresh.

Of all the fish native to the warm creeks flowing through the farming districts, the best for food is the catfish, and the next is the sunfish. There is no better fish than the catfish taken from clean water, and in the smaller streams they could undoubtedly be grown profitably if the hatching of the eggs and the rearing of the fry were better understood. In such streams as the Perkiomen and the Brandywine, wherever in fact they are naturally found, they could probably be cultivated with advantage. It may be objected that such streams are many miles in length and that no single land owner would be likely to possess a sufficient length of the creek bed to make it worth any one owner's time to go into the business, but this difficulty could easily be met by the co-operation of the owners. Farmers have for years sent their milk to creameries operated on joint stock plans to their mutual advantage, and it would be equally easy to operate a fish hatching plant for an entire stream upon a proportionate division of the expense and profit, or for all the owners to join in leasing the creek to a fishery, on a division of rent in proportion to the area owned by each farmer.

Experiments, scientifically conducted, may also discover opportunity for the profitable cultivation of the waters with other fish; the above are merely suggested as examples that occur to me.

It is undoubtedly true many of our finest streams have been rendered unsuitable for these works by the drainage of mines, the washing of minerals, the escape of waste products from mills and factories, and the sewerage of towns. It is no part of the scheme of this paper to discuss the many sided question of the right of the government to interfere on this point. So far as the public health is involved the question is in the care of another department of the public service. It is only mentioned here to indicate that in my

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opinion the experiments of cultivation above mentioned can probably be tried with the best chance of success in waters which most nearly approach the natural conditions of purity. But in all this care of the commercial interests, the supply of the fish market and the education of the farmer in new industries, the sportsman may ask: "Where do I come in?" The only approach to criticism which occurs to my mind as I review the past work of the Fish Commission, laboring as it does under the old law under very great disadvantages, is that the angler for sport has had more than his fair share of the care and labor of the Commission.

Year by year in the annual report appears the long list of persons and fishing clubs to whom millions of trout fry are presented by the government with great trouble, in a car specially made for the purpose, and at very considerable expense, and it is undoubtedly the fact that most of these fish are planted in waters that are not public streams and that in some instances they are even privately preserved. In my view of the subject this is an unjust discrimination in favor of the angler to which he is not entitled, and which men actuated by the proper spirit of sportsmen should be ashamed to ask for. The angler has no more claim on the State government for trout fry to stock his brook with than he has for fly rods or wading boots, or any other appliances of his favorite pastime. If his waters are insufficiently stocked he ought to gather trout eggs and hatch out fry for himself. Live trout eggs cost about a dollar a thousand, a trough similar to an ordinary horse-trough, set in a spring house, with sieves pegged into it, set four inches below the water line, would easily hold fifteen thousand eggs. Six layers of flannel across the fall of water is a sufficient filter and with these simple and cheap appliances trout fry can be hatched at a cost very much less than is commonly supposed, probably about three dollars per thousand for the first seven thousand and the cost of the eggs on all over that number. Surely this expense is not a burdensome one to a fishing club, and if the State should supply the anglers for sport with live trout eggs instead of fry, and charge the proper cost of producing and packing them for shipment. This is the utmost assistance that they ought to expect. In return for this it ought to be stipulated that the fry be planted in waters free from fixed obstructions to prevent their wandering, so that the fishing above and below the place where they are planted might be gradually improved. Many of the best anglers are not owners of streams and do not belong to fishing clubs, but when they go fishing, they usually stay at a hotel near their favorite stream, and these hotels are well known. It would be perfectly easy for the owners of the more prominent of them to maintain hatcheries for trout or bass and adequately stock the streams their patrons come to fish, and it would pay them well to do this. It is not generally done only because it is easier for the hotel keeper to apply to the Fish Commissioners than to set up hatcheries for themselves.

There is, however, one exception. The State is forming Forest Reserves, which now aggregate in area one million acres, and are being increased. These reserves are generally on the water sheds, and abound in springs, brooks and small cold streams, which can easily be made as good trout fishing as any in the State. The improvement of these waters is entirely within the proper function of

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the Fish Commission, and as the lands are public property, it will be entirely right to allow public fishing in these waters under proper restrictions. In this way every one, rich and poor alike, may have a fair share of good sport at moderate expense, and the Forest Reserves will become popular places of sport and recreation, where all may enjoy out-door life, amid healthful and happy surroundings.

What the sportsman needs is not free distribution of trout and bass fry so much as proper protection of the water itself. I have seen streams which in my younger days were famous resorts for anglers dry up into small channels of warm water, as the splendid forests which shaded them and protected the springs were cut down, leaving the banks and mountain sides bare open wastes.

We need to have the mountain ranges well timbered. We need protection from forest fires. It ought to be as punishable to burn growing timber as to destroy growing wheat. The banks of streams ought to be shaded with the oak, ash, walnut and other hard woods, systematically cut and carefully replanted. In this, Pennsylvania may well follow the example of other countries. The famous Black Forest in Germany is made up entirely of trees which have been artificially planted and cultivated; the Bavarian trout streams would long since have warmed and their game fish become extinct species, if it were not for the shade of forests grown, not as parks, but for profit.

Much as the Fish Commission has done, and much as I hope for its future, I believe that its labors will be in vain, so far as the trout streams of the State are concerned, until the wholesale destruction of the shade is controlled, the timber allowed to grow and forest fires be lawfully restrained. To reach these results, we must hope for the education of the landowner of the mountain districts to a more enlightened selfishness, and this is being done by the good example and earnest precepts of the Forestry Commission.

These remarks may invite the criticism that they advise a course which gives nearly everything to the fisherman for the market, the farmer and the lumberman, and sacrifices the claim of the angler.

No one here loves the sport more than I do; to no one is the delight of life and sport along the streams and in the fields and woods greater; no one's heart answers with truer sympathy than mine to the call of the Dame Berners, written nearly five hundred years ago:

"Come forth then to ye sporte of anglynge. If ye catche fishe welle; but if ye catche no fishe, ye have ye holsom walke, ye syghte of ye freshe flowers, and ye sweete songs of fowlis."

The love of sport springs from the love of nature and of fair play. The feeling that avoids taking an unfair advantage, prompts earnest advice against an unfair discrimination.

The public interest should be considered before all. "Business first and pleasure afterwards" should be recognized as the truth. The State calls on us for advice and counsel; let us give it freely, unselfishly and honestly; confidently relying on a return of good-will and fair dealing on the part of the government of Pennsylvania, the great Commonwealth which has recognized more than any other state of the Union the interests of the sportsman.

CHAS. WETHERILL.

January 1st, 1904.

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with those who do try to have said laws enforced. Now, gentlemen, there is one point in our trout season I wish to call your attention to, namely, an inconsistency. The season opens April 15th, in Pennsylvania. Now, this is to say the least fifteen days too early. My reason is this, our law says, a trout less than six inches must not be retained, but returned to the stream unharmed. Now the rub, how can this be done? He or she (the trout, I mean) has been taken on a worm, a ("garden hackle"). Now mark me, it does not measure six inches, what will the fisherman do with it? You say, why put it back in the stream;" "what for?" The fish has swallowed both worm and hook. This means throwing dead trout back into the stream. Now mark me, well, had this fish been taken after May 1st, by an angler, who uses a "fly," the fish will be found to have been hooked only in the mouth or jaw. A trout does not leap for a "fly" and swallow same at once; a trout leaps for the "fly," makes a snap and grabs it. But, give him a chance to once discover your "fly" is a deception he ejects it on the instant. Now I am not writing on hearsay, but on observation and experience. A trout swallows a worm, but not an artificial "fly." So this being the case, of two evils, I say, choose the less. Cut out that part of our "open season" which is, so to speak "the fish hog's season."

He who cares not as to the means used to procure same, but simply any way or means to obtain the fish. Now, gentlemen, ask any one of this too numerous class of our "general public," to contribute funds to help restock our forests and streams, depleted by them, and the answer you would receive, is, "Oh, that is not my affair, let the State see to that." Now, gentlemen, we are fighting an uphill fight, our streams are growing less each year, so are the trout. But the great army of fishermen increases day by day. Our forests are fast disappearing. The trout (Salmo Fontinalis), our woods fish, along with them. Our ruffed grouse, our woods birds, are going the same long road, never to return. Same old story, extinct, or gone all gone. Gone where the "wild pigeon" buffalo and antelope have gone. Kindly permit me to quote a refrain from "Woodcraft," by "Nessmuck:"

"Never any more
Can it be,
Unto me (or anybody else)
As before."

PROGRESS.

Of course the world moves on—this is progress. But, whether backward or forward, let some one decide 50 years hence. And just what is happening to our own State to-day is happening all over our land. It is the same old story of "grab and greed." Let's go on the make to-day and whack-up to-morrow, cheating each other as villianously as we may and posterity be d——d. "What's all the world to a man when his wife's a widdy?"

"THIS IS THE MORAL."

From Maine to Montana, from the Adirondacks to Alaska, from the Yosemite to the Yellowstone, the trout hog, the deer wolf, the netter, the skin hunter, each and all have their own way, and the law

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biting at anything that moves, which renders it easily to catch. There are plenty of streams in Pennsylvania which would afford excellent habitations for these fishes. At the new Wayne County Station it is proposed to provide a battery for the hatching of these fish, and I can think of no project which promises more fruitful results than the vigorous propagation of the perch family, for their marvelous reproductive powers will enable them to be produced in enormous quantities. A stream once well stocked will keep well supplied, if the streams are protected against illegal devices for fishing. A single female less than three pounds in weight has been found to contain 125,000 eggs. If the farmers will only give their attention to stocking their streams with these fish, they will always have a pleasant addition to the dining table and an additional source of revenue at their market stands. The third fish to which I desire to call attention is the catfish. Half a century ago this was a great fish, and catfish and wafles were advertised as a meal fit for a king. They have been largely exterminated, but it is to be hoped that the efforts of the Department of Fisheries may result in once more restocking the streams. They are tenacious of life, indifferent to environment, can be transplanted to any distance, placed in a ditch of tepid water and with care will increase wonderfully. It would be almost an insult to tell any boy how to catch them. Their eggs hatch in about five days and during this time the mother fish stands guard like the faithful Roman sentinel. When incubation takes place, she assumes all kinds of maternal watchfulness and anxiety until the little ones are able to take care of themselves. They have the bright and shining virtue in that they are not cannibal; they do not eat their young. Any farmer who has raised these fish understands that they are more easily taken care of and more productive financially than poultry. The description of the habits of the catfish or bull-head, as it is sometimes called, written as a burlesque by George W. Peck, gives a vivid and truthful idea of the life history and game qualities of this fish. After speaking of the aristocratic habits of the brook trout, he says:

"There are fish that should be propagated in the interests of the people. There is a species of fish that never looks at the clothes of a man who throws in the bait, a fish that takes whatever is thrown to it, and when once hold of the hook never tries to shake a friend, but submits to the inevitable, crosses its legs and says, 'Now I lay me,' and comes out on the bank and seems to enjoy being taken. It is a fish that is the friend of the poor, and one that would sacrifice itself in the interest of humanity.

"The bullhead never went back on a friend. To catch the bullhead it is not necessary to tempt his appetite with porterhouse steak or to display an expensive lot of fishing tackle. A pin hook, piece of liver, and a cistern pole is all the capital required to catch a bullhead. He lies upon the bottom of a stream or pond in the mud, thinking. There is no fish that does more thinking, or has a better head for grasping great questions, or chunks of liver, than a bullhead. His brain is large, his heart beats for humanity, and if he can't get liver a piece of tin tomato can will make a meal for him. It is an interesting study to watch a boy catch a bullhead. The boy knows where the bullhead congregates, and when he throws in his hook, it is dollars to buttons that 'in the near future' he will get a bite.

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"The bullhead is democratic in all its instincts. If the boy's shirt is sleeveless, his hat crownless, and his pantaloons a bottomless pit, the bullhead will bite just as well as though the boy is dressed in purple and fine linen, with knee breeches and plaid stockings. The bullhead seems to be dozing on the muddy bottom and a stranger would say that he would not bite. But wait. There is a movement of his continuation, and his cowcatcher moves gently toward the piece of liver. He does not wait to smell of it, and canvass in his mind whether the liver is fresh, it makes no difference to him. He argues that here is a family out of meat. 'My country calls and I must go,' says the bullhead to himself, he opens his mouth and the liver disappears.

"It is not certain that the boy will think of his bait for a half an hour, but the bullhead is in no hurry. He is in the mud and proceeds to digest the liver. He realizes that his days will not be long in the land, or water more properly speaking, and he argues that if he swallows the bait and digests it before the boy pulls him out he will be just so much ahead. Finally, the boy thinks of his bait, pulls it out, and the bullhead is landed on the bank, and the boy cuts him open to get the hook out. Some fish only take the bait gingerly, and are only caught around the selvage of the mouth, and they are comparatively easy to dislodge. Not so with the bullhead, he says, 'if liver is a good thing, you can't have too much of it, and it tastes good all the way down.' The boy gets down on his knees to dissect the bullhead and get his hook, and it may be that the boy swears. It would not be astonishing, though he must have felt, when he gets his hook out of the hidden recesses of the bullhead, like the minister who took up a collection and did not get a cent, though he expressed thanks at getting his hat back. There is one drawback to the bullhead, and that is his horns. We doubt if a boy ever descended into the patent insides of a bullhead to mine for Limerick hooks that he did not, before his work was done, run a horn into his vital parts, but the boy seems to expect it, and the bullhead enjoys it. We have seen a bullhead lie on the bank and become dry, and to all appearances dead to all that was going on, and when a boy sat down on him and got a horn in his elbow and yelled murder, the bullhead would grin from ear to ear, and wag his tail as though applauding for an enchore.

"The bullhead never complains. We have seen a boy take a dull knife and proceed to follow a fishline down a bullhead from head to the end of his subsequent anatomy, and all the time there would be an expression of sweet peace on the countenance of the bullhead, as though he enjoyed it. If we were preparing a picture representing 'Resignation,' for a chromo to give to subscribers, and wish to represent a scene of suffering, in which the sufferer was light hearted, seeming to recognize that all was for the best, we would take for the subject a bullhead, with a boy searching with a knife for a long-lost fish hook.

"The bullhead is a fish that has no scales, but in lieu thereof has a fine India rubber skin that is far ahead of fiddle string material for strength and durability as possible. The meat of the bullhead is not as choice as that of a mackerel, but it fills up the stomach just as well and the Department of Fisheries should give the bullheads a chance."

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It is the intention of the Department of Fisheries that a large part of the land at the Wayne County Hatchery shall be devoted to the propagation of the three species above cited. It will thus be possible to furnish these fish by the millions to the citizens of the State, so that the farmer devoting the same amount of time and attention to the fish in the streams and ponds on his farm as he does to his poultry, will have plenty of fish at all times for his table, a considerable amount for the market and a large amount of fun for himself and his family in catching the fish. With the proper amount of money appropriated for the carrying on of this good work the Department will send out bulletins telling how to arrange the ponds and streams on the farms which are numbered by hundreds, so they can be made suitable for the growing of fish.

The present appropriation for the Wayne County Hatchery is enough to begin the work for which it is intended. I suggest that the farmers build a series of lakes or ponds for the accommodation of the fish and with the increase of facilities that may be expected in the future the Department will be able to supply all demands which will be made upon it for fish to stock the waters in question.

By doing this we will not only reach the end of having the fish, but at the same time instil in everybody's mind the fascination of raising fish. Several years ago, when the boys would discover a fish their first idea was to destroy it, but the day is coming, when the boy is beginning to learn the usefulness of fish, the wastefulness of destroying the small ones and the desirability of protecting them.

Another fish which is to be raised at the Wayne County Hatchery, and of which I have not previously spoken is the gold fish. This fish will be introduced in all the schools of the State, where it will serve as an object lesson. It will show how fish grow, give an idea of their habits and teach the growing youth to protect fish instead of destroying them.

TROUT FRY VS. FINGERLINGS FOR PLANTING.

By W. E. MEEHAN, Commissioner of Fisheries.

Fishermen and fish culturists have for years discussed the question of which yield the best results, the planting of brook trout fry or fingerlings. With the advocates of the first method it was for a long time, in a measure, a campaign of education, for twenty years ago it was difficult to find a person who believed the best results could be obtained other than by planting fingerling trout, that is to say trout which were hatched in the winter and retained in the hatching houses until the following autumn. As time passed a decided change was noticed in public sentiment, and to-day the number of advocates of planting fry, or fish of from three to four months old is vastly greater than those who still believe in fingerlings. I

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am free to say that I am among those who for more than fifteen years have been a firm believer in planting fry, and have been a missionary in the cause. I am more than gratified when in surveying the field of Pennsylvania, I find irrefutable evidence of the strong sentiment in favor of planting trout in what may be termed their childhood, or soon after the egg sacs have been absorbed. There are sections of Pennsylvania where experienced planters of brook trout expressly ask for fry and those who have not been in the habit of applying for State fish still request fingerlings.

The position which I take is not the result of mere theory, but of actual experience, extending over a period of many years. I have been a planter of fish since 1874, and I have planted both fry and fingerlings. My most marked successes have been with the former.

Success or failure in planting trout fry depend entirely on the manner in which they are planted, the time they are deposited in the stream, and the suitability of the stream for the fish.

Apart from all other considerations, it might be said that it would be impossible for any State to begin to supply the demand on the hatcheries for trout, if fingerlings only were supplied. The Department of Fisheries this year had applications which called for upward of eight millions of trout fry, or more than two millions more than were incubated in the hatcheries, and even then, to supply the applicants who forwarded their papers before January 1st, it was necessary to order the delivery of a less number of fish to each than the Department felt should properly be sent. If the Department were to retain its trout in ponds until the autumn, or until they became fingerlings, the cost and the acreage of the hatcheries and the facilities for transportation would have rendered it impossible to have reared more than one million, probably a lesser number. Such a state of affairs would not for a moment satisfy the great army of men who are anxious to have the trout streams well stocked with fish.

There are many arguments in favor of planting fry. Briefly stated they are; first, fry are necessarily planted early in the spring, as soon as the streams are reasonably free from snow and ice. Consequently when the fry arrive at the stream side the water in the cans and the water in the stream are nearly of an equal temperature, a very important consideration where full success is desired.

Second. By early shipping it is not necessary to use much ice in the cans during transportation, only just sufficient to maintain the temperature of the water in the cans at the normal spring water when first shipped. Every intelligent planter of fish will at once recognize the importance of this point.

Third. By planting early in the spring, the fry are deposited in their new home at a time when insect life is beginning to become abundant, and when the fry can secure food without any particular effort, and without their missing the change from being fed to having to hunt their own food. It does not require much reasoning to show that fish which have not yet come to rely exclusively on artificial feeding, will more easily learn to seek their own than a fish which has been fed for months in a hatchery.

Fourth. From three to four times the number of fry can be delivered to an applicant than fingerlings.

The objection to planting fingerlings are several.

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First. It frequently happens that the weather is yet warm when they are received, which necessitates constant use of ice in transportation, so that on arrival, the water in the cans have a temperature of ten to fifteen degrees lower than that of the stream. To plant the fish under such conditions would be fatal to most of them, and to bring the water to the proper temperature before planting entails a long and wearisome task.

Second. The fish after being kept during the entire spring, summer and early fall in hatching troughs and in ponds on the hatcheries, become accustomed to schooling or keeping together in large numbers, and when the spring arrives the entire planting may easily be caught by a conscienceless fisherman.

Third. The fish by being retained in the hatcheries until they are nearly a year old become accustomed to being fed, and when they are liberated in the stream in the fall at a time when wild food is becoming scarce, the fish scarcely know how to seek and capture that which is still in existence. The result is that the fish are half starved and do not present the same good appearance in the spring as their brethren which were planted in the spring.

Fourth. Trout reared on wild food are believed to be stronger and grow faster than those which are fed on artificial foods in the hatcheries.

Whatever may be the merits of the arguments of the two sides, there is one fact which remains clear and distinct, namely that given two streams, which are barren, and planted one with fry and the other with fingerlings, and both properly planted, the one in which the fry are planted will outstrip the one in which the fingerlings were planted. I will give an illustration. A number of years ago, I selected one stream and a friend another, both of which contained no trout, and both of which it was mutually agreed possessed about equal qualifications. The stream which I chose was a meadow brook, that which my friend selected ran for the most part through woodland. I received five cans of fry, each can containing 1,000 trout, my friend secured, if I remember rightly, about the same number of cans of fingerlings, perhaps 2,000 trout in all. Each of us planted our fish according to rule. One year later, I had a trout stream abounding in young trout from four to seven inches long, and it was maintained for several years in the same condition. It was nothing to catch half a dozen trout within a hundred yards, trout which would run from six to ten inches long. My friend's planting was not a failure, but he frankly admitted that the results were far below those which I had achieved. I had stronger, better and more fish.

I have since planted stream after stream, many of which had previously been barren or almost entirely so, and the results have invariably been very satisfactory.

Some of those who object to planting fry give as a reason that they are washed away by floods. I wish to say, and with the emphasis which comes from knowledge, that there is probably not a flood yet been found big enough to move a trout fry an inch from a spot it did not wish to leave. There is more brain power also in the heads of the little creatures than the average man gives it credit for. As soon as waters begin to rise, boil and become unduly

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boisterous, the trout fry simply slips into an eddy, behind a piece of brush, some grass or a stone and there it rests quite quietly until the waters resume their normal condition.

If with still rising waters, the spot becomes uncomfortable, the young trout moves into shallower and quieter water. Sometimes, and indeed often, in very high water, this action will carry them into meadow lands, where ordinarily the ground is above water. It sometimes happens that when the water recedes, the little creatures do not get back to the bed of the creek fast enough, and they perish; the proportion of those which escape to those which perish is vastly the greater. I had a remarkable example of the power which small trout possess in maintaining themselves against floods.

Some years ago I undertook to stock a stream for a gentleman in the suburbs of Philadelphia. There was but one good spring run flowing into the stream to be stocked, and there I planted 3,000 trout fry. The distance was perhaps a little less than a quarter of a mile. I visited the little brook every few days, and soon came to know the favorite spots. Suddenly one day there came a furious thunder storm. At the rear of the spring two streets came together, and a little groove was the remains of an old and long dried up water course. Both streets and the old water course poured torrents of nasty yellow water down over the route taken by the spring run. The little rill disappeared and in its place was a roaring stream fully fifty feet wide, and from four to six feet deep. A mile lower down on the main stream which in its normal condition was from two to three feet wide, a man and two horses were drowned.

I was young then in the business of fish planting and I had no thought of ever seeing my little fry any more. It was more than 24 hours before the little spring run resumed its normal condition, and when I went thereto, instead of a depopulated run, I found the little trout all as far as I could see in exactly the places they were accustomed to be.

The fact of the matter is that if properly planted, one need not fear the result. A stocked stream is a reasonable certainty, barring unusual accidents, such as a sudden visit of ducks or other deadly enemy of fish. The question then which is paramount is, what is the proper method of planting trout fry.

First. When the stocking of a stream is contemplated, the initial proceeding is to determine whether trout will live therein. Fortunately this is a problem easy of solution. If the usual creek minnows, particularly the striped dace, are found in the creek, it is a suitable stream for trout. The striped dace, and most of the creek minnows require almost exactly the same water conditions as brook trout. If the minnows are absent, the next step is to ascertain whether the fish have disappeared through water pollution or netting. If after becoming satisfied that the water conditions are all right, the next important rule to observe is not to plant the trout fry in the stream from which it is expected to catch them, but in spring runs which empty into it.

It does not matter how small the spring run is. The rill may only be six or eight inches wide and an inch or two deep, with here and there tiny pools of four or five inches. Indeed such a rill is often better than a run a foot or two wide and with a greater

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volume of water. Insect life is usually more abundant on a tiny rill overhung with grasses, and hiding places from enemies more effective. The trout planter should go to the very head of such a rill and scatter the fish along the whole distance, a half dozen here and a dozen there. A rill of the character described will safely hold a thousand or more trout; but five hundred would be the better number, if there are many other rills like it.

Under no circumstances should trout fry be dumped out of a can into one spot. Although if they are so dumped, the little creatures might, if they had time and opportunity, scatter themselves along the entire length of the rill, but the chances of their living to seek roomier quarters are very small, the many enemies, ducks, snakes, frogs, field mice, cats, various species of birds, and other creatures would soon make short work of them.

The fry will live and thrive in the rills until about the first of October, when they will find the water supply inadequate and move into the stream which is to be stocked and it will be found that the number which managed to get through the first and most dangerous portion of their lives, remarkably large.

It sometimes happens that there are streams in which there are no very small spring runs, and where the spring runs are themselves respectable sized streams. In that case the fry should be planted a few here and there in the back waters and out of the spots usually occupied by larger fish. When such streams are come upon, it is advisable wherever possible to plant a slightly larger supply, say one-third more than where the spring runs are mere lills

If the directions given are followed closely, there need be no fear that trout fry are too young to plant, the results will be of such a gratifying character that the great majority will prefer them to the larger but weaker and in every way less desirable fingerlings.

CAUSE OF THE DISAPPEARANCE OF BLACK BASS IN THE DELAWARE RIVER.

M. LUTHER MICHAEL.

In 1873, if I remember rightly, black bass were introduced into the Delaware river in all the upper waters. (I helped empty the cans that contained them, in Shoemaker's Eddy.) By 1876, the bass had multiplied to such extent that they afforded good rod and line fishing. They could be caught readily on the Delaware and all its tributaries not obstructed by dams and falls. For a period of 27 years, namely from 1873 until 1900, this greatest of fresh water game fishes held its superiority and sway against all enemies, including man. But in 1900 there was a perceptible decrease in the catch of bass. In 1901 the catch was even smaller. In 1902 he was a lucky fisherman that filled his creel, and in 1903, to capture a small mouthed black bass in the Delaware river was a rare occurrence.

During these years of 1900, 1901, 1902 and 1903, observing anglers noticed the almost absolute or entire absence of small fingerling

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black bass in the most likely haunts of the young bass. In the rocky eddies bordering the edges of the swift rifts, where prior to 1900 young bass existed in countless numbers, it was rare if not impossible to find a small bass, and if one was seen or caught it was invariably an old mature fish of several years of age. This in the face of protective laws prohibiting the taking of bass by all methods excepting rod, hook and line.

During these years of the falling off of the hitherto unconquerable bass the German carp made their appearance. They multiplied by thousands, and to add to their numbers a series of unfortunate accidents took place. A number of farmers in Monroe county, Pa., and in other localities had been taught from government sources, particularly from the Washington Fish Commission, that there was millions in growing carp, and hence many dams were constructed on small creeks and stocked with carp. Almost every heavy rain in my locality brought word of these dams going out, and pouring their contents into the Delaware. A large dam owned by Kerr Bros., near Stroudsburg, Pa., that contained many thousands of carp, was washed away, and carried into the Delaware.

In addition to these accidents, carp had escaped from ponds in New Jersey, and prior to their appearance above Delaware Water Gap, Pa., had taken possession of the Raritan river in New Jersey, and many other confluent streams below the Gap. When they first appeared above the Gap, they came in schools; all mature fish. They could be seen in all the deep waters containing mud banks, or deposits of decayed vegetable matter. I saw five acres behind Pocono Island in a deep cove, the bottom of which I judged was covered from three to six feet deep with carp. The time of year was November, when the first shore ice was forming. They seemed to be in winter quarters, hibernating. I have seen them everywhere on the Delaware in single pairs and numbering many thousands.

May 22d, 1903, I was interested in a shad fishery, seven miles above Delaware Water Gap, Pa., on the Delaware river. The fishery was located on the head of an island in mid-stream. The river was very low, the water in the haul being no where over five feet deep. The bottom was a solid paved cobble stone bottom, the water running swiftly over the whole course of the fishery. The first drag of 100 yard seine landed three large roe shad and six carp. The respective weights of the carp were 6, 9, 12, $16\frac{3}{4}$, $23\frac{1}{2}$, $29\frac{3}{4}$ pounds. The hauls were continued until morning , and the same ratio in numbers of the two species was maintained. These carp were taken in a fishery in which they were never taken before, showing their spreading proclivities. "The decline of the bass is contemporary with the rise of the carp in the Delaware."

We have often observed the clean habits of the small mouth black bass. He loves pure water, and fails to properly multiply in contaminated streams.

The carp destroys all other embryonic fish life in the Delaware river. The sunfish are as much affected as the bass and the "goggle eye," which in 1900, could be taken with an angle worm in goodly numbers, entirely disappeared in 1903. The horned chub and common sucker, which ordinarily spawn in the swiftest waters, alone escaped.

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All fishermen know of the paternal habits of nearly all varieties of fish making nests or spawning beds. Many of these beds show a great deal of labor and ingenuity, and we observe that each species of fish has a different method of spawning, its characteristics, its locating, constructing, spawning, caring (some fish, as the black bass jealously guarding their spawning beds), with jaw and fin.

The small mouthed black bass, when they can have a choice in locating their spawning beds, will usually choose a site near a couple submerged logs, or old sunken trees, limbs, brush, frequently between two spreading limbs or behind a rock or a shelving bar.

The bottom chosen is generally, of course, gravel, mixed with course sand, should any material be lacking, it will be found near by, and the bass will carry the necessary materials in his mouth and add them to the bed. The beds will as a rule be in calm water, placed behind an object that divides the current, or shoots the water over the bed. In a natural season, by the time the bass begin to spawn in earnest, the river declines to such an extent that the bulk of all bass beds lie in calm waters, and these calm waters are the eddies lining the sides of the stream. The carp is properly a calm water fish, for in this calm water they find their sustenance, and hence their occupying them. The accumulating sediments, mud, rich in decayed matter, they feed upon. No matter whether the mud is thick or thin, whether it lies in ridges formed by wind and current or is a sediment settling in the interstices of the stones. He is not handicapped by such obstructions for he has a peculiarly formed proboscis that he can extend out and draw in for fully two inches on more without moving his body, and further this proboscis has the power of great suction and expelling force, so that he can draw the muds in his mouth without much exertion and retain what he wants and expel any objectionable muds.

Before the carp's appearance in the Delaware river the black bass had possession of all the waters. But the carp came (not as the bass had come in the waters of the Delaware in cans of tin, midgets in size), but in bands—vast schools. They swam up and down the eddies, veritable giants in size, polluting the pure waters with their very numbers, and plowing, rooting, turning the river bottom into an unsightly mud hole, like a drove of hogs. One can imagine the consternation with which the bass must have viewed these ruthless invaders, and the despair that seized the bravest of them, when these hordes of vandals began the destruction of their old habitations.

Day after day the pollution of the crystal waters continued. True, nature occasionally had in the past and would continue in the future from heavy storms to rile the water, but this only lasted a few days at a time, and only added to the greater stamina and longevity of the bass family and made them set their houses in order as it were. Nature's riley water was not perpetual, but the carp were. So day after day the sediment falls upon the bass' spawning beds, like the lava and ashes that covered up Pompeii, and the spawn of the bass is encased in cyts of mud and smothered.

In these muddy carp befouled eddys you will see the knowing farm lads at nightfall (frequently accompanied by their elders), anchored in a batteau and running a straight pole up and down rapidly through their hands into the water, with a wad of angle worms

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tied to the smaller and bottom end of the rod. These boys and men are bobbing for eels. Prior to the advent of the carp, bobbing for eels when there had been no rains to make the river rise and riley, was unknown. The presence of the eels in such numerous quantities, attracted to the carp befouled waters from many acres of clearer water round about, make them a great factor in adding to the general ruin of the bass spawn. The eel which is more at home in mud than in water, wriggles and squirms his slimy body through the smallest aperature, greedily devouring whatever remains of the bass spawn.

So on the carp we will place this crime, for the bass are very jealous of their beds and woe to the despoiler of them who exposes his presence, and were it not for the riley waters, made such by the carp, the bass would challenge every eel approaching their bed, but the eel under cover of the riled water is secure. To establish the pugnacity of the small mouthed black bass I recite the following: June 5th, 1901, three Philadelphia gentlemen in company with myself viewed a struggle along the shores of the Delaware river in three or four feet of water between a bass of perhaps four or five pounds in weight and a three foot water snake. The battle lasted about five minutes, and would have continued longer but for the curiosity of some of the party, who wishing to make closer observations frightened the combatants, but it was conceded by all that the bass would have won out eventually and killed the snake. Later the snake was dispatched.

An examination of the bottom in the locality of the battle discovered a bass' spawning bed, over which the identical bass fighting the snake a few minutes before stood guard, as the scars, loss of scales, etc., indicated that he had been in the recent conflict.

What I desire to keep before you is the fact that the black bass held their own for twenty-seven years against all enemies, and only succumbed to fate when the carp moved on them in unison with their old time enemies, forming too powerful a combination for our friends the bass. Bear in mind also that the natural muddy waters in the Delaware is only seen when there is a freshet, and the waters high either in the river itself or some of its tributaries, and the mud sediment so injurious to the spawn of our game fish under discussion is wafted along with the current and deposited in Delaware Bay, instead of in the quiet river waters. These sediments may, before they reach the bay finally have been in many mud bank formations, and in the numerous mud and sand bars lining the stream, but when they moved on their way to the bay, step by step, by slow degrees, no matter how often they settled to the eddy bottoms, they settled permanently, until disturbed by a rise of water, and the riled conditions only last a couple of days from storms ordinarily. But carp keep the same eddy's riled for 60 to 90 days without any cessation, and during low water when there is no current to draw off the stirred up sediment, and then it happens that as fast as the sediment settles, it is re-stirred up again and again, and this is constantly serving but one single purpose, to make the water muddy and drive all other fish that prefer pure clear water to those parts of the streams where pure conditions exist, but the conditions outside of the pure water itself is uncongenial and unsuitable to the best welfare and complete propagation of bass. Further it is

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a natural inference that inasmuch as the bass prefer moderately quiet waters (in which there are quantities of vegetation, grasses, weeds, etc.), in close proximity to their beds, or at least skirting the waters near their beds, that their young at a very early stage of their existence must depend for their subsistence upon minute larvae and diminutive breeds of amphibious creatures that thrive among this water vegetation.

I have noticed that where certain eddies abounded a few years ago in several varieties of water plants, in the nooks and small coves, and where the mating bass could be found in quantity every May, with numerous spawning beds, not only have the bass entirely disappeared from these choice black bass spawning grounds, but these various species of plant life thriving so luxuriently in the same waters practically have entirely disappeared, and I believe these plants to have been destroyed through the constant mud in the water not permitting the sunlight to stimulate them, or that the carp uprooted the plants and used them for food. Certain it is, that these plants held their own until the carp came and that with the disappearance of the bass these plants simultaneously disappeared from their favorite waters.

EXPERIMENTS IN REARING BLACK BASS.

BY WILLIAM BULLER.

By request of Hon. W. E. Meehan, I will give the following report of my limited experience in bass culture, having begun the work in 1899. I was instructed by Mr. Meehan, who was at that time secretary and statistion for the Pennsylvania Fish Commission, to begin the raising of small mouth black bass. I was ready and willing to do my best, and had it not been for my time being almost fully occupied with trout work, I would have been able to give the bass work closer attention.

Notwithstanding misfortunes which will be mentioned later, I feel we have been reasonably successful. In the first place we were somewhat limited for space, as we did not have the additional ground which has since been purchased.

I decided to convert several abandoned trout ponds which when located in the deer park, into my idea of what was necessary, as near as possible for the breeding work. These were as follows: two ponds twelve by thirty feet, with race at upper end eight by twenty-four feet; depth of water in race being eight inches and in pond three feet. The bottoms were covered with four inches of loose gravel. The ponds were so built that there was a drop of two feet from one pond to another. I placed a water-tight gate with slide to regulate the flow of water and raise or lower the temperature when needed.

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When we had completed the work of construction, I secured seventy-eight mature black bass, taken from Lake Erie, which were placed in the ponds. Although by this time it was past the spawning season, I considered it advisable to secure the fish to be prepared for work the following season. This could have been deferred until spring, but I have found better success with fish which have become accustomed to their surroundings. They become domesticated, and naturally better results follow.

I began feeding the bass with tadpoles which I was fortunate to have on hand, giving them about one pint three and four times a week. I would also cut up dead fish and feed to them. I tried to feed them beef liver at different times, but they refused to touch it. They did nicely with the food they received during the winter, and were in a healthy condition in the spring when they entered the race which was graveled and began to make nests. Whether male or female I could not tell, as at this time they are very timid, and on account of a great many visitors to the hatchery, they were frequently disturbed.

After the nest was completed the male and female, whichever it was would leave and return with a mate. I felt certain that they spawned and removed the fish to another pond, which I have since learned was a mistake, having no young bass to show for my work. By leaving the parent fish in the pond they remain on the nest and by motion of the fins and tail they keep the spawn free from sediment which would smother the eggs.

The following winter I lost all of the breeding fish, and it still remains a mistery what has become of them, but they gradually disappeared. Thinking probably they were hiding in the grass on the bottom, I drew the water from the pond, but much to my surprise and disappointment there were not any fish to be found, alive or dead. It could be possible minks or coons had carried them off.

Thus far my bass work had been a failure. It takes time to experiment in this work, and one almost gives up in despair, but you finally decide on another plan and start out with hopes for better success. I secured some more breeding fish, which I placed in what was formally my carp pond, which is oval in shape, forty by seventy feet, depth of pond in centre four feet, the water being shallow around the edges of pond, which are thickly grown in places with cat-tails, pond lillies and water grass. The open spaces were heavily graveled and upon this they made their nests. I retained the large fish in pond after they had spawned. Late in June to my joy and satisfaction, I discovered the pond full of little fish. I felt more encouraged. I could not give very much attention to the work at this time on account of shipping trout fry, which keeps us very busy, so I left the small fish remain in the pond until fall without feeding them, as the pound was well supplied with water plants, furnishing plenty of food for them. The large fish as before were fed on tadpoles and dead fish. When I drew the water from the pond in the fall, I did not have the amount of young fish expected, but was able to fill a few applications.

One disadvantage in raising bass is that they are of a voracious nature. Even though sufficiently fed they will devour each other. To illustrate their habits, my brother, who has charge of the Erie Station, put four thousand fry into a pond ranging in size from

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one inch to one and one-half inches in July. They took the food readily a few days after being put into pond. They were fed on beef liver ground up, also fish prepared in the same way. He noticed they took the food more readily when not cut so fine. They will take food every few hours, yet it was plainly seen they would prey on each other.

During the time they were in the pond there were not more than fifty dead fish taken out, and no possible chance for them to escape. Out of the four thousand there were only two thousand seven hundred fish left to be shipped. In three months time they devoured twelve hundred and fifty fish, besides the food given them, which averaged about four pounds of liver and fish ground every day. When the fish were shipped they were from three to three and one-half inches in length.

The Fish Commission purchased a tract of land adjoining the hatchery grounds. As soon as they had possession I began to construct three large bass ponds. They are about five feet deep at one end and shallow at the other. I put five inches of gravel on the bottoms and planted water plants. The spawning fish were placed in ponds in the fall. Before spawning time began in the spring I placed a number of boxes in one pond built on the same plan as those used by the Michigan Fish Commission, for the fish to build their nests in. I had fine and coarse gravel in the boxes for them to work upon, but I could not see any of the fish working in the boxes, and I have my doubts as to their using them. The two ponds without the artificial nest boxes were alive with small fry. This leads me to think I have my ponds properly constructed, and that the fish prefer building their nests to their own liking.

When I discovered the ponds filled with small fish, I felt well satisfied with the results. They worked around the shallow parts of the ponds and around the plants. It was my intention to remove the large bass in a few days after noticing the fry, but before I could find time to attend to it, there was an unusual heavy rain, causing a large amount of surface water to flow into the ponds from the hill resulting in the ponds overflowing carrying away all the fry which were many thousands.

I now have a large ditch along the north side of the ponds to carry off any surface water in the future.

I know it is possible to hatch the fish in large numbers and hope we will not meet with any misfortune this coming season. There are many things to be learned in raising the fry, but it is my opinion the fry should be kept in large ponds, well supplied with water plants, as they furnish food for them to feed upon. It also affords them hiding places, which are a protection from eating each other. I hope to be more successful in the future.

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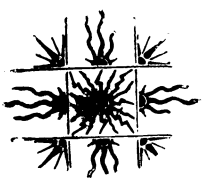

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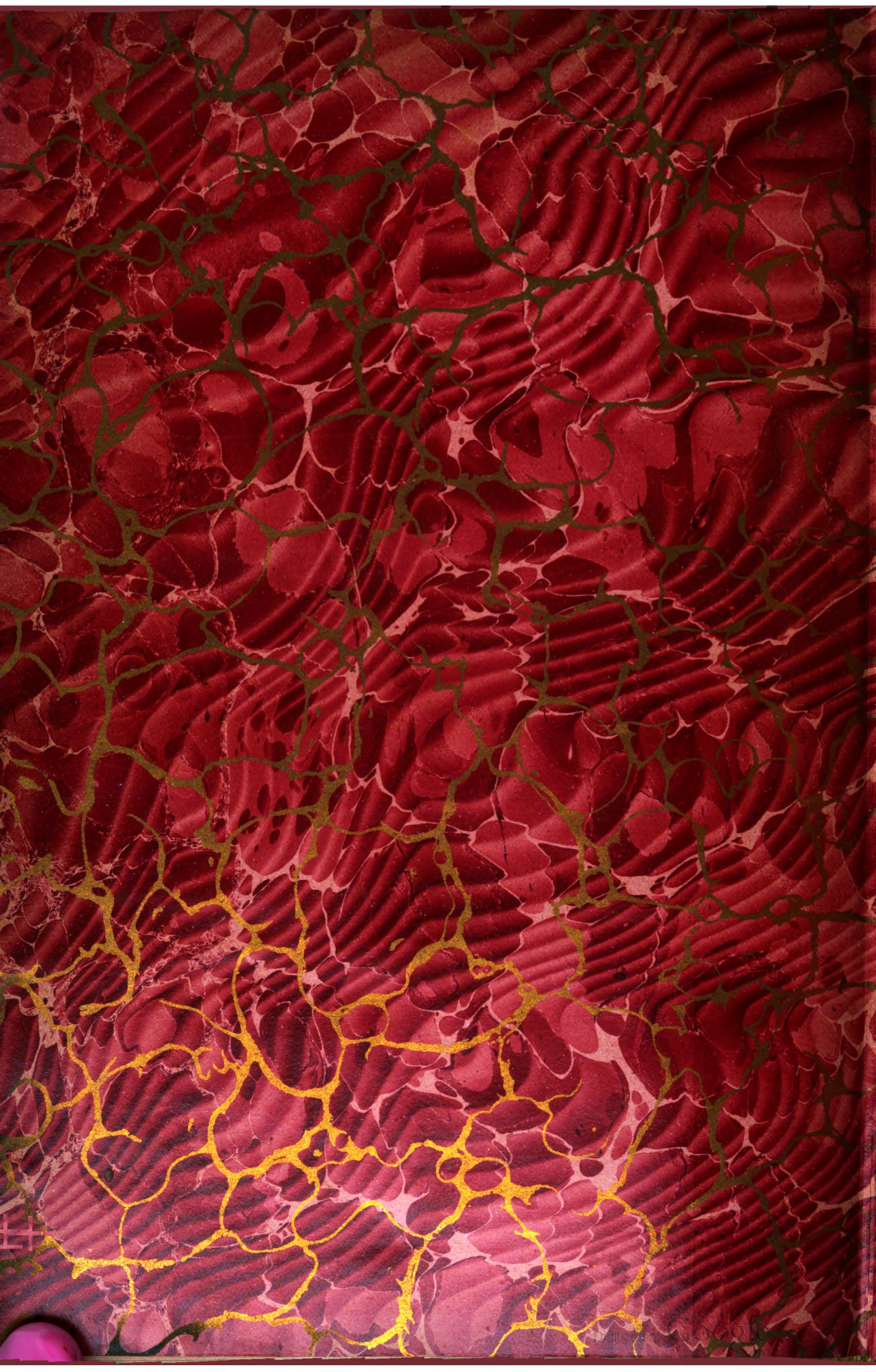

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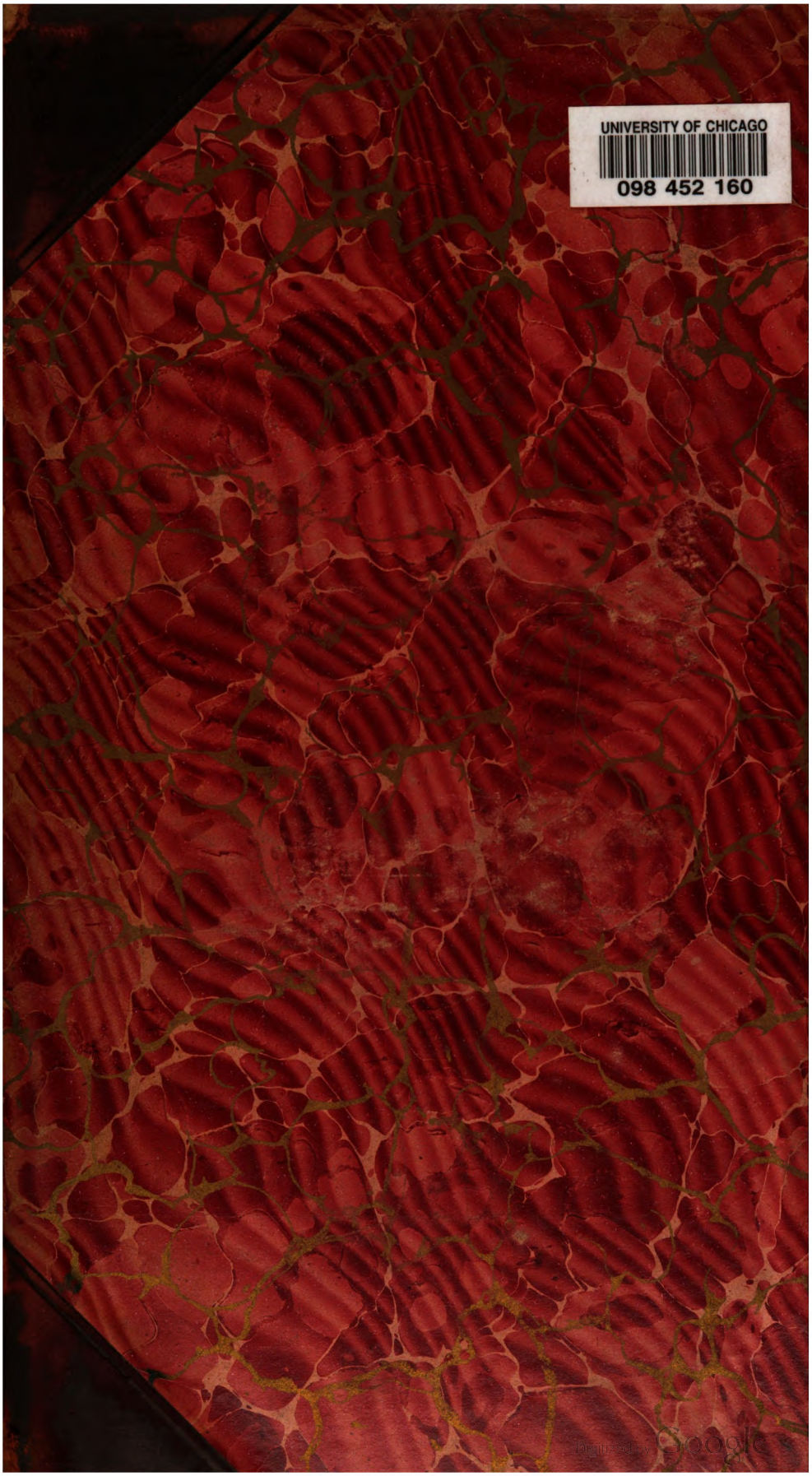
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