

XXXIII.—REPORTS OF SPECIAL CONFERENCES WITH THE AMERICAN FISH-CULTURISTS' ASSOCIATION AND STATE COMMISSIONERS OF FISHERIES.

A—MEETING AT BOSTON, JUNE 13, 1872.

At a meeting of fish-commissioners and members of the American Fish-Culturists' Association, held at Boston June 14, 1872, the following gentlemen were present :

Prof. S. F. BAIRD, United States Commissioner; Dr. W. W. FLETCHER, New Hampshire; A. A. REED, Rhode Island; NEWTON DEXTER, Rhode Island; Dr. J. H. SLACK, New Jersey; E. A. BRACKETT, Massachusetts; C. A. WALKER, Massachusetts; B. F. BOWLES, Massachusetts; GEORGE SHEPARD PAGE, New York; and LIVINGSTON STONE, New Hampshire.

GEORGE SHEPARD PAGE was chosen chairman.

On taking the chair, he briefly stated that the meeting was brought about in consequence of a motion by Dr. Edmunds, fish-commissioner of Vermont, at the late meeting of the American Fish-Culturists' Association at Albany, that Congress be memorialized to make an appropriation for the purpose of propagating salmon and shad in the rivers of the United States.

Mr. Page said that he was honored with the chairmanship of the committee for this purpose, and he had called on the Committee on Appropriations, with Professor Baird, Mr. Walker, and Mr. Frye, member of Congress from Maine, to urge the requisite appropriation.

The committee of the House voted to grant an appropriation of \$10,000, which was stricken out when the bill came up for consideration in the House; but in the Senate the item was restored, and increased to \$15,000, thus giving this amount for the desired purpose; and Professor Baird, as United States Commissioner of Fish and Fisheries, was placed in charge of the disbursement of the sum. It was thought proper by him, on consultation with others, to have a meeting called at once of at least one representative from each State interested; and of the number invited, nine gentlemen were present on a very brief notice, while from others letters were received expressing regret at their inability, on so short a summons, to participate in the deliberations of the meeting.

A letter was read from W. Clift, one of the commissioners of Connecticut, giving his views of the importance of stocking the tributaries of the Mississippi with shad, and of expending the greater part of the appropriation in propagating the nobler fish.

Professor BAIRD spoke of the subject that it was proposed to discuss as one of great interest and one in which the country is vitally concerned.

When the proposition of the Fish-Culturists' Association was presented to Congress, it met with great favor. He found scarcely any one who objected to it at all. All with whom he had conversed agreed that it was important, and realized that State aid could not accomplish the object, and that the General Government must come in to assist; especially as the waters to be stocked belonged to many States, and it was not the interest of one State to provide fish for the others, inasmuch as what one State might sow the others might reap.

When this measure was first brought up in the House of Representatives, it was objected to because it was not in accordance with any pre-existing law, it being insisted that nothing shall be inserted in the regular appropriation-bills not intended to carry out some previous law, and a single objection can kill any such item. The matter, however, was only laid aside temporarily, and by presenting it to some Senators, especially Senator Edmunds, of Vermont, it was brought forward again, and he is perhaps entitled to the credit of having it put into the Senate bill, and a sum of \$15,000 instead of \$10,000 appropriated.

The idea of having shad introduced into the waters of the Mississippi River was specially favored by the members from the valley of the Mississippi, from Alabama and other Southern States. They all felt the necessity of increasing the number of fish, and wished every effort used to add to their supplies from this source; and the shad question was one which seemed practicable, because partial experiments in the Mississippi Valley have been made with great success. Two rivers in Alabama, one the Alabama, and the other the Escambia, have been stocked by private enterprise, and they are now catching the shad there. The fish were taken from the Alabama River some years ago; and from the Escambia so many have been taken during the past season as to have become quite an article of traffic. On this account, in part, the members of Congress from the Southern States were very much interested; and should even a partial success attend the present effort, it is likely hereafter to receive a strong support.

Of course, all thought that the most important fishes that can now be introduced into the waters were the shad and the salmon. The question in regard to the salmon is how and when the experiment can best be tried. If impregnated salmon-eggs are best for the purpose, where shall these be obtained? Can we get plenty of them in our own waters from the west coast, or shall we go to Europe? In regard to the western salmon, there are several difficulties in the way. In the first place, there are six, eight, or ten so-called species, probably six well-defined kinds. One serious objection has been made to the salmon of the west coast; and that is, they are said not to take the fly in fresh water. If this be true, shall we introduce fish that will not give sport to the angler? Nevertheless, it has lately been ascertained that they will take the fly outside of the mouths of the rivers. The Columbia River salmon will

bite in Shoal Water Bay, affording rare sport, although it is only a few years since this fact was ascertained. He did not remember to have seen any authentic statement of a salmon having been taken with the fly on the west coast. They can be caught in other ways; but whether they can be induced to rise at a fly in the eastern waters is perhaps questionable.

Again, according to the published accounts, many of these species are worthless; they are soft, white-meated, and not much better than cat-fish or suckers. Then, there is this fact, that one kind runs up in the spring and another in the fall; so that there are salmon almost all the time in the Columbia and in the Frazer; and there are said to be certain kinds that always die after spawning. The Indians say they all die; and the shores of the rivers are lined with dead fish, furnishing food for bears, hawks, &c. Probably, however, the white-meated fall-salmon or dog-salmon are in reality only the exhausted fish of the spring-run in the kelt condition, corresponding to what is known to occur in the European salmon. In this event, the number of species will be reduced.

If it be unadvisable to take these salmon from the West, is it worth while to encourage the idea of depending upon the Canadian government; or is it best to supplement our own stock by sending to Germany, Sweden, Norway, and Denmark, especially Norway and Germany? He invited any of the gentlemen present to give their views or make any suggestions on this subject.

Dr. SLACK heartily indorsed the suggestions of Professor Baird, believing that the General Government should co-operate with the States. Rivers were frequently the boundaries of the States, and the only hope of securing the propagation of fish in such cases was in the action of the United States. The people of New Jersey were anxious to stock the Delaware, but Pennsylvania could not agree, and thus nothing was done.

Mr. BRACKETT spoke of Mr. Atkins's experiments with reference to stocking the rivers of Maine with salmon, and his plan of purchasing them from the pounds and keeping them in ponds until the spawn is mature, and thus obtaining a stock of spawn for supplying the rivers. Mr. Atkins had not been successful in his first attempt; but having changed his plans somewhat, he now anticipated good results, and the method was now considered entirely feasible. His station is at Bucksport, Me., and he thinks he can furnish salmon for \$4 a thousand, being furnished himself with the breeding salmon from weirs at the mouth of the Penobscot River.

Professor BAIRD inquired what should be done with the salmon-spawn, supposing it to be obtainable from the Penobscot.

Mr. BRACKETT thought it should be distributed among certain States, where salmon can be grown, according to population.

Professor BAIRD. Will it be desirable to add from the funds provided by the General Government to the State funds in the hands of State commissioners; or have they all the money they want?

Mr. BRACKETT said that if we had a thousand times as much as we now have, it would not be too much. Putting a few eggs in a stream amounts to nothing; they ought to be put in by millions.

Professor BAIRD. What States have provision for receiving this spawn and hatching it out?

Mr. BRACKETT mentioned Massachusetts, Maine, and New Hampshire as prepared to receive the eggs.

Mr. FLETCHER said his State could dispose of 100,000.

Mr. BRACKETT said that Dr. Fletcher was to place about 15,000 salmon-eggs in the headwaters of the Merrimack. He thought that seven or eight thousand had been placed there previously. Three small rivers in Massachusetts had received from one to three thousand, and this season, for the first time, the market has been teeming with salmon, weighing from two to three pounds, caught in weirs in Massachusetts Bay. In the town of Plymouth, the fishermen who sell fish from house to house carry around these small salmon. It is reasonable to suppose that these fish are the result of what has been done in stocking the rivers of New Hampshire and Massachusetts. There ought to be some law making it a penal offense to have these small salmon in one's possession. Unless possession of the fish be made a crime, the catching of them could not be prevented. None should be sold weighing less than four or five pounds.

Professor BAIRD stated that there was such a law in Nova Scotia.

Mr. REED said Rhode Island would be prepared very soon to place shad in two or three of the streams of that State. They had already hatched about 30,000 trout and 10,000 salmon, having obtained the spawn in Canada.

The question was then raised whether the salmon from Mr. Wilmot's establishment were the land-locked salmon; and it was concluded that it was of little consequence whether they were or not if they were equally good with the sea-salmon.

Dr. SLACK had had the true salmon and the land-locked, and could not tell which was which.

Mr. STONE said that the land-locked salmon when a year old has a black spot on the dorsal fin, which is not upon the true salmon.

Mr. BRACKETT said that some land-locked salmon would reach a weight of 17 pounds.

Mr. FLETCHER said they would average 10 pounds.

Mr. BRACKETT had seen one at the head of Sebago River that weighed 17½ pounds.

Professor BAIRD inquired as to the propriety of attempting to introduce the land-locked salmon into the upper lakes. He thought that a good deal should be done in the way of experiments in the western waters, the Mississippi Valley, and the lake-regions, to stock them with shad or salmon.

Dr. SLACK thought that the petroleum discharged into the Ohio River had killed off the fish.

Mr. BRACKETT thought the Sebago salmon should be introduced into the upper lakes.

Mr. STONE understood that some of the salmon from Mr. Wilmot's establishment had been introduced into Lake Superior, in order to test the question whether they were land-locked and could subsist there. They have been there already two or three years.

Professor BAIRD said that Mr. Whiteher informed him that he had put some into Lake Huron. The small crustaceans of the genus *Mysis*, which is the principal food of the salmon on the coast of Great Britain and of Norway, are equally abundant in the deep waters of the great lakes. Mr. Milner had found this *Mysis* in water over 25 fathoms in depth. It is impossible to separate this shrimp-species from that of Labrador. The same thing was found in the stomachs of the lake white-fish. It is quite a common theory that the red color of the *Salmonidae* is due to their feeding on small shrimps and other crustaceans.

Mr. BRACKETT said he had been informed that when they built the dam across the stream near Lake Sebago, they prevented the salmon from going down the lake; and in the course of time they bred very freely below, and are still taken clear down to tide-water; but that the flesh is of a clay-color or white, while all those in the lake itself are almost as dark-red as the sea-salmon.

Dr. SLACK said that the large trout which he had raised from the egg had white flesh, although those from which they came were red.

Similar results were stated by other gentlemen; and Dr. Slack said that although he stocked his ponds with red-fleshed trout, in a year or two the flesh became white. This is probably due to the absence of shrimps.

Professor BAIRD inquired whether those present would advise him to empower Mr. Atkins to obtain as many salmon-eggs as possible; and it was agreed to as desirable.

Dr. SLACK said New Jersey would take a portion of them.

Professor BAIRD expressed doubts as to the practicability of introducing the Penobscot salmon successfully south and west of the Hudson. He thought they would not get the proper temperature in the open rivers. It had been a theory that salmon were abundant in the Hudson; but he had seen a positive statement that they were never taken west of the Connecticut. The idea that salmon were in the Hudson River is based on the statement of Hendrick Hudson; and from the season of the year in which he professed to have seen them, and from the locality, there is not the slightest doubt that they were weak-fish. The oldest records of our own writers say nothing about salmon west of the Connecticut River. But Williams and Douglass, who both wrote a hundred years ago, state that in the Connecticut River they were very abundant, but none were to be found west of it. There is no doubt that they occurred in the Connecticut.

Mr. STONE stated that 3,000 salmon had been placed in the Connecticut recently, and some have been seen as the result.

Mr. SLACK inquired whether, as this is an object of national interest, it would not be well to purchase Seth Green's patent, which no doubt interfered much with fish-culture. He thought it would be a good way to expend a part of the money.

Professor BAIRD responded that that would have to be done, if at all, by direct action of Congress.

Mr. STONE thought that enough salmon-eggs could not be obtained from the State of Maine, and that it would be absolutely necessary to resort to the Pacific coast, where they can be gathered in any desired quantity. It was true there were many varieties, and some of them were worthless. There are one or two varieties, however, that are of good quality.

Professor BAIRD. The Quinnot salmon is said to be the best.

Mr. STONE. Some persons living on the Pacific coast consider them the best in the world. If the whole appropriation of \$15,000 were expended in purchasing all the salmon to be obtained from the State of Maine, there would not be anything near enough. We should have to go to the Pacific coast and put up large establishments, and then we could supply the rivers of the East with tens of millions. It would cost no more to get 10,000,000 eggs on the Pacific coast than to get 100,000 at the East. The question of stocking the large rivers is to be one of numbers. It cannot be done by putting a few thousand eggs in the rivers here and there, but we must put in millions of them; and there is no way of getting eggs by millions except from the Pacific coast.

Mr. BRACKETT thought that either the Saint Croix or the Sebago salmon should be looked after this year. He would prefer the Sebago to the Schoodic salmon, as they are the largest.

Mr. FLETCHER spoke of the number of eggs produced by a single salmon. He believed that there were more than 10,000 from a fish weighing ten pounds.

The question of stocking the Ohio and other tributaries of the Mississippi with shad was then more specifically considered.

Dr. SLACK said that until the 10th of July shad-spawn could be taken to the Ohio River. It takes about seventy-four hours to hatch them; and the eggs could be carried across from Springfield to the headwaters of the Ohio in less time than that.

Mr. BRACKETT thought it better to transport spawn than young fish.

Mr. FLETCHER said he had carried the eggs from the Connecticut River to the headwaters of the Merrimack, from Holyoke to Meredith, and hatched them out successfully in the Merrimack. The water can be changed more readily with spawn than with small fish. They may be kept in a vessel having a second one outside with ice in it. It will not do to put the ice in with the eggs.

Professor BAIRD spoke of the introduction of the carp, and inquired as to the views of the gentlemen present in regard to it.

Dr. SLACK spoke of the European carp as a very inferior kind of fish, and only palatable by the aid of French sauce. He thought the Sebago salmon the coming fish of America, and one that should have most attention devoted to it.

Mr. STONE referred to the British char as a fish to be recommended.

Professor BAIRD asked the opinion of gentlemen as to the sterlet.

Mr. PAGE had eaten the sterlet in Saint Petersburg, and considered it a delicious fish. He thought it the most valuable fish that could be imported from Europe. It is a hardy fish, and could be brought as young fry in a tank. They could probably be obtained from Berlin.

Mr. STONE called attention to the pike-perch as a fish also worthy of consideration.

Professor BAIRD spoke of the white-fish as one of the most important species in Lakes Michigan and Erie, but diminishing rapidly from many causes. It lives in the depths of the lakes, and formerly ran into many of the rivers in October and November to spawn, then returning. But the river-ways have been obstructed so much that they cannot go up excepting in the Saint Clair, Saint Mary's, the Nepeegon, the Michipicoten, and one or two other rivers, and therefore they shoot their spawn anywhere, and that has much to do with the decrease of the fish. The question has been agitated of establishing hatching-houses on the lakes, and producing them there in very large numbers, and then discharging them into the lakes, and let them furnish the stock for future growth. It is now too late to preserve their spawning-beds; but millions of them can be hatched out in different localities, and set adrift, which will keep up the supply. He was not sure but the best policy was to continue breeding them in that way year after year, in as large numbers as possible. If the waters are thus supplied with young fish, the ordinary means of capture will not destroy them. That is the true way in which the General Government can act to the best advantage by furnishing the eggs in large quantities and turning them loose into the waters; a moderate outlay will undoubtedly supply a great amount of food to the nation.

The subject of hybrids of the *Salmonidæ* was then briefly discussed.

Dr. SLACK had seen a hybrid between a white-fish and salmon-trout. It was a bad thing to teach trout to eat young fish; for after a short time they do not discriminate species.

Mr. BRACKETT said the Sebago salmon do not eat fish. He did not know what they fed upon; but he had taught them to eat curdled milk.

Mr. STONE thought they would learn very readily to eat each other.

Dr. SLACK said that in feeding trout he would give a great deal of food at a time, as otherwise the smaller fish would not get their share.

The meeting then adjourned.

B—MEETING IN NEW YORK, OCTOBER 19, 1872.

Professor BAIRD said he had invited those present to attend this meeting, in order that he might communicate something as to what he

had done, as United States Commissioner of Fish and Fisheries, in the disposition of the appropriation by the Government, and the introduction of useful food-fishes into rivers and lakes of the United States.

He referred to the action of the meeting of the Fish-Culturists' Association at Albany in February last, and the appointment by it of a committee to visit Washington and memorialize Congress, of which Mr. George Shepard Page was chairman. The efforts made by Mr. Page were stated, resulting ultimately in the final passage of an appropriation of \$15,000 for the contemplated work.

Reference was made to the late date at which the bill was passed, and the necessity of calling a meeting of fish-commissioners and fish-culturists for advice as to the best manner of applying the appropriation. A meeting was held for this purpose on the 13th of June in Boston, and some conclusions were arrived at, more particularly with reference to the introduction of shad into certain streams at once, as the season had nearly closed when it would be possible to do this.

The arrangements made with Messrs. Green and Clift, and the results of their work, were stated, namely, the placing of several thousand young shad in the Allegany at Salamanca, and in the Mississippi at Saint Paul, and in Lake Champlain, by Mr. Green; and a much larger number at Salamanca, in the White River at Indianapolis, and in the Platte at Denver, by Mr. Clift.

The question whether shad could be successfully planted in the more southern and western rivers was alluded to, and the opinion expressed that all the rivers emptying into the Atlantic could be thus stocked. As to the Mississippi and its tributaries, experiment alone could decide its susceptibility to sustain shad; though there was no reason why this might not be the case, while the fact that shad are now, and have been for many years, taken in the Ouachita River, goes to show that the experiment of stocking other tributaries of the Mississippi would be likely to succeed. If shad can ascend to the vicinity of Hot Springs, Ark., as they do, there is no good reason why they may not go higher.

Dr. GOLDSMITH, of Vermont, said he had taken shad at the falls of the Ohio River several years since.

Professor BAIRD concluded that, as far as the question with reference to the shad is concerned, there is every reason to look with hope to the future. The next most important fish to be considered was the salmon. These formerly abounded in the rivers of the New England States, but never occurred spontaneously west of the Connecticut River, or at least of the Housatonic. The fish referred to by Hendrick Hudson, which was caught in September in large numbers in the vicinity of New York, and described by him as the salmon, was undoubtedly the squeteague, or weak-fish, (*Cynoscion carolinensis*.)

Salmon were formerly plenty in Lake Champlain and in Lake Ontario, but whether the Ontario salmon went to the ocean and returned again has not been determined. There is little doubt that every river in the

United States, having suitable physical conditions, can be stocked with salmon. The true salmon (*Salmo salar*) is adapted to the waters throughout New England and possibly to the lakes. There are salmon in the Pacific waters which differ from the eastern species, and which make their way through water of a far higher temperature than that of most of the streams on the Atlantic coast. The Sacramento River during the past summer was exposed to a heat of from 100 to 115 degrees in the shade, and the upper part of the valley is perhaps one of the hottest places in the United States. But still salmon abound in that river, and it is believed that fish taken from that locality will have an equal power of resisting heat on this side of the Rocky Mountains.

The recommendation of the meeting at Boston was first attended to, of co-operating with the commissioners of the States who were disposed to supply Mr. Atkins with the funds necessary to carry on his experiment on the largest possible scale. He had already begun his work, and a general plan of operations was arranged, by which he was authorized to purchase as many salmon as were offered to him in good, healthy condition. These he obtained from the fishermen of the Penobscot, and placed them in a pond embracing 150 acres, within a central inclosure of about 5 acres, to be kept till the period of spawning. With the funds thus supplied him by the United States Commissioner and the State commissioners, he procured six hundred salmon, varying in weight from 5 to 25 pounds, of which number nearly all survive, and the prospect of a large number of eggs from this source was very encouraging. These, at the proper time, were to be distributed among the parties contributing to the expense of procuring them.

As this supply was not likely to be as great as was desired, application was made to the *Deutsche Fischerei-Verein* in Germany, and through their instrumentality the German government had been induced to offer to the United States a quarter of a million eggs of the Rhine salmon from the national establishment at Hünningen. Besides this number, half a million had been engaged from the establishment of Mr. Schuster in Freiburg. It was expected that both these lots would be placed in charge of Mr. Rudolph Hessel, an experienced fish-culturist, for transfer to the place of shipment, and that possibly he would accompany them to America. These were expected some time in January, and if possible another quarter of a million would be procured from the same source.

In accordance with the suggestion of the meeting at Boston, Mr. Livingston Stone had been sent to California, and had established himself on a branch of the Sacramento River, unfortunately, however, too late in the season; yet, from this source several thousand eggs were expected, which would be placed in the Susquehanna and Delaware.

The report of operations by Mr. Stone, as forwarded to the United States Commissioner, was then read.

The Commissioner then called upon the gentlemen present for any sug-

gestions as to the best localities for the introduction of the different kinds of salmon expected, and also as to the expediency of procuring certain other kinds of fish, either from abroad or our own waters, for introduction into streams where they do not now occur. He also asked as to the number and kinds of eggs of salmon expected to be available that the different gentlemen present would receive and provide for hatching and distributing them into appropriate streams.

Dr. EDMUNDS, of Vermont, said he had made inquiries in regard to the waters emptying into Lakes Champlain and Ontario, and found that salmon were formerly plenty in them. Some of the people in the vicinity of these waters make a distinction between the salmon of the lake and what they call the Bay Chaleur salmon, which were found in all the rivers up to the Oswego, but in what respect these differed from each other he could not learn. Salmon have been gone from Lake Champlain since 1824, where, at one time, they were exceedingly abundant. Since dams have been built, they have gradually disappeared, and people think the dams and sawdust killed them. The sawdust undoubtedly acts injuriously by covering the spawning-beds.

Mr. SETH GREEN said that salmon used to occupy the streams emptying into Lake Ontario, except the Genesee, clear to Niagara, on both sides. A good many still run up to the head of Lake Ontario, and up Wilmot's Creek, which is only ten or twelve miles long. He did not regard these as land-locked salmon, though they may never go down the Saint Lawrence; they may find the requisite food in Lake Ontario. He hoped that shad would also find appropriate food in the lakes, as he had placed some in the Genesee River in 1871, and he had seen some this summer $4\frac{1}{2}$ and 5 inches long, and some had been caught in Lake Ontario that would weigh a quarter of a pound, and were over 8 inches long.

Salmon placed in the rivers of New York will grow and go to sea and come back as far as the first dam if not taken by pound-nets, but as long as pound and trap nets are allowed we can never restock our rivers. The salmon is strictly a shore-fish, never being caught far from the shore; a pound-net will catch every fish that follows along the coast.

The Delaware would be a good river for salmon if it were not for the pounds. There are trout in the headwaters of that river; and any rivers that have trout in their headwaters will be suitable for salmon. Over-fishing is the cause of the scarcity of salmon and other fish in this country. They must all be hatched and kept up artificially, in order to have a supply in the future.

Until we have better fish-ways than have hitherto been made, we cannot have salmon. They should be distributed when hatched into small streams, so that they will have plenty of food. You will never have salmon till pounds are abolished.

Mr. BRACKETT. The salmon have been killed out of the waters of Massachusetts for the last twenty-eight years. The Massachusetts commissioners succeeded in getting a few thousand, and distributing them in

the headwaters of certain streams. This was three years ago, and this year, for the first time, the market in Boston has had a great many salmon, weighing from two to three pounds, taken in gill-nets set for mackerel. Almost every man in the fish-market in this city has had salmon, weighing from one to three pounds, brought from the east, and unquestionably the fish which the Massachusetts commissioners placed in the rivers of that State. The only way to prevent the taking of these small salmon would be to pass a law, making it a penal offense to have any such fish weighing less than five pounds for sale or in one's possession.

Mr. THADDEUS NORRIS said he was an old salmon-fisher, and had given the subject of fish-propagation considerable attention, and had learned a good deal about the habits and instincts of salmon. The salmon that Mr. Wilmot, of Canada, procures is a fresh-water fish. The fish of the lakes have lost their sea-going instinct. Lake Ontario is their wintering-place; and they live there all the year when not going up the streams to spawn; this done, they go back into the lake. The Sebago salmon, he thought, was once a fish that went to the sea regularly; and that they are the same as the regular sea-going salmon.

Dr. EDMUNDS said he saw salmon in Montreal that had herring in them. This he thought an evidence that they feed in the rivers.

Mr. BRACKETT thought the herring were probably taken before the salmon entered the fresh water. No man could say he had ever taken salmon with minnows in its stomach.

Mr. NORRIS thought the salmon of Lake Ontario were fresh-water salmon, for the reason that they had minnows in them. He had visited Saint John many times, and had been assured by Mr. Venning that there were true salmon in Lake Lomond, which supplies the water for the city of Saint John; that they are called white-fish there, having deteriorated in size. The fish, having gone up from the sea, had been retained there, and now could not get back. Mr. Norris himself believed them to be true salmon, and had seen them there not more than 8 or 9 inches long.

Mr. BRACKETT said that the Sebago salmon had been known to weigh 17 pounds.

Mr. NORRIS. The obstructions were once removed and salmon then ran up to Lake Lomond again. He thought there would be no difficulty in stocking all the western lakes with salmon if an appropriation were made to continue the work now begun. He thought the Sacramento salmon should be placed in the northern rivers; he did not know where the Rhine salmon should be placed. The Susquehanna and Delaware he thought would be suitable for the Sacramento salmon. They can go fifty miles above tide-water in the Susquehanna, even up into the State of New York. He hoped New Jersey and Pennsylvania would be remembered in the distribution of the eggs obtained from the Sacramento. And he would be glad to try in those States the Rhine and the Penobscot salmon. They had facilities for hatching them in tributaries of the Susquehanna near Harrisburgh.

To show how simple a matter it is to stock a river with salmon, he related the experience of himself and others in placing 12,000 young fish in the Delaware last year. He obtained the eggs of Mr. Wilmot, and they were kept until the yelk-sac was absorbed, and then turned into the small streams, where they were able to take care of themselves. There was very little trouble in the operation, and no care of feeding them was required. There are now 13,000 salmon in the Delaware.

Mr. SETH GREEN related his practical experience as a fisherman and dealer in fish for many years on Lake Ontario. In the course of his operations, he had dressed tons of salmon, and never saw anything in them that really amounted to anything. They were taken in a trap-net in the lake; and the trap-nets killed them all out of Lake Ontario in about five years. They were set near the shore all along the lake.

The first pound-net came from Scotland in about 1836. It was a curious contrivance, that took a great many salmon. After much effort, he got an opportunity to go out to the net, the construction of which was kept a secret, and assisted in taking out the fish, and after working for some weeks in that way he got the idea of the whole thing, and then went into the business himself. After five years, only a few salmon were left, and these came into Wilmot Creek, and another creek at Grafton.

Mr. REED. Are you satisfied that the Sacramento salmon will rise to the fly?

Mr. GREEN. Yes, I know they will; when the right man goes with the right kind of tools, he will get them fast enough.

In answer to Mr. HOWELL, who inquired if salmon, in passing up the Delaware would be likely to pass along the shores or in the channel, as the question would have an important bearing on the Delaware River fisheries, there being nets placed near the shore for a long distance, Mr. Green said he thought they would keep the center of the stream. When he spoke of salmon being a shore-fish, he meant to be understood as saying that the ocean-salmon pass along the shore.

Mr. NORRIS. In the tidal waters of the Delaware, would they follow the channel or shore?

Mr. GREEN. Both.

Mr. PIKE said that having some curiosity to investigate the question of the similarity of the salmon from Mr. Wilmot's stream and those of the Penobscot, he had three of each sent him last winter. He examined them carefully, and they were examined by others, and no one could see any difference. There was more real difference between those that came from the Penobscot than between them and the Wilmot stream salmon. That was the only way to test the question, to bring them side by side.

In regard to the expense of hatching salmon, he said his apparatus cost him only \$3, and he hatched out a thousand without the slightest difficulty. He lost about three hundred. The water used came through lead-pipe, being that used in the city.

Professor BAIRD, with reference to the introduction of sea-salmon into the lakes, said he had full confidence that the experiment would be successful with the Penobscot salmon.

It is well known that the food of the salmon, in the North Atlantic, consists largely of small shrimps, about half an inch long, belonging, to a considerable extent, to the genus *Mysis*, and which occur in great abundance. Two years ago, some investigations were made in the deep waters of Lake Superior and Lake Michigan, in which the dredge and other improved apparatus were employed. To the surprise of the gentlemen engaged in this work, this very shrimp was found at a depth below 25 fathoms. It there constitutes, to a great extent, the food of the white-fish being very generally found in its stomach.

The fact that the gastric juice of fishes continues to act after their death is one reason why so little is found in the stomachs of those which feed on minute, soft-bodied animals, if not examined immediately after they are caught. After a few hours, nothing but a microscopic examination will tell what a fish feeds upon.

The occurrence of this small crustacean in the larger lakes is the guarantee that the salmon will thrive there. Anadromous fish placed in a river are led by their instinct to follow the current down to some large body of water. When they get down from the rivers to the lakes, they find this large body of water, and in Lake Superior or other large lakes they are practically in the ocean. They do not know the road through the waters except by a current, or else by a route which they have previously traversed. Their instinct teaches them to go down the river to the sea, and to return; and they cannot get into the wrong river any more than a man will mistake his own house.

Fishermen at Halifax had told him during the past summer that it is very common for salmon, after they have spawned, to go into the lakes and spend the winter there. They are perfectly ravenous, and can be taken easily. They go down in the spring to the sea, and back again at the proper spawning-season.

Many white-fish have precisely the same habit; in certain fresh-water lakes they run up into the streams in summer, and winter in the lakes. In Hudson's Bay, the white-fish winter, and are taken there in immense numbers. They run up from the bay into the rivers exactly as they do in some of the rivers of Lake Superior or Lake Michigan. Therefore there is every reason to believe that the great lakes can be stocked with salmon to any desirable extent.

Dr. GOLDSMITH said that during the time when negotiations were going on between the British government and our own, he made an effort to secure legislation to permit the passage of fish up the Saint Lawrence, which is the great artery by which our lakes must be supplied with sea-going fish; and the matter being referred to the Secretary of State, it was brought to the attention of the Canadian authorities, who assured him (Dr. G.) that it was only necessary for those interested in

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the fisheries of the great northern lakes to state what legislation was necessary in order to permit the easy and safe ascent of fish seeking to go up the rivers, and it would be done. He, therefore, thought this meeting a fit occasion for the formation of some plan, and to confer with some persons connected with the Canadian government, with a view to procure such legislation on the part of the Canadian authorities and on the part of the States of the Union which are concerned, as will secure an easy and safe migration of fishes to the lakes.

Professor BAIRD said he met Mr. Mitchell, the commissioner of the Dominion, last summer, and he said that if existing regulations were not sufficient they should be made so. Their own existing regulations are very stringent as to time and other particulars. Mr. Mitchell manifested the utmost cordiality, and offered any aid that he could render in the prosecution of the work of the United States Fish Commissioner in the Bay of Fundy, even to the extent of tendering the service of a government steamer if it was desired. He also gave free permission to take fish in any waters of the Dominion, any law to the contrary notwithstanding. It is as much for the interest of the Dominion as our own that the work on the border has been prosecuted; and salmon are to be placed in the Saint Croix, which is the boundary-line between the United States and New Brunswick.

Mr. GREEN. Pound and trap netting is prohibited on the Dominion coast. He said he had great faith in the feasibility of stocking our small lakes with salmon-trout, and at a small cost. He expected to have a great abundance of salmon-trout spawn, and would gladly send to any of the States whose commissioners wished to try the experiment a quantity of the eggs.

Mr. NORRIS. Will salmon-trout do well in the Susquehanna?

Mr. GREEN. No, sir; but they will probably grow to a good size in trout-streams where the trout have been exterminated. They rise to the fly. All our great lakes and the inland smaller lakes can be stocked in three or four years with as many fish as they ever had. But he would not recommend the effort until pound-fishing is stopped.

Professor BAIRD inquired if any one had experimented upon hybrids of the *Salmonidæ*.

Mr. GREEN said he had crossed the white-fish with the salmon-trout, and the salmon with the salmon-trout, but never raised them.

Professor BAIRD referred to experiments made in Europe, where it is becoming an important branch of fish-culture to produce hybrids, promising the best results.

The subject of the introduction of new species of fish was then considered, and the opinions of several gentlemen were given as to the varieties which might be properly tried.

Mr. CLIFT deprecated the introduction of the Danube salmon, (*Salmo hucho*.) He thought that salmon could go up the Mississippi to the headwaters.

Professor BAIRD said that question, as far as distance was concerned, was settled affirmatively by the fact that salmon do go up the Yukon River and the Frazer. The Yukon is at least two thousand miles in length, and the ascent must be much more fatiguing to fish than that of the Mississippi, on account of rapids and obstructions in the former river. In the Yukon, the salmon has to fight his way to the mountains, while in the Mississippi there is nothing to hinder his progress.

Mr. GREEN further spoke of the necessity of the removal of obstructions from the rivers, so that fish may have a free run to the upper waters, and he advocated a close time at least for all pounds and traps.

Doctor EDMUNDS said the authorities in Vermont had come to the conclusion that the only way to stock their streams was by artificial propagation, and a law would probably be enacted by which towns might stock their rivers with trout and then charge a royalty for fishing in them.

Mr. NORRIS then spoke of the manner in which Mr. Green holds his patent for a hatching-trough, and thought the Government ought to buy the patent and have the right to its use everywhere. He also urged the importance of action by the General Government in stocking all such streams as are the boundaries of States, and where it is difficult to procure concurrent legislation on the part of the States themselves. He thought there should be an application for at least \$30,000 or \$40,000 at the next session of Congress for this work of fish-propagation.

Colonel WORRALL thought that the ova coming from California should all go into one stream, so as to make the experiment on as large a scale as possible.

Mr. GREEN wanted enough fish put into whatever stream received any to do somebody some good.

Mr. HUDSON also thought the Sacramento salmon should be placed in a stream west of the Hudson. He would be willing to relinquish any claim to them.

Mr. NORRIS thought some of the Rhine salmon should go to Dr. Slack, to be placed in the Delaware or Susquehanna.

Professor BAIRD stated that the salmon of the Rhine prefer a temperature below 60°, and when it rises to 65° they retreat to the sea and wait until by some rise in the river, on account of rain, the temperature is diminished.

Mr. HOWELL inquired how early salmon would ascend the Delaware.

Professor BAIRD thought that they would probably go up in April or May.

Dr. GOLDSMITH called attention to a matter which concerned more especially those separated from the sea, and with whom fish-culture must relate to fresh-water fishes only, such as trout. The question which had been presented to his mind was one which lies at the economy of fish-culture. How many pounds of fish-food, muscular fiber, does it take at a given temperature of the water to produce a pound of trout?

and what, with a given cost of food, is the absolute cost of a pound of trout, the first, second, and third year of feeding ?

He said he had made some experiments in this direction himself, and he desired to bring the matter to the attention of the meeting, with a view to secure some experiments by others living in different parts of the country, for the purpose of determining this fact, and thereby settling the question whether fish culture is profitable or simply a congenial amusement. He therefore moved that the United States Commissioner of Fish and Fisheries be requested to address a letter to such persons as are now engaged in the culture of the trout, which shall contain recommendations from himself, and which shall secure the careful performance of the necessary experiments, and prescribe the method by which the questions shall be determined.

This motion was agreed to.

The subject of fish-ways was then considered and discussed, and the various forms of those constructed by Colonel Worrall and others were briefly explained.

Dr. HUDSON spoke of the obstruction at the Holyoke dam, which prevents the ascent of shad.

Mr. PIKE said no expense was spared in Connecticut to make one of the finest fish-ways, but shad had never gone through it.

Colonel WORRALL said all the plans of the New England fish-ways he had seen were not more than 4 or 5 feet wide, whereas the narrowest part of his own was 20 feet wide. The wider they are the better.

Mr. PAGE referred to the meeting of the American Fish-Culturists' Association, held in Albany last February, and to his appointment upon a committee to enter into correspondence in regard to fish-culture in China and Japan. He had communicated with the State Department in regard to this subject, and had met with a favorable response ; and, singularly enough, he had just received a letter from Japan, which he would read.

The letter is as follows :

No. 113.]

“ UNITED STATES CONSULATE,

“ *Kanagawa, September 5, 1872.*

“ SIR : Referring to your dispatch No. 60, I have the honor to report, that from the best information within my reach I glean the following facts :

“ In Japan there is no scientific or business method of propagating fish. The great abundance of salt-water fish and the fact of but little being used which is not previously salted do not seem yet to involve the necessity of propagation.

“ A few Daimios, chiefly in the south, and also in Kinishin, have transferred *live* fish when young (not two inches long) from river to river, from river to pond, and from pond back to river again. They are transferred in small, flat vessels of water, and put into temporary artificial ponds made of puddled clay, only a few inches deep, and covered with netting to keep the fish safe from attack of birds.

"The gold-fish are treated in this way, as are also a kind of fish called koi, which resemble somewhat carp, but are rounder. They are fed on very small worms, dug out of mud at the bottom of stagnant and slow-running ditches. At the end of three weeks or so, the pond is made to communicate by a channel, either with a larger pond of old standing or a river, and the artificial pond is thus emptied of its stock. This is done in Hizen and Bingo for ornament of gardens.

"Salmon abound in the rivers on the western coast of Nipon, north of this latitude, as do also black bass. Yesso and its rivers teem with salmon, the fishing for which by net on the sea-shore begins about the 1st of September, and ends about the 27th of November.

"Fishing for salmon by net is at present going on about 85° northeast from this port on the Pacific coast.

"I have the honor, sir, to be your obedient servant,

"C. O. SHEPARD,

"*Consul.*

"Hon. CHARLES HALE,

"*Assistant Secretary of State, Washington.*"

After the reading of this letter, the meeting adjourned.