TRANSACTIONS

OF THE

AMERICAN FISHERIES SOCIETY

1883

FISHCULTURE IN MICHIGAN.

BY HOYT POST.

In this year of reminiscences, it may not be amiss to briefly review the work done in fishculture in Michigan. The record of this work is found in ten biennial reports of the State Fish Commission. This record, presumably like that of other States, shows some blunders, frequent mistakes, and many sad disappointments; but by persistence, energy and pluck, the blunders were overcome and the mistakes corrected, and the disappointments were borne with that Christian resignation which is a characteristic of the craft. As an illustration of this spirit of resignation, a quotation from the Second Report is in point. It says: "Now what is our lake and river farmer to do about it, when accident and insuperable force so confront him? What can he do more than did the honest Dutchman who, when he broke his leg, thanked the good Lord that it was not his neck. Few mortals, if any, can create circumstances, and the fishculturist's work, like all other human work, must take its chances."

The outcome has been a steady and continuous progress, resulting in a fair degree of success.

The Board of Fish Commissioners of the State was established by an act of the Legislature approved April 9, 1873. At this time seventeen other States had embarked upon the work.

The first Board of Michigan consisted of the Governor and the two appointed members, who were to hold office until the expiration of the next regular session of the Legislature. Their duty was stated to be "to select a suitable location for a State fish breeding establishment for the artificial propagation and cultivation of whitefish and such other kinds of the better class of food fishes as they may direct, upon the best terms possible." They were required to appoint a Superintendent of Fisheries of the State, and

to supervise generally the fishing interests and secure the enforcement of all the laws relating to the protection of fish and fisheries in the State. The fact that the whitefish was the only one specifically named in the organic act indicates the regard the people of the State had for this fish, and it has been often since cited as an argument against any neglect of that branch of the work.

The Governor at the time this legislation was enacted was Hon. John J. Bagley, of Detroit, whose interest and appreciation of the work had much to do with the passage of the law, as well as with the public interest in the subject and the early success of the Commission. His associates on the first Board were Andrew J. Kellogg and George Clark, the latter of whom had an experience of almost half a century in catching whitefish in the waters of the State.

The first Board was singularly fortunate in securing as Superintendent the enthusiastic and untiring George H. Jerome, whose spicy and vigorous contributions to the literature of the subject contained in the early reports of the Commission have won the admiration of each succeeding Board and of every appreciative reader.

The salary of the Superintendent was limited by the act to twelve hundred dollars, but the meagreness of the compensation did not hinder this enthusiast from giving to the work all the energy and ability he possessed. He was the life and spirit of the Board so long as he retained his place.

The following words from the First Report of the Commission are deemed worthy of quotation: "The water world, subject year by year to new discovery and to a larger development, may be implicitly relied upon in the years to come to contribute a much larger quota of food than at any pre-existing period. This, as viewed from the fishculturist's standpoint, is believed to be not merely possible, but highly probable. Indeed, this is the fish prob-

lem, nothing more, nothing less; and to the solution of this problem the veteran band of fishculturists, with the appliances at hand, and with a will and courage equal to every conceivable emergency, have gone to work, resolved not to lay down their tools till every promise of theirs is redeemed and every prophecy fulfilled."

The appropriation for the first two years was seventy-five hundred dollars a year. With this fund the Commission established a State hatchery at Crystal Springs, Pokagon, Cass County, on the Methodist camp-meeting grounds, and built a hatchery 20 by 60 feet, one story high, with a roomy attic, and a small residence for the overseer. The earlier efforts of the Commission were devoted somewhat to the propagation and planting of several kinds of foreign fish—the Atlantic salmon, the land-locked salmon, the California salmon and the shad; and we are constrained to believe that much faith and enthusiasm, as well as labor and money, was wasted in the effort to acclimate these foreigners to the waters of Michigan. The whitefish, however, was never overlooked or neglected.

The first plant of whitefish was in the spring of 1874, and it exceeded a million and a half, which was greater than the plant of all other kinds. These whitefish were hatched at the hatchery of N. W. Clark, at Clarkston, Oakland County.

In the spring of 1875, there were hatched at the State hatchery at Pokagon about 150,000 whitefish, and about two millions were bought of N. W. Clark & Son, of Northville, at the price of one dollar a thousand. The plant was upwards of twenty-two hundred thousand.

In the fall of 1876 a small whitefish hatchery, 20 by 50 feet, was built on a leased lot near the water works on Atwater Street, in Detroit, and the experiment tried of using the city water. Oren M. Chase was put in charge of this hatchery. The hatching was done at first in the Holton

hatching-box, for the use of which a royalty of $100 a year was paid.

In the spring of 1876 nearly ten million whitefish were hatched, and the plant in Michigan was nine million three hundred and ten thousand.

The rather boastful mention of this then unparalleled hatch in the Second Report of the Commission is somewhat amusing in the light of what is now being done in that line.

In the organic act provision was made for co-operation with other States contiguous to the waters of Michigan, which should make appropriations for the work and express a desire for joint action; and in the report of 1876 mention is made that several of the States bordering upon the Great Lakes, notably Ohio, Wisconsin and Minnesota, "have got sharply to work upon the whitefish."

The planting of salmon trout was begun in 1875, when one hundred and fifty thousand fry were purchased of N. W. Clark & Son, at the price of two dollars a thousand, and planted in the inland lakes of the State. The work on the Atlantic, the California and the land-locked salmon continued through the seasons of 1875 and 1876. In the meantime, Eli R. Miller, of Richland, had succeeded Governor Bagley as Commissioner, and was made President of the Board, the statute having been so amended as to provide for three Commissioners, one for two years, one for four years and one for six years, and their successors to be appointed to a term of six years each. The appropriations for 1875 and 1876 were seven thousand dollars for each year. Twenty-two States were at this time more or less actively engaged in fishculture.

In 1877, the whitefish plant exceeded eight millions. Some experiments were made in hatching the herring and the German whitefish. In the Third Report the Commission congratulates itself that while it had paid a dollar a thousand for hatching whitefish, it now was producing

them at a cost of not to exceed ten cents a thousand. The Chase automatic jar, an invention patented by Oren M. Chase, had now taken the place of the hatching-box, and was the means of greatly cheapening the production.

The hatching of lake trout and of California salmon and land-locked salmon was continued through the years 1877 and 1878, and experiments were made with the grayling, though with indifferent success. In 1877 the planting of eels was first inaugurated. They were taken in the Hudson, near Troy, and transported in cans.

In the Third Report the Superintendent concludes the California salmon is too large a fish for the great bulk of the inland lakes, and should be planted mainly in the rivers emptying into the Great Lakes. The brook trout work commences about this time at the hatchery at Pokagon, the take being from two to three hundred thousand eggs.

On October 14, 1877, George Clark died, and was succeeded by Dr. Joel C. Parker, of Grand Rapids, who continued as Commissioner by successive appointments until January 1, 1893. He held the office of Commissioner continuously longer than any other member, and gave much valuable work and thought to the subject of fishculture.

The appropriations for the years 1877 and 1878 were seven thousand dollars a year. Twenty-eight States were now engaged in fishculture. The plant of whitefish for 1878 reached the figures of upwards of twelve and a half millions, and for 1879 upwards of fourteen and a half millions. During these two years the work on California and land-locked salmon and trout and eels continued, and two new varieties, the German carp and the California or rainbow trout were introduced.

The appropriations for the years 1879 and 1880 were cut down to five thousand a year. On July 1, 1879, George H. Jerome resigned as Superintendent, and was succeeded September 15, 1879, by James G. Portman, of Watervliet,

Berrien county, and the only one of the old employees retained was Oren M. Chase, who had been overseer of the Detroit hatchery from its start.

Up to this time a considerable plant of whitefish fry had been made each year in several of the inland lakes of the State. No extensive reports of the favorable results of such planting coming to the Commission, the planting was thereafter confined to the Great Lakes and the rivers and straits connecting them, and such interior lakes as contained native whitefish; and thus another undoubted mistake was corrected. The Commission becoming convinced that the brook trout was capable of a much wider range throughout the State than was formerly supposed, began to give additional attention to raising and distributing this popular fish. The Fourth Report bravely suggests that not less than a million brook trout fry should be hatched yearly for Michigan streams.

A few black bass were hatched and planted, and some experiments made in hybridization. Renewed efforts were also made to accomplish something for the grayling, but without success. '79?

About this time the few remaining adult California salmon were turned loose; his exit was preceded by that of the Atlantic salmon, and his by that of the shad, and thus was another mistake corrected. The land-locked salmon struggled along a few years later, but his name has since been stricken from the list.

In the summer of 1880, the Detroit hatchery was remodeled, and the last of the Holton boxes discarded and their places supplied with the Chase jars, giving a total of three hundred jars and a hatching capacity of more than thirty million whitefish fry. Six of these jars were exhibited by Prof. Baird at the International Exposition at Berlin, and Mr. Chase secured the "golden medal of honor" for the invention. About this time the trout and salmon in the ponds at Pokagon began to sicken and die,

and an analysis of the water demonstrated that it was not suitable for the trout work; and thereupon ground and water was rented at Boyne Falls, where through the liberality of Hon. Thos. S. Cobb, of Kalamazoo, a temporary hatchery was located. After one season's use, however, the dam was carried away by a freshet and the hatchery abandoned. The carp were retained at Pokagon for a while, but were soon after removed to Glenwood, where the carp hatchery has since been carried on under the supervision of Mr. Worden Wells, in ponds belonging to him, and with unvarying success.

The whitefish plant for 1880 was ten million six hundred and ninety-five thousand, and for 1881 only three millions. The cause of the falling off was the difficulty in procuring the ova on account of storms, and the failure of the Detroit river fishery, where the fish had theretofore been obtained. About this time the methods of securing the ova were much improved under the suggestion and experiments of Oren M. Chase, who found it feasible to retain the fish in small crates through which the water flowed freely, and to handle the fish from day to day, and take the eggs when ripe, thus making a great saving of the eggs and resulting in but trifling injury to the adult fish.

In July, 1881, the trout station at Paris, Mecosta county, was located on Cheeney Creek, and about 40 acres of land and the meander of the creek 15 rods wide across 120 acres more were purchased.

Here in the early fall of that year was built a trout hatchery 20 by 60 feet, a dwelling house and barn; and the hatchery and ponds at Pokagon were abandoned.

The principal trout work of the State has been conducted at the Paris station ever since without any serious drawbacks. The work, however, has now about reached the limit of the water supply, and one neighboring stream

has already been brought over in pump logs, and it is contemplated doing the same with another.

The whitefish plant of 1882 was upwards of eighteen millions. That spring, the experiment was first made with the wall-eyed pike, and a plant was made of eleven hundred and twenty thousand.

The Board had some difficulty with Superintendent Portman, and in September, 1882, he was succeeded as Superintendent by Oren M. Chase. Mr. Chase served until November 11, 1883, when he was drowned in Little Traverse Bay, while in the performance of his duties, sacrifing his life in his zeal for the work. Walter D. Marks was then made acting Superintendent until March 26, 1884, when he was regularly appointed Superintendent, and continued to act in that capacity until the early part of 1893, when he resigned. Mr. Marks was an early pupil of the veteran Seth Green, and was a man of large experience in handling the breeding fish. He was full of resources and always found some way out of every difficulty that beset his work.

January 1, 1883, Eli R. Miller retired as Commissioner at the expiration of his term, and John H. Bissell, of Detroit, was appointed his successor. The work had reached a somewhat low ebb at this period and needed just such an energetic, thoughtful and practical man as he proved to be, to give it a new impulse. It is no disparagement of any one else to say that Mr. Bissell is entitled to as large a degree of credit as any one for such success as the Michigan Fish Commission has attained.

The appropriation for 1881 was eight thousand dollars, and for 1882 seven thousand five hundred dollars. In the fall of 1883, the work of obtaining accurate statistical information as to the amount and value of the commercial fisheries of the State was commenced in a small way. The whitefish plant of 1883 was twenty-three million seven hundred and thirty-five thousand, and that of 1884, thirty-

seven million seven hundred and fifty thousand. The brook trout plant of 1883 was two hundred and sixty-nine thousand, and that of 1884 was three hundred and fifty-three thousand.

In the Sixth Report it is again urged that there ought to be hatching-house room sufficient for at least a million brook trout. In 1883 a new site was chosen at the corner of Joseph Campau avenue and Lafayette (now Champlain) street, for the Detroit whitefish station. This site is 100 feet square. The lots were rented, and a hatchery 40 by 80 feet built with a shop and barn 30 by 46 feet in the rear along the alley. This building cost about fifty-six hundred dollars, and was equipped entirely with Chase jars. It held 812 jars, with a hatching capacity of about forty-two million whitefish eggs. About this time more land was purchased near the trout station at Paris, and the ponds increased and grounds much improved.

In August, 1883, a whitefish hatching station was established at Petoskey, upon leased grounds, but for various reasons, principally connected with the condition and quality of the water supply, this proved another mistake, and a somewhat costly one, too. Without going into detail, suffice it to say that this hatchery, after being used two or three years, had to be abandoned. As early as 1883, a movement was inaugurated towards the establishment of a whitefish and trout hatching station upon Lake Superior, but it did not result in anything tangible until several years later.

In October, 1883, a meeting was held at Detroit of the Fishery Commissioners of the States bordering the Great Lakes, upon invitation of the Michigan Commission. Commissioners attended from Minnesota, Wisconsin, Ohio and Michigan, and a representative of the United States Fish Commissioner was present. A movement to secure uniformity of legislation led to the consideration of the subject of Federal supervision of the fisheries of the Great

Lakes. At the request of the Michigan Fish Commission, Mr. Otto Kirchner, then Attorney-General of the State, examined the authorities and presented an able brief to the point that the Federal Government had no jurisdiction of the subject, and that such protection as we had must come from the authorities of the several States. This conference was productive of much good feeling, and undoubtedly helped on the work of uniform legislation of the several States bordering the Great Lakes for the protection of the fishing interests.

In February, 1883, a Secretary of the Board was appointed for the first time. Herschel Whitaker was appointed and served until June 1, 1884, when he resigned and Andrew J. Kellogg succeeded him. Mr. Kellogg served until March 20, 1888, when he was succeeded by George D. Mussey, who has served ever since. On the resignation of Mr. Kellogg as Commissioner, to take the appointment as Secretary, Mr. Whitaker was appointed Commissioner in his place, and has continued in office to the present time. The combination of Mr. Whitaker, Mr. Bissell and Dr. Parker made a strong Board, and from this time on a new impetus was given to the work. The business was organized and the work classified and systematized as it never had been before. Through their influence larger appropriations were obtained and the work extended in every department.

The Commission in 1884 obtained control of one of the fisheries on the Detroit river, and this policy has been extended until now they control all the fisheries on the American side of the river.

The Sixth Report sums up the condition of fishculture in 1884 as follows: "The present aspect of this subject is far different in many respects from what its advocates and promoters of ten or more years ago believed it would be at this time. The general enthusiasm of the early movement as it seized upon the naturalist and sportsman

of ten or fifteen years ago in the blush of its first successful experiments has not entirely faded away, but has ripened into a deep conviction on the part of an ever-increasing number of intelligent men, that fishculture has solved one half of the question, Can the fisheries be preserved? and has now settled down upon business-like principles and methods to do its part. The other half of that question must depend for its answer upon wise measures for protection. This is true of almost every State and Territory in the Union." The appropriations for 1883 and 1884 were ten thousand dollars for building and equipping new stations, and ten thousand dollars a years for current expenses.

In August, 1885, Mr. Lyman A. Brant was appointed statistical agent for the Board and visited all the commercial fisheries of the State, and made a full report in writing of his work, which was much the best of its kind that had thus far been done, and afforded the Commission much needed information.

The whitefish plant for 1885 was forty millions, and for 1886 was sixty-one million six hundred and twenty thousand; a few Loch Leven trout were planted and the plants of California trout were continued, but the adult fish did not do well in the stock ponds, and many of them were liberated. Further experiments with the grayling were continued; a large portion of a grayling stream was stocked with them and barriers erected to prevent their escape, and every inducement provided for them to spawn in a semi-wild or natural state, but the experiment was a failure. Additional ponds were built at the Paris station and the grounds otherwise improved by grading and sodding. Further agitation was given to the question of the Upper Peninsula whitefish station. A scheme of systematic examination of all the inland waters of the State seriatim was inaugurated. For this purpose a double crew of men was sent into the field, and charts of each lake examined

were made and filed in the office, to be bound in books. These charts contain a rough sketch of the shape of the lake, give their name and location, dates of examination, kind of bottom and shores, temperature at top and bottom and surroundings, number and kinds of fish caught and how, their condition and what feeding upon, the kinds and condition of fish food in the water, and recommendation as to kinds of fish to plant. This work has been continued each year until at present there are complete records of upwards of four hundred lakes which have been examined, the reports of which are bound together in volumes indexed and easy of reference. These volumes are consulted in passing upon applications for fish plants in the waters.

The capacity of the trout hatching house at Paris has already reached a million and a half, and a new house is recommended to increase the capacity to three and a half millions.

The hatching and planting of whitefish, brook trout, lake trout, wall-eyed pike, carp, Loch Leven trout, landlocked salmon and California trout was continued through the years 1887 and 1888. In 1887 the first plant of German trout was made, and the rearing of this fish has been continued ever since and much increased in later years. It seems to thrive in Michigan waters and has every appearance of being a hardy and a vigorous importation.

In 1887 a new additional trout hatching house 40 by 82½ feet was built at Paris, at a cost of about $4,000 for the house and fittings. The old hatching house was dismantled, but remains standing and is used for a store house and shop. It is capable of being restored and put in commission again on short notice and at small cost, if needed. The capacity of the Detroit whitefish house was increased by the addition of the jars removed from Petoskey, so that it now contains 525 jars, which would hatch eighty to ninety millions of whitefish a year.

In 1888 the Commission had a car built for transporting fry and fish. It is over 55 feet long and substantially built, with passenger coach trucks, air brakes, platforms, coupler and buffers, so that it can be easily hauled in any passenger train. It has an office at one end and a kitchen at the other, and is fitted with five berths, enabling the men to live and sleep on the car. Its capacity is 175 cans. It is named "Attikumaig," the Chippewa name for the whitefish, meaning literally the "deer of the water." This car has proved a great convenience, and has been the means of cheapening the distribution of fish and fry. It has been in continual use from February till the latter part of June of every year since it was built. The plant of whitefish in 1887 was seventy-two million nine hundred and eighty-four thousand, and in 1888 about the same number. The brook trout plant in 1887 reached one million, and in 1888 was over a million and a half. The wall-eyed pike plant of 1887 was three million two hundred and eighty thousand, and in 1888 eleven million four hundred and ninety-two thousand.

Mr. Bissell's term of office expired January 1, 1889, and Hoyt Post, of Detroit, was appointed his successor. On March 20, 1888, Mr. Kellogg resigned as Secretary, and the present Secretary, George D. Mussey, succeeded him.

In 1888 and 1889, the Secretary made trips of investigation of the fisheries and filed written reports, which are printed in the biennial reports of the Commissioners. In January, 1890, Mr. S. C. Palmer continued this work on a more extended scale. During the years 1891 and 1892, Mr. Charles H. Moore engaged in similar work for the Commission and obtained complete reports of every fishery in the State, his work being as complete as could be made. Experiments were made in hatching sturgeon eggs, and a few were successfully hatched. A successful hatch was also made of the eggs of white bass. These eggs are very small and hatch in about forty-eight hours.

Subsequently larger quantities were successfully hatched in the Chase jar.

The Commission has made several fish exhibits, embracing nearly all varieties of native fish, at the State Fair and the Detroit Exposition, and elsewhere. These exhibits were comparatively inexpensive and were very attractive, and proved valuable aids in disseminating knowledge of fish and fishculture. The Report of 1890 was the first illustrated Report issued. It contains cuts illustrating the hauling of the seine, and the stripping of fish, and interior and exterior views of the hatcheries, and of the ponds and grounds at Paris, which added much to the attractiveness of the Report.

Some attention now began to be given to scientific work, and Prof. Jacob Reighard, of the University of Michigan, began his investigation of the development of the wall-eyed pike. The motive that first led to this investigation was the discovery of the cause of the large percentage of loss in hatching the eggs of this fish, as compared with those of the whitefish. He made extended microscopical examinations and accompanied the men in the field and followed the eggs to the hatchery and watched their development and hatching. He reduced his observations to writing, furnishing an article of upwards of 60 pages, with microscopical drawings, which was published in the Ninth Report, with plates and drawings. This article is regarded as a most valuable contribution to the literature of fish-culture and has been in great demand. Prof. Reighard also conducted like experiments with whitefish eggs. He also accompanied the crews for examination of waters with his microscopes and an assistant and a botanist, and made quite extensive examinations of the fish food and aquatic plants, and incidentally of some fish parasites. He also prepared a still more elaborate article on the development of the embryo of the wall-eyed pike, covering about eighty pages, which with the plates illustrating it are pub-

lished with the Tenth Report. He is at present inaugurating some experiments connected with the food of the whitefish, and its life and abundance, and when and how distributed, which it is hoped will be of value in determining the proper places for planting the whitefish fry. It is designed to make this examination as careful and exhaustive as the means at hand will allow, and it is planned to interest the authorities of the University of Michigan, to co-operate with the Commission in extending work of this scientific nature from time to time. No work of the Commission has attracted wider attention among intelligent readers than the work already done by Prof. Reighard.

A boiler and pump were added to the Detroit hatchery for use in case of an emergency causing the stoppage of the flow of the city water, such as had been once or twice experienced. By this means the water in the storage tanks could be on short notice pumped up into the troughs which feed the hatching jars and keep the water circulating through the eggs until the stoppage of the regular flow of the city water ceased. The storage tank capacity of the hatchinghouse was also nearly doubled by enlarging the wing of the building.

In the summer and fall of 1889, the efficiency of the Detroit whitefish hatchery was doubled by the erection of two additional frames of jars, which increased the number of jars in place to one thousand and fifty, with a hatching capacity of nearly two hundred millions; but the difficulty of obtaining sufficient ova to fill the jars prevented for a year or two reaping the full benefit of the increased capacity. The whitefish plant in 1889 was sixty-three millions, and in 1890 one hundred million seven hundred thousand. The wall-eyed pike plant of 1889 was forty-four million three hundred and forty thousand, and in 1890 twenty-two million three hundred thousand. The brook trout plant of 1889 was two million four hundred and sixty-

eight thousand, and in 1890 two million five hundred and seventy-eight thousand. The appropriations by this time had increased to upwards of twenty thousand dollars a year, and the inventory of the property of the Commission showed a valuation of upwards of thirty-five thousand dollars.

The Tenth Report covers the years 1891 and 1892, and is a substantial volume of 228 pages. In the fall of 1891 a small hatchery for whitefish, lake trout and brook trout was established at Sault Ste. Marie, containing 200 jars, besides such hatching troughs as the space in the building would admit. The city paid the rent of a small store building in which this hatchery was set up, and furnished city water free. This hatchery was run during the seasons of 1891 and 1892, but owing to difficulty and disappointment in procuring whitefish ova, was not filled until 1892. The purpose of a whitefish hatchery on Lake Superior, was to provide for stocking that great lake; the hatch at the Detroit house coming too early to be planted on account of the ice in the harbors.

It was thought that the difference in the temperature of Lake Superior water would retard the hatch about two or three weeks, which proved to be the fact. The water at the Sault proved admirably adapted to the work, both of hatching whitefish and brook trout. The temperature of the water is remarkably even and cold. It began November 15, at 42°, and for the month ensuing varied from 42° to 38°, and about January 1, ran down to 34°, where it remained without variation to exceed one degree either way until April 20, and from then until May 15 it did not go above 40°. A daily record of the temperature of the water is kept at each station while in operation.

The appropriations for 1891 and 1892 exceeded $27,000 a year, and those just granted for the years 1893 and 1894 are $25,000 a year. The inventory of the property has increased to nearly $38,000.

Never till the fall of 1892 had the Detroit hatchery been completely filled with eggs. In that year the Commission controlled all the fisheries on the Michigan side of the Detroit river, and instead of letting them out to others to fish, hired the fishermen and absolutely controlled and directed the fishing.

Through the energy, persistence and skill of the Superintendent, W. D. Marks, in conducting this work, more fish were caught and more eggs taken than had ever been before. The total number of whitefish caught was 13,074, the total eggs taken was 4,544 quarts or 142 bushels, making 173,630,400 eggs. It was a beautiful and inspiring sight to look upon the tiers of jars in the Detroit house, more than a thousand in number, all filled and in active operation. It is a sight never equalled elsewhere and but once there.

The whitefish hatchery at Detroit is undoubtedly the largest, best arranged, best equipped, most economical and most efficient in the world. No other has begun to compete with it in out-put. And there are few, if any, brook trout hatcheries that excel the one at Paris.

The whitefish eggs are placed in the jars in November and December, and remain from 130 to 140 days, or until March and April, before they hatch; and the fry are no more than out of the way before the same jars are filled with the eggs of the wall-eyed pike, which are placed in the jars in April and May, and hatch in 28 or 30 days, coming out the last of May and first of June.

It has been the habit of the Board for the past few years to hold regular monthly meetings and such special meetings as may be found necessary, and full records are kept in writing, in bound volumes, of the proceedings, including everything of interest in fishculture which comes to the attention or knowledge of the members from time to time.

Full books of account are kept of all the money transactions. All payments are by checks signed by the member of the auditing committee who certifies to the account, and vouchers in duplicate are taken for all payments. William A. Butler, Jr., of Detroit, has been Treasurer of the Commission since about 1883.

Bound volumes are kept of the statistical reports and examining crews. All applications for fish are in writing on printed blanks furnished, which describe the location and character and temperature and soundings of the water, and the surroundings where it is proposed to plant the fry.

In January, 1893, the term of Dr. Parker expired and Horace W. Davis, of Grand Rapids, was appointed his successor.

In December, 1892, an International Fish Conference was held at Detroit, under the auspices of the Michigan Commission. There were present Samuel Wilmot, of Ottawa, Canada; Edward Harris, of Toronto; Thomas Marks, of Port Arthur; and W. S. Wells, of Chatham, Ontario, and members of the Fish Commissions of New York, Ohio, Minnesota, Maine, and many others from different States, including some fishermen. The subjects discussed were connected with uniformity of legislation protecting fish and game, and more particularly the vital question of a close season for the commercial fish. The main results of the meeting were embodied in a report of a committee which was adopted as follows, viz:

"1. That all small fish and others unfit for food of all kinds, when taken in nets, should be replaced in the waters when taken alive; that fishermen should not be allowed to take such fish on shore nor expose them for sale.

"2. That no strings of pound nets used in the lakes shall extend more than four miles from shore.

"3. That one-half part of all channels between islands or elsewhere—where fish migrate to spawn, shall be kept free from nets of all kinds at all seasons.

"4. That all whitefish taken of less than sixteen inches in length, and all salmon trout less than two pounds in weight, shall be immediately returned to the waters where taken and shall not be exposed for sale.

"5. That the month of November in each year be made a close season for whitefish, herring and salmon or lake trout.

"6. That all penalties fixed for violation of any laws that shall be enacted shall be made not only to apply to those who take fish, but also to all persons who buy, sell, transport or have the same in possession."

The following resolution was also passed, viz.:

"*Resolved*, That the law should authorize the seizure and destruction of nets used in violation of law."

Throughout all the ten reports of the Commission are frequent acknowledgments of courtesies and exchanges with the Commissions of other States, and especially with the United States Commissioner, to whom the Michigan Commission is under many and acknowleged obligations for continued favors and grants of eggs and fry, and fish of varieties that could not be elsewhere procured.

The Michigan Commission would be guilty of gross ingratitude and lack of appreciation if it ever permitted any account of its work to go forth without due acknowledgment of its obligations to the railroads of the State, without whose aid, given for the asking and without stint, it could never have accomplished anywhere near what it has.

Ever since the organization of the Commission it has at each legislative session given much time and attention to procuring the passage of proper protective legislation to preserve the fisheries; but it seems much easier to get legislation through to propagate fish than to lay any restrictions upon the catching. As against any such restrictions an active and not over-scrupulous lobby always appears on the scene, and cries out about the ruin and destruction of

their property and investments, and who ever knew a legislature that was proof against such a plea.

Appended to this article is a complete table of the totals of all plants of fish of all kinds that have been made by the Michigan Commission, taken from their Tenth Report:

TOTAL PLANTS OF BROOK TROUT IN FOURTEEN YEARS.

1879	12,000	1886	719,000
1880	50,400	1887	1,090,000
1881	388,500	1888	1,639,000
1882	251,000	1889	2,468,000
1883	219,000	1890	2,578,000
1884	353,000	1891	2,500,000
1885	408,000	1892	2,422,000
Total			15,097,900

The above is a statement of the plants of brook trout made from the Paris station from and including 1879, the year in which the trout work of the Commission was removed from Pokagon to Paris.

TOTAL PLANTS OF WHITEFISH.

1874	1,532,000	1885	40,000,000
1875	2,211,500	1886	61,620,000
1876	9,310,000	1887	72,984,000
1877	8,001,000	1888	72,968,000
1878	12,520,000	1889	63,000,000
1879	14,545,000	1890	109,700,000
1880	10,695,000	1891	104,000,000
1881	3,000,000	1892 (from Detroit station)	65,500,000
1882	18,170,000	1892 (from Sault Ste. Marie station)	9,724,000
1883	23,735,000		
1884	37,750,000		
Total			740,965,500

TOTAL PLANTS OF WALL-EYED PIKE.

1882	1,120,000	1889	44,340,000
1884	2,040,000	1890	22,300,000
1886	1,806,256	1891	27,045,000
1887	3,280,000	1892	57,300,000
1888	11,492,000		
Total			170,723,256

TOTAL PLANTS OF CARP.

1881	1,093	1889	3,490
1885	2,088	1890	5,798
1886	3,422	1891	2,231
1887	2,843	1892	2,025
1888	3,878		
Total			26,868

TOTAL PLANTS OF ATLANTIC SALMON.

1873	21,350	1874	139,000
Total			160,350

TOTAL PLANTS OF CALIFORNIA TROUT (FRY).

1880	12,000	1889	4,000
1884	6,000	1890	16,000
1885	25,000	1890 (adults)	475
1887	20,000		
Total			83,475

TOTAL PLANTS OF SWISS LAKE TROUT.

1890	17,360

TOTAL PLANTS OF LOCH LEVEN TROUT.

1885	8,000	1890	30,000
1888	5,000		
Total			43,000

TOTAL PLANTS OF BROWN TROUT.

1889	20,000	1891	156,000
1890	60,000	1892	271,500
Total			507,500

TOTAL PLANTS OF LAKE TROUT.

1875	150,000	1886	490,000
1877	168,500	1889 (two years old)	13,000
1878	433,834	1890 " " "	467
1879	879,000	1892 (from Sault Ste. Marie station)	204,000
1880	26,500		
1885	215,000		
Total			2,080,301

TOTAL PLANTS OF SCHOODIC SALMON.

1876	20,300	1885	48,000
1878	26,000	1886	23,000
1879	4,867	1887	23,636
1880	20,000	1888	73,424
1882	13,517	1889	5,000
1883	27,874	1890	44,000
Total			329,618

TOTAL PLANTS OF CALIFORNIA SALMON.

1873	45,900	1878	73,000
1874	419,930	1879	315,246
1875	323,000	1880 (adults)	575
1876	227,000		
Total			1,304,651

TOTAL PLANTS OF EELS.

1877	265,000	1883	236,000
1878	405,000	1885	325,000
1879	817,000	1891	273,000
1881	390,000		
Total			2,211,000

TOTAL PLANTS OF BLACK BASS.

1880	8,500	1888	1,560
1881	7,000	1890	185
Total			12,245

TOTAL PLANTS OF WHITE BASS.

1891	2,500,000

The aforesaid biennial reports contain detail statements of the place of each plant, date of delivery and to whom, and amount of each.

From the annexed table it will appear that the total plants of whitefish aggregate the large number of nearly seven hundred and fifty million, commencing in 1874 with little above a million and a half. The twenty million point was not reached until 1883, the fifty million point until 1886, nor the hundred million point until 1890, so that more than half the whole number have been planted within the past five years.

It is matter of deep regret to every one connected with or interested in the artificial propagation of whitefish that actual and tangible demonstration of the results of such large plants, cannot in the nature of things be obtained. The results of brook trout planting in streams are so open to inspection and so easily observed and appreciated that

it is not difficult to convince any caviller by proofs and demonstration that cannot be gainsaid; but to reason from analogy it would seem that if the relatively smaller output of brook trout has produced such remarkable results as they are known and ackuowledged to have, the millions of whitefish and wall-eyed pike that have been planted in the Great Lakes must have made a marked impression on the commercial fisheries, and yet frankness compels the admission that thus far the increased catch of adult whitefish is not at all commensurate with what it seems ought to have been expected as the outcome of these great plants. It is true there are many things to be taken into account in this matter, not the least of which is the slaughter of immature fish; but it would be very gratifying if the actual outcome of these plants could be proved as it can with the plants in the streams.

A SUGGESTION:

THE SPECIALIST IN FISHCULTURE.

BY W. DAVID TOMLIN.

In all lines of bnsiness, the specialist has become a factor. In engineering circles the specialist is called in to examine the plant before it is started, even though a consulting engineer has supervised the construction all through.

In electric engineering, after the contract is completed, a specialist carefully examines the entire system; not alone to test the efficiency, but to look for the most economic methods of operating the system.

Specialists are not confined entirely to the medical profession. The demands of American business life call for the most improved systems that can be devised to furnish

our people with food and comfort; with the best of raiment, with homes adorned with all that is beautiful, and replete with such surroundings that will conduce to the lengthening of our days, and to take off the sharp edge of erroding care that so stealthily eats into the life of even the strong man.

Among the tasty tid-bits that so many enjoy is the planked whitefish—the *Coregoni* of Lake Superior—becoming year by year a scarcity.

The States west of Lake Superior—Minnesota, the Dakotas, Montana, Colorado and Iowa—demand whitefish early in the season, and continue the demand as long as there are possibilities of getting them. In all these Western States they are staple articles of fish food when they can be procured; but the decrease is rapid, and unless some means are devised to restock the waters that formerly produced them, the fishermen will not find a school of such fish in a single season's catch.

At present we are dependent upon Canadian fishermen to largely supply our Western markets. We are brought to face the subject, American fishermen cannot get whitefish within one hundred miles of their home ports, and year by year the nets and boats have to go further up into Lake Superior to find any whitefish for the home market, let alone the demand for the same fish for the market in the States west of us.

Mr. Milner sounded the notes of warning: "That the whitefish were decreasing in 1872." At that time the fishermen could get nets fairly well filled with them in Lake Superior waters within 12 to 20 miles of Duluth; today the fishermen must go 160 miles up into the same lake to get any of these fish, and if the ice is late in breaking up and going out, the fish have visited the grounds and departed before the fishermen get to the fishing grounds. These fish visit Isle Royale late in the fall to spawn, and