

MAINE STATE LEGISLATURE

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Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

PUBLIC OFFICERS AND INSTITUTIONS

FOR THE YEAR

1875.

VOLUME I.

AUGUSTA:

SPRAGUE, OWEN & NASH, PRINTERS TO THE STATE.

1875.

EIGHTH REPORT

OF THE

COMMISSIONERS OF FISHERIES

OF THE

STATE OF MAINE,

FOR THE YEAR

1874.



AUGUSTA:

SPRAGUE, OWEN & NASH, PRINTERS TO THE STATE.

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REPORT.

To the Honorable the Governor and Executive Council:

Your Commissioners of Fisheries, in laying before you their third annual report, cannot but express their gratification at the cordial manner in which their efforts have been seconded by the people. Exceptions have been met with of course, but these very exceptions have been so presented in contrast to our general experience, as to exhibit their authors in so narrow-minded and selfish a light, as to make us more keenly appreciate the public spirit and big-heartedness of the majority.

Were we enabled by a larger edition of our report, to disseminate more widely a comprehension of the designs of the General and State Governments in establishing this department, to impart by aid of increased means, a knowledge of the different varieties of native fishes of our State, illustrated by drawings and descriptions, as well as of the anadromous fishes that visit our rivers, but a comparatively short time would elapse before fish culture would be not only an important and wealth-producing interest of our State, but a resource of private industry as an article of food, as much as now from our domestic animals, our poultry or the grains and root products of our fields. The Creator in his wisdom, for the best development of mankind, has stocked the Earth with the basis of all supplies. The soil with trees and plants and appropriate animal life; the waters, with its own peculiar existences of fishes that should live only in their own inland homes, the lakes and rivers; but as their food must be there limited, He placed in the great pasture of the ocean, fishes that should feed and grow and fatten there alone, and should ascend the rivers only to deposit their spawn; never competing in feed with the inland fishes and thus lessening their food supply. Such are the anadromous fishes, the salmon, the shad and the alewife or gaspereau. They come to us only when fat and fit for food, on their way to their spawning beds to lay their eggs and thus continue

their species. Could a more wonderful, beautiful system of equivalents be devised by which the wealth of ocean with its health-giving constituents so essential to the inhabitant of the far country home, should be so equally distributed? Do you not now appreciate the fatal error committed in allowing the river highways by which these ocean visitors traversed to your very doors to be obstructed? Do you not now see why we seek to correct this grave error, by requiring the owners and occupants of these obstructions, placed across the paths God gave these fishes, to build fishways to enable them still to ascend to their old spawning grounds? Upon the first settlement of a country, the supply of animal food is in excess of the consumption, and no requirement then of domestic stock of cattle or poultry is experienced, the forest and plain and stream provide for all want; as population increases, the supply simply equals the demand, and plenty still reigns; population goes on increasing until the natural production of food is not equal to the demand, and the stock producing capital of the forest and plain and stream is trespassed upon, and annihilation of the source of food supply is threatened. Pre-vision provides the means for civilization and culture. Subsistence must be insured beyond the chance production of a system liable to be varied by the elements, and a surer method, controlled by the wit-sharpening influences of necessity, must be devised. The same causes, the same desire of thinking man to protect himself from the casualties of chance, or to permit his food supply to be controlled or placed at the mercy of the elements, the same experiences, have all been gone through with, have given us our turkeys, our ducks, our geese, our barn-yard fowls, our cows, our oxen, our roots, our bread producing cereals, and each and all in their time have been the subject of as much wonder and incredulity and ridicule from the sordid and narrow-minded and ignorant of their time, as is fish culture from the same class in our own. And yet fish culture is a settled fact, and every acre of water will in the future be looked to by its owner, to yield its crop of fishes, as much as his tilled fields for their cultivated product of roots or grains. Our rivers are capable of being so stocked with salmon by yearly contributions of young fry to their waters, that no protection would be needed, but simply fishways to allow the grown-up fishes to ascend to their utmost tributaries, that all, from the river mouths to their inland fastnesses, might have the opportunity to catch and consume.

Such is the design entertained by your Commissioners for the future, if the State is allowed to extend to us sufficient aid and protection to re-stock her rivers. If the consumption of the inhabitants on the Penobscot or Kennebec or Androscoggin, be one hundred thousand salmon per year, then let us put into the river to be stocked, two hundred thousand salmon fry per annum; this will allow fifty per cent. for casualties, and will insure the required result. The taxes paid and to be paid by the innocent public for dredging out our rivers, to remove obstructions caused by manufacturers, to enable those same manufacturers to ship the product of their mills, would pay many times over all we require to re-stock our waters. By the annexed report of the accomplished Superintendent of the Bucksport Salmon Works, you will perceive that the cost of salmon ova is reduced to two dollars per thousand; this, with the ability to set up cheap hatching houses on the Kennebec and Penobscot rivers, or others to be stocked, at some high up point, would make the expense but trifling. We look to volunteer aid in hatching salmon eggs at those places where the inhabitants desire their rivers re-stocked. We propose in the future to send salmon eggs in such quantities as may be desired, to such persons as are willing to hatch and turn them into our rivers at proper places.

Allow us here to extend to the Governor and Executive Council, the officers of the State Government and members of the Legislature, an invitation to visit the Salmon Breeding Works at Bucksport. It is the cordial wish of all the gentlemen interested, from Mr. Atkins, the Superintendent, to the different proprietors and subscribers, comprising Prof. Baird for the United States Government, and the Commissioners of Fisheries of the several New England States, that this invitation should be accepted. It is important that our State Government have ocular proof of the advance that fish culture has made in our State, and yet how plain and simple and practical is the whole process. Our State Government can then report understandingly to the people, as well as respond advisedly to the application for appropriations for our department.

The instinct of appetite is the guardian of health. The necessities of a remote population still demands the sanitary requirement of its "Quintal of Fish!" Once it was taken at the river side. The yearly store of salted salmon or shad or alewife, may be no longer had; the dried fish of trade, at first at a very low

price*, for a time supplied the want. Soon an unaccountable scarcity of our ocean fishes so raised the prices, that fish became a luxury and not a homely need. The system of checks and balances, Nature's law of equivalents, may not be lightly meddled with by man.*

Kansas and Nebraska are now making an appeal to the sympathy of their fellow-citizens of our republic for bread to save them from famine caused by the grasshopper. Should man in his thoughtless disregard of the laws of Nature destroy all the fishes that inhabit our waters, the result would be fatal to all growing vegetation, as well as to animal life. No so powerful check upon the insect tribe as our fly-feeding fishes and birds.

Had not the access of the anadromous fishes to our rivers been interrupted by thoughtless, reckless legislation, granting to individuals and to corporations unconstitutional privileges, we should not now be suffering from the want of a fish supply, not only as an article of food, and enhancing the cost of living by raising the price of other articles of subsistence in the precise ratio of this deficiency, but in a not less serious feature, in its sanitary bearing upon society.

Had our migratory fishes not been interfered with at all, the time would as certainly have come, but far, far away in the future, when the natural production of our rivers would not have equalled the demands of an increased population. Then, as now in the necessity of the present, science and artificial culture would have, and does provide the remedy. The average fecundity of fishes' eggs, running the gauntlet of the unnumbered casualties of the elements and natural enemies, is scarce two per cent. hatched. Then the embryo salmon is for thirty days helplessly anchored to the yolk sac, which for that time by absorption is its whole support. Artificial culture hatches ninety-two per cent. of the one hundred, protects until the helpless period is passed, and then

* Thus far had we written when the following item from the columns of Portland Press, presented itself to our attention: "Men of science are beginning to think that there may be some connection between the destruction of forests and the rapid increase of grasshoppers, and in proof of the idea point to the fact that insects most injurious to rural industry do not multiply near woods. The locust of the East is bred in open plains that harbor no birds to feed upon the larvæ, that gather no moisture to destroy the eggs, and that let in the full light of the sun to hasten hatching. Attention is called to the fact that only since the felling of the forests of Asia Minor has the grasshopper become destructive there."

turns the little fishes, when able to care for and protect themselves, into the stream they are designed to stock.

We shall here, without apology, introduce a letter to us from Prof. Baird, U. S. Commissioner of Fish and Fisheries, which will exhibit at a glance the mischief that rash legislation has caused, and how much remains for us to do before the evil can be remedied. We hope that every member of your Honorable Body will give it the most careful attention, and that it may meet with the same close consideration from both branches of the Legislature and their constituents. This letter has been once before given to the public in the columns of our report, but we deem it of sufficient importance to republish, until its plain, simple, uncontrovertible truths have stamped themselves upon the minds of every citizen of our State :

WASHINGTON, D. C.,
November 16, 1872. }

My Dear Sir,—I am in receipt of your letter, asking my opinion as to the probable cause of the rapid diminution of the supply of food-fishes on the coast of New England and especially of Maine. The fact, as stated, needs no question; it is too patent to the experience of every man who has been interested in the fisheries, whether as a matter of business or as an amateur. An examination of the early records of the country in which the subject is referred to cannot fail to convince the most skeptical.

We are all very well aware that fifty or more years ago, the streams and rivers of New England emptying into the ocean were crowded, and almost blockaded at certain seasons, by the numbers of shad, salmon and alewives seeking to ascend, for the purpose of depositing their spawn, and that, even after these parent fish had returned to the ocean, their progeny swarmed to an almost inconceivable extent in the same localities, and later in the year descended to the sea in immense schools. It was during this period that the deep sea fisheries of the coast were also of great extent and value. Cod, haddock, halibut, and the line fish generally, occupied the fishing grounds close to the shore, and could be caught from small open boats, ample fares being readily taken within a short distance of the fishermen's abodes, without the necessity of resorting to distant seas. Now, however, the state of things is entirely different. The erection of impassible dams upon the waters of the New England States, and especially of the

State of Maine, has prevented the upward course of the anadromous fishes referred to, and their numbers have dwindled away, until at present they are almost unknown in many otherwise most favorable localities.

The fact has been observed, too, that with the decrease of these fish there has been a corresponding diminution in the numbers of the cod and other deep-sea species near our coast; but it was not until quite recently that the relationships between the two series of phenomena were appreciated as those of cause and effect. Halibut, it is believed, can be reduced in abundance by over-fishing with the hook and line, but experiences in Europe and America coincide in the confirmation of the opinion that none of the methods now in vogue for the capture of fish of the cod family (including the cod, haddock, pollock, hake, ling, etc.,) can seriously affect their numbers. Fish, the females of which deposit from one to two million of eggs every year, are not easily exterminated unless they are interfered with during the spawning season, and as this takes place in the winter and in the open sea (the spawn floating near the surface of the water) there is no possibility of any human interference with the process. Still, however, these fish have become comparatively very scarce on our coast, so that our people are forced to resort to far distant regions to obtain the supply which formerly could be secured almost within sight of their homes.

It is now a well established fact that the movements of the fishes of the cod family are determined: first, by the search after suitable places for the deposit of their eggs; second, by their quest of food. Thus, the cod, as a summer fish, is comparatively little known on the coasts of northern Europe; but as winter approaches, the schools begin to make their appearance on the northwestern coast of Norway, especially around the Loffoden Islands, arriving there finally in so great numbers that the fishermen are said to determine their presence by feeling the sounding lead strike on the backs of the fish.

Here they spend several months in the process of reproduction, the eggs being deposited in January, and the fishery being prosecuted at the same time. Twenty-five to thirty thousand men are employed in this business for several months; at the end of which the fish disappear, and the fishermen return to their alternate occupations as farmers and mechanics. The fish are supposed to move off in a body to the Grand Banks, which they reach in early

summer, and where they fatten up and feed until it is time for them to return again to the northeast. It is believed that the great attraction to the cod on the Banks, consists in great part of the immense schools of herring or other wandering fish, that come in from the region of the Labrador and Newfoundland seas, and which they follow frequently close in to the shore, so that they are easily captured.

It is well known that the presence or absence of herring determines the abundance of hake and cod on the Grand Manan Fishing Banks, the fishes of the first mentioned family having a peculiar attraction to carnivorous fish of all kinds. It is, however, the anadromous fishes of the coast which bring the cod and other fishes of that family close in upon our shores. The sea herring is but little known, outside of the region of the Bay of Fundy, excepting in September and October, when they visit the entire coast from Grand Manan to Scituate, for the purpose of depositing their spawn; this act depending upon their finding water sufficiently cold for their purposes, a condition which of course occurs later and later in the season, in going south.

In the early spring, the alewives formerly made their appearance on the coast, crowding along our shores and ascending the rivers in order to deposit their spawn, being followed later in the season by the shad and salmon. Returning when their eggs were laid, these fish spend the summer along the coast; and in the course of a few months were joined by their young, which formed immense schools in every direction, extending outward, in some instances, for many miles. It was in pursuit of these and other summer fish that the cod and other species referred to came in to the shores; but with the decrease of the former in number the attraction became less and less, and the deep sea fishes have now, we may say, almost disappeared along the coast.

It is therefore perfectly safe to assume that the improvement of the line fishing along the coast of Maine is closely connected with the increase in number of alewives, shad and salmon; and that whatever measures are taken to facilitate the restoration of these last mentioned fish, to their pristine abundance, will act, in an equal ratio, upon the first mentioned interest. The most important of the steps in question are the proper protection of these spring fish, and the giving to them every facility needed for passing up the streams to their original spawning grounds; this is to be done of course by the construction of suitable fishways and

ladders. The real question at issue in regard to the construction of these fishways is, therefore, after all, not whether salmon shall become more plentiful, so that the sportsmen can capture them with the fly, or the man of means be able to procure a coveted delicacy in large quantities and at moderate expense. This is simply an incident; the more important consideration is, really, whether the alewife and shad shall be made as abundant as before, and whether the cod or other equally desirable sea fish shall be brought back to our coast, so that any one who may be so inclined, can readily capture several hundred weight in a day.

The value of the alewife is not fully appreciated in our country. It is in many respects superior to the sea herring as an article of food; is, if anything, more valuable for export; and can be captured with vastly less trouble, and under circumstances and at a season much more convenient for most persons engaged in the fisheries.

I have already extended this letter to an unreasonable length, and must therefore bring it to a close, with the assurance, however, that all the propositions I have thrown out can be amply substantiated.

Very truly yours,

SPENCER F. BAIRD,

U. S. Commissioner of Fish and Fisheries.

E. M. Stilwell, Esq., Bangor, Maine.

SALMON.

Two hundred thousand salmon eggs was our dividend from \$700 invested in the Bucksport Salmon Breeding Works. In addition, 250,000 eggs were placed to our credit as a gift from the U. S. Government, through her Commissioner of Fish and Fisheries, Prof. Baird, making a total of 450,000 eggs. Ten thousand of these were sent to the Messrs. Coffin, of the Pembroke Iron Works, they volunteering to hatch and turn them into the Penmaquan river. Fifty thousand intended for the St. Croix, were sent to the hatching house of the Dobsis Club, Hon. Harvey Jewell, its President, kindly offering us every facility of its use; and Mr. Ball, the Club steward, taking charge of and distributing them in proper localities when hatched. Fifty thousand intended for the Piscataquis river, at Dover, and for the Sebec river a tributary, were sent to the Sebec Land-Locked Salmon Breeding Works,

where they were kindly and skillfully taken charge of and distributed by Mr. Hiram Leonard, the superintendent. One hundred thousand, to be equally divided between the Medomak and Georges rivers, were sent to Dr. Everleth, of Waldoboro', who liberally volunteered to take charge of and distribute them when hatched. One hundred thousand were sent to Dixfield, where they were hatched under the skillful hands of Mr. Commissioner Stanley, and in due course were turned into the Androscoggin at the village of Dixfield, and a part into Swift river, one of its tributaries. The remaining one hundred and forty thousand were hatched at Bucksport and planted in the Piscataquis river; in Pleasant river, at Brownville; in the Baskahegan, at Danforth; in the Seboois, at Howland; and in the Penobscot, proper, at Salmon Stream, and at Madoceunk. A few thousand were planted at Cold Spring, on the Passadumkeag, and two cans, containing five thousand, were kindly taken charge of and planted in a tributary of the Mattawamkeag, at Island Falls, by Col. Daniel Randall.

Having to transport all our hatched fishes over the European and Piscataquis railroads, we again express our keen appreciation of the aid and courtesy extended to us by all connected with the roads; all took an interest in and lent a helping hand and became co-operators with us, as in a common cause.

The reports from the various localities where we have planted salmon fry are of the most favorable description. Of the salmon planted at Vanceboro', in the spring of 1873, Frank B. Bailey, Esq., writes:

VANCEBORO', Sept. 30, 1873.

I thought I would drop you a line and let you know that we are hearing from those salmon you placed in our river. All summer they have been catching them, and two weeks ago a party of us were down the river, about four miles below the mouth of the stream into which we emptied the young salmon, and the river was alive with them. They are about six inches long and bothered us to death, taking our flies the moment they struck the water. Mr. Boardman went way down the river to salt water and found them the same in every place where he made a cast. At the mouths of all the brooks, they seem to swarm.

Hon. Wm. C. Hammatt of Howland, reports remarks made by dwellers on the Seboois river, of the abundance of a "new species of small fish, never noticed there before." Young parr and smolt

have been taken at various points and in many cases sold as trout, particularly at Calais. Wherever parties have been sufficiently acquainted with fishes to recognize the young salmon, has our attention been called to the fact of the great number taken by men and boys, and an urgent request for us to arrest and punish. We have no power in the premises. The State provides no law for protecting the very fish it pays the expense of purchasing and planting. We must look to the Legislature to pass one, as well for young salmon as for barred or yearling trout. No salmon should be permitted to be taken less than three pounds in weight, or any trout less than six inches in length, under a penalty of five dollars for each salmon and one dollar for each trout so taken; and imprisonment until paid, or fine and imprisonment, both at the discretion of the magistrate. On the Androscoggin, both smolt and parr have been taken at various points from Norway and Dixfield to Lewiston and Brunswick.

LAND-LOCKED OR FRESH WATER SALMON.

So much attention has been called of late years to this invaluable and beautiful fish; so many and continued inquiries are addressed to us of its habits, characteristics and haunts; we are so continually in receipt of applications for fish and spawn, that we think it appropriate here to give as condensed a description as we are able, of our own personal knowledge of the fish and its "habitat."

It is known in our State under names so various, that it is almost impossible to recognize the fish saving from one's own personal experience. *Salmo Gloveri*, Schoodic Trout, Lake Shiner, White Trout, Silver Trout, Salmon Trout, Black Spotted Trout and Land-locked Salmon, these are a few of the names by which this fish is known among us. It varies as much in external appearance, according to the waters in which it is bred and feeds, as does the common brook trout. In some waters it has the spots much more numerous than in others. In fact it varies in its different localities and seasons as does the sea salmon. In Schoodic or Grand Lake waters, embracing a chain of lakes and ponds that feed the St. Croix river, it is found in large numbers, but never attains to any great size; now and then one is caught of eight pounds weight, but very rarely; the average size is about one and a half pounds. In Sebec lake, which is the lower of a series of lakes and ponds that extend far up to and in the mountains, there is a great store

of these fishes, and the beautiful streams and brooks that connect them, afford the finest sport in the world to the angler. There is Sebec lake, and then Ship pond stream and Ship pond, then five or six miles more of connecting brook brings one to Long pond. About three-fourths of a mile from Sebec lake, a beautiful little stream debouches into Ship pond stream, known as Buttermilk stream. This empties Buttermilk pond, and this is one of a series of ponds, all containing these fishes. They are all similar in size and general appearance to the Schoodic shiner or salmon. About twelve miles from Bangor, on the Calais road, is a lake known as Reed's pond. It is of some eight or nine miles in length, extending to the city of Ellsworth, and emptying into Union river. This is the lower link of a chain of these ponds containing these fishes, of a size like those of Sebago lake in Cumberland county, that compare with the Schoodic and Sebec salmon, as does the huge Rangely trout with our ordinary brook trout. They are the same fish, only developed to a greater size by the superior range and purity of water, and greater supply of feed for both the young fry and the growing fish. The Reed's pond salmon have in the past, been caught of great size and weight, viz., twenty-two, fifteen and ten pounds. Last autumn one was caught in Sebago lake weighing seventeen pounds. Two others were taken in Presumpscot river, the outlet of Sebago, weighing respectively thirteen and one-half and eleven pounds. These fishes of Reed's pond, have not only been very much thinned out by the merciless slaughter of them on their spawning beds, by the class of drunken roughs who live by pot-hunting and poaching, but to fully as great an extent by being deprived of access to their natural spawning ground in swift running waters. It is a necessity of this fish to have access to running aerated water as well for spawning as for health. The Reed pond salmon have been so driven by the erection of dams on most of the brooks and streams that empty into this lake, to seek other spawning places, that many of them will deposit their eggs on sand bars in the pond itself; these eggs never hatch, as a certain amount of motion and circulation to the water seems absolutely essential to that process.

Unless the inhabitants living around and in vicinity of the waters of Maine, in which these fine fishes are found, can be aroused to the importance of preserving and protecting them, they must soon become extinct. More money would be brought into the vicinity of these lakes by visitors and their families, who would

come to spend the season and enjoy the sport of angling and boating; more travel for railroads and stages, and custom for hotels, than would erect fishways over every dam, and buy out the whole race of dishonest, cowardly roughs, who fish with spear and net and grapnel.

We are often asked, "What is the land-locked salmon? Is it what its name implies, an ocean salmon that some accidental circumstance, some convulsion of Nature has barred from return to its ocean home, and thus established a new race; or is it a distinct species?" The year before the death of Prof. Agassiz, we sought from him an answer to these same questions, while on a visit to the Cambridge Museum of Natural History, with our esteemed friend and brother Commissioner, Dr. Hudson of Connecticut. His reply was, "Thirty years since I supposed it to be a *demoralized salmon*, that some cause had prevented from access to ocean; but since then I have changed my opinion, I now think it is a distinct species. I have found it in Sweden;" (and we think he added in Norway.)

Finding ourselves in St. John, N. B., some weeks since, on a Saturday, we resorted to the shelves of a library for our mental "pabulum," until the Monday's railroad train. A book entitled "Sporting Sketches, by author of Ten Years in Sweden," attracted our attention. On page 39, the author speaking of angling in Lake Wenern in Sweden, and the Wenern trout, says, "Much confusion still exists about the classification of the Wenern trout, or as they are erroneously called here, salmon, and without entering further into the subject, I will only observe that, in my opinion we have two distinct species, and only two of the great lake trout in these waters—the common lake or great grey trout, (*salmo ferox*) identical with the British lake trout, and another species, which we call here the 'silver-lax' or silver salmon, (from its bright silvery appearance) at present not identified in British waters. The real *salmo ferox* is taken in these waters up to thirty-two pounds; the 'silver-lax' (I can give no Latin synonym, seeing that none of our ichthyologists can decide what species this really is) from seven to twenty pounds and even larger, but generally, especially in the South of the Wenern, under twelve pounds. The real lake trout are caught, when taken on a hook, invariably by spinning bait, a bleak or small roach; whereas the other species rise freely to the fly."

These fishes, in all the Grand Lake and Schoodic waters, as well as in the whole line of lakes of which Sebec is the lower, are identical in appearance and more closely resemble a grilse than any other fish. Were we on the Miramichi, we should accept them as grilse, without a question. Of the Sebago and Reed's pond fishes, the large ones, from four pounds upwards, so closely resemble salmon that we do not think, if they were shown in market together, any one would be able to distinguish between the two. In gill covers, rays, fins, vertebræ, whole structure, they are identical. To Mr. Charles G. Atkins, we are indebted for the following distinctive mark, which, we believe, has been noted by no other naturalist.

The young of both *salmo salar*, as well as of the land-locked or fresh water salmon, are marked by dusky grey bars, which gradually fade out and entirely disappear in the second year. Upon stripping off the skin of the adult fresh water or land-locked salmon, these bars will be found still visible upon the body of the fish, while on the *salmo salar* they are not apparent.

The young of both these fishes are so entirely similar that they may not be distinguished. We met a countryman at Sebec, the last season, who had been fishing at Ship pond stream, where we had turned in twenty-five thousand salmon fry and several thousand of the young of the land-locked salmon. He had a string of some thirty of these fishes. We could not distinguish the one from the other. The young fry seem to remain in the fast water, before going down to *their* ocean, the deep, still water of the pond or lake, about the same time as the fry of the *salmo salar*. In the heat of the summer, when the temperature of the water is so high that every brook trout has left the stream, for some spring-fed, cool, alder-shaded forest brook, these fishes will still rise at the fly or bait in every well aerated stream or pool. We have caught them in the hottest days of August. *Salmo salar*, as well as fresh water salmon, will live in a temperature that would be fatal to the brook trout, if the water be only broken and aerated. As a table fish, we deem them of richer flavor than the sea salmon. As a game fish they have no equal. We have caught many fresh and sea salmon in our day, but nothing that we have ever hooked on to can equal one of these fishes in his electric like leaps and runs, but a French dancing master.

The result of the experiment tried by Mr. Hiram Leonard, at the Sebec works, of keeping them over for another year, was

unsuccessful. Although they were plentifully supplied with food and aerated water, they gradually pined away and died. The deep water of the lake is as essential to these fishes as is the ocean to the sea salmon. They seek the gravelly bottom of some fast running stream or brook to spawn in, but they seem to run indifferently either up or down into rivers that afford appropriate spawning ground. The number of eggs to the pound corresponds to that of the sea salmon, as does also the time of spawning and the length of time in hatching. As the period of spawning approaches, the unsightly hook on the under jaw of the male fish develops and he assumes the same brilliant tints as the male sea salmon. In the spring, the fish caught in the rivers emptying into the lakes are mostly females; in autumn, the males predominate. It is the opinion of many observant anglers, that the male fishes of both the trout and land-locked salmon precede the females and prepare the spawning beds. They are not as a general rule fished for in winter through the ice with much success. Sometimes by deep fishing with a live bait, one is caught. Their scales are then dirty, discolored by mud and slime, covered with parasites, sometimes leeches fastened upon them. The scars with which many of these fishes are marked, are attributed to the leech, but we are more inclined to charge them upon the murderous pickerel, or the more worthless animal, the lazy poaching rough, with his cruel spear or grapnel. We have known exceptions where quite a number have been taken through the ice in winter, but it is our opinion that they resort to the muddy bottoms of very deep waters, and exist in a semi-hibernating state. In spring time they become more active, and many are caught at the mouth of running streams where they follow to feed on the smelts or other early spawning fishes. We have caught these fishes high up on the Pleasant river at Katahdin Iron Works; we have caught them still higher up in the mountains, at a place known as the Gulf, which approaches within a mile of Long pond and the Sebec head waters on the other side of the mountain. We have heard of a pond emptying into the West branch of the Penobscot where these fishes are said to abound, but have never had time to explore and investigate the matter in person.

We are not ambitious to add another to the numerous "aliases" of this fish, but would it not be better that some order should be attained out of the present confusion of nomenclature, by giving it the simple designation of *Fresh Water Salmon*?

Two thousand young fry, hatched from eggs presented by Prof. Baird to the State of Maine, were transported fifty miles by wagon and five miles by boat, and turned into Kennebago stream above the dam, without the loss of a fish. The Kennebago empties into the Mooselocmagantic, one of the Rangely lakes.

SALMO OQUASSA, OR BLUE-BACK TROUT.

The size of fishes is governed as much by the supply of food on the spawning ground for the young fry, as by the after supply for the growing fish. To the wonderful amount of insect and fish life in the Sebago and Rangely waters do we attribute the great size of the fishes found in those lakes. In Sebago is there not only an immense supply of smelts, but of other fishes that are the prey of and afford abundant food for the trout and land-locked salmon. We have been often asked if we do not regard the big Rangely and Sebago trout as a different species from the true *Salmo Fontinalis*? Some have even declared them to be akin to the *Salmo Confinis*, or Big Lake trout. We have had abundant opportunity to see and judge of these trout, and pronounce them, unhesitatingly, to be pure, unmistakable brook trout, developed by an unlimited supply of appropriate food for the fishes at every period of their growth, as well as an unrestricted range in the purest and coldest water.

We propose here, to speak more particularly of the blue-back trout as a stock fish, to be put into other ponds, to afford an unlimited supply of food for trout and land-locked salmon. This beautiful little fish takes its name from a blueish tint on the back, not unlike the bloom on a plum. They are spotted like a trout, and to a casual observer the difference in a basket of fishes would not be noted. But like the togue, they have only the yellow and black spots but not the red; they attain a length of about eight inches. In a box of these fishes sent us by Mr. C. T. Richardson, Steward of the Oquossoc Angling Association, there were about one hundred specimens, affording a fair average of their size and weight; but few we should say would measure eight inches; the weight ranged from two to four ounces. Their tints and coloring are very beautiful, particularly in the male, the pectoral fins rivaling in color the autumn-tinted maple leaves; like the dying dolphin, their brilliancy of color is lost or fades away with their

lives. At the season of spawning they come up from the deep recesses of the lake at night in pairs, but in numbers countless. The eggs in size and appearance are similar to trout spawn, the number varying from one to two hundred per fish, average about one hundred and twenty-five. They run about three weeks, and in the height of the season many remain up through the day hidden beneath rocks and stumps. They are more delicate and symmetrical in shape than the brook trout and have the tail forked. They are rarely seen but in the spawning season. Now and then in deep fishing with bait in the lake, one is caught, but as rarely or exceptionally as the ordinary sucker; like the latter, they will in the breeding season take a bait but it is the exception and not the rule. As a table fish we cannot speak advisedly, never having eaten them except when taken on the spawning bed. To us they are not palatable, but as much so as trout under the same circumstances.

There is a special statute allowing these fishes to be taken in Franklin and Oxford counties during the close-time for other fishes. We think it a great mistake to allow these beautiful fishes to be taken at all, as we attribute mainly to them, the great size of the Rangely trout, and we opine that as they diminish in numbers, so will those far-famed Mooselocmaguntic trout. Rangely waters teem with fish life; two or three varieties of the suckers, red-fin minnows, chubs, &c. The blue-back is to Rangely, what the myriad smelts are to Sebago lake and Reed's pond. We think this fish can be advantageously introduced into all waters that are stocked with trout or land-locked salmon. Of its food, mode of feeding or habits, but little is as yet known. We subjoin an extract from a letter to us from Mr. C. T. Richardson, whose long experience on Rangely waters entitles his opinions to much respect.

"The blue-back stays in deep water in the lake from near the middle of November until the middle of October, when they come up the brooks and streams to spawn, which almost invariably occurs between the middle of October and the middle of November. The male brook trout, visits the spawn bed and prepares it for the use of the females, before the females arrive; the blue-backs go up in pairs, male and female, using spawn beds cleared, used and vacated by brook trout. The blue-back is not considered a biting or game fish, yet I have caught a bushel and a half in a day, with a baited hook; they are mostly caught in dip-nets."

BLACK BASS.

In the autumn of 1869, Duck pond in Falmouth, Philips pond in Dedham, Newport pond in Newport, Cochnewagan pond in Monmouth, and Cobbosseecontee pond in Winthrop, were stocked with black bass. It was intended that these ponds should be a basis of supply to stock other waters when application should be made for that purpose to the Commissioners. These fishes have grown and multiplied to the utmost of our expectations, but we have not been able to obtain the requisite supply when desired. Our best success has been at Duck pond, near Portland; we there obtained thirty-eight, which were transported to a pond in Norway, and others to Whitney pond in Canton. There is an abundance of these fishes in all the ponds we have recited above, but we are not always successful in being able to find parties living near these ponds to catch them for us, at reasonable prices. As the case is now presented to us, the better method is to purchase of dealers in Massachusetts, and have the fishes delivered at the desired localities here.

Mr. Gilman of Meddybemps, who takes a deep interest in fish culture, desired us to stock Meddybemps lake with black bass, as the utter disregard of the laws at Dennysville prevent the ascent of the alewives and salmon, and the pickerel have destroyed all the trout in the lake. We promised to furnish the bass during the month of October, but have not been able to redeem our pledge, as the fish could not be obtained. We hope another year to be more fortunate. Denny's river was once a noted salmon river, and is capable of being so made again, but no respect is paid to the law, salmon are speared at the Mills, nets are used at all times and places, fish-ways are obstructed, gates opened or shut at the caprice of these persons. We have but one warden in that district, and he is stationed at Calais. We do not deem it advisable to appoint one on Denny's river in the present state of affairs. If the people are willing to have their fisheries destroyed, allow them to reap the price of their own folly.

The public spirited citizens of Dexter, desirous of having Dexter pond stocked with black bass, collected a sufficient sum of money among themselves, sent to Massachusetts and obtained the fish, and had them turned into the pond. Application was then made under provisions of Sect. 43, Chap. 40, revised statutes, to the Commissioners for protection of the pond for three years, and

granted. This is the way the energetic people of Dexter do business.

FISH WAYS.

Five years ago, the Commissioners of Fisheries for Maine made the attempt to have fish-ways constructed over the dams on the Presumpscot river. Their efforts and the wishes of the people were defeated by the determined opposition of the mill owners. Since then, the amendment of the laws led the people to hope that their long-entertained desire, to have fish restored to their river, might be gratified; and in response to their importunities your Commissioners visited the Presumpscot river, viewed the dams and obstructions, and held meetings with and consulted the owners in relation to the proposed fish-ways. As a general rule, there was but little opposition expressed; all seemed willing to comply with the requirements of the law. At a further hearing, which was requested and held at the Falmouth hotel, the parties there present argued for more time, and desired that a year more should be granted them. Your Commissioners willingly assented to the request, if the parties seeking the continuance would bind themselves in good faith to build at the expiration of that time. Their reply was a prompt and energetic refusal. In due course we made surveys, furnished plans, and defined a time within which the structures should be built, all of which were duly served upon the respective parties. In the mean time, an organized opposition was determined upon, to oppose the execution of the law. In order to gain time, and in conformity to their expressed determination "to do nothing this autumn, but to go into the Legislature this winter," an appeal according to the provisions of Sect. 26, Chap. 40, was taken in ten cases, before the County Commissioners. Your Commissioners were duly summoned to appear at Portland, and after a long, vexatious, and fatiguing trial, occupying with its unavoidable adjournments a number of days, a decision was rendered on the third day of November, in their favor, of every point at issue, in every one of the cases, by a unanimous vote of the Board of County Commissioners. If the Legislature sees fit in its wisdom to grant to the appellants in these cases, the same lenient extension of time as was granted to the owners of the Augusta dam, on the Kennebec, we think at the expiration of the coveted time they will be met by a similar exhibition of gratitude in a demand for an indefinite postponement.

At the expiration of the statute by limitation exempting the owners of the Augusta dam from the execution of the law enforcing fish-ways, the inhabitants of the towns on the Kennebec, both above and below Augusta, promptly solicited the Fishery Commissioners for an immediate enforcement of the law. A notice was served upon the owners and occupants of the dam at Augusta of a hearing, and a hearing was duly held. When the survey was made by Mr. E. A. Brackett, the engineer whose patented fish-way it was proposed to use, the Hon. James W. North, mayor of Augusta, and Col. De Witt, the representative of the Messrs. Sprague were present. A thorough explanation of the intended fish-way, its location, place of entrance into the canal, all was talked over, and met the entire approval of the agent of the mill owners. So soon as the plans could be got ready, they were served by an officer, with an order requiring the fish-way to be constructed according to plan and specification annexed, by the first day of September, on Col. De Witt, who represented the mill owners as their agent and engineer. On the 28th of October, the fish-way not being constructed, and no apparent design being evident of complying with the order of your Commissioners, the matter was placed in the hands of Wm. P. Whitehouse, Esq., County Attorney, and the mill owners were indicted by the Grand Jury.

At the request of the most prominent citizens of Machias and Whitneyville, including her principal merchants, mill owners and professional men, we visited their town, held hearings, made surveys, and in course furnished plans and served orders for three fish-ways. Two of these are now finished, and the third will be completed in due time. Application has been made to us to furnish salmon eggs to be hatched on the spot for the use of the river, and we have responded that we will furnish as many thousands as they will hatch and take care of. There are men in Machias!

PROPOSED LEGISLATION.

Your Commissioners would most earnestly impress upon you the necessity of a more uniform system of Fishery Laws for the State. Most urgent is this in the matter of close-time. As at present on our statutes, the law of close-time commences the 15th September on Schoodic and Grand Lake waters; 15th October on Brassau and Moosehead waters, and the 1st of October for the

rest of the State. The endless confusion that this creates is evidenced by the number of letters we are continually called upon to reply to from neighboring States. If by the unprincipled conduct of a worthless class who hang around our inland waters and kill our fishes when spawning, the fisheries of our State should be destroyed, the effect upon railroad travel, and the receipts of our places of summer resort, as well as the community generally, would very soon be realized. Since attention has been called to the valuable varieties of fishes that inhabit our lakes and streams, every mail during the fishing season brings us inquiries as to routes and places, and every railroad train its passengers equipped with rod and reel in pursuit of sport. In our State where but a few years since an artificial fly for angling was a curiosity, they are now a regular article of manufacture and sale, even to the shores of Sebec Lake. Bangor now supplies New York, Boston, California, even England and Scotland, with the most effective, luxurious and costly trout and salmon rods. Our country stores, from Rangely to Moosehead, are now as well supplied with rods and flies as with ammunition.

The interest felt by the public in the fisheries of Maine and her progress in fish protection and culture, is exhibited by the money distributed among our population by sportsmen from all parts of the Union. Let our people appreciate this; let them realize that the man who destroys the spawning fish is committing as great an outrage as he who girdles fruit trees, or destroys the growing crops. Crows or other vermin are mercilessly hung, or poisoned or shot at sight, for lesser offences. Society would be richer for any cause that would remove this class of lazy roughts from among us, as their support is stolen from the rights of others. We would recommend that killing our spawning fishes should be punished by both fine and imprisonment, and the latter in addition to the sentence, until the fine is paid, as this class of criminals is too lazy to work and seldom has money. It is a crime to destroy the food of others and should be so treated. Our fish and fisheries are capital to the State, and we are all interested in their preservation.

The law entitled "An Act to regulate the taking of trout in Moosehead Lake and Brassau Lake," approved February 24, 1873, is eminently unwise, unjust and partial. By this law the people of Maine are virtually told, if they will allow the visiting sportsman to catch their trout in Moosehead until the 15th of October, when they are notoriously on the spawning beds and

crowded up the rivers, that as compensation to the people who own the lake, they shall not be allowed to catch their own fish until the 1st of March, when they, the visiting sportsmen, are ready to come again. No more demoralizing lesson can be taught a people than that their rights are sacrificed to private interests. We would respectfully suggest that all fishing for all kinds of fresh water fishes, even pickerel and perch, should cease from the first of October until the first of January. The poacher, when caught fishing for trout, is either fishing for perch or pickerel. The evil can be best met by making it a close-time for all fishes.

We would most respectfully suggest that from and after this date, no charter be granted for the construction of any dam on brook, or stream, or river, or outlet of pond, without making it imperative on the parties or applicants, as a condition of their charter, that they build a fishway through said dam at the time of its construction. While such a law would hardly add an item to the expense of building the dam, it would very materially lessen the future costs to all parties, both State and petitioners.

We recommend that using any net but a dip net in any lake or pond, or any net but a drift net of three inch mesh in a bona fide fishery for salmon, shad or alwives, in any river above the flow of tide, shall be punished by forfeiture of all the property used in said illegal act, and by fine and imprisonment. These ponds, lakes and streams are the property of the people, places where they should be allowed to go and draw rations of food for their own consumption and pleasure, but no one individual should be allowed to either destroy by his own criminal act, or stimulated by avarice to illegally capture and sell to his own profit that which equally belongs to all.

Your Commissioners would respectfully suggest, that in all cases of appeal from their decisions, as provided for in Sect. 26, Chap. 40, revised statutes, the appeal shall be made directly to the Supreme Court for final decision. The Commissioners of Fisheries have jurisdiction throughout the State, while that of County Commissioners is confined to as many counties, rendering us liable to as many decisions, and perhaps contradictory ones, as there are counties in the State. Is there any more propriety in referring our decisions to them than theirs to us? It seems to us that there would be peculiar fitness in presenting these cases at once to our highest court, where the interest and meaning of a statute can be finally adjudicated upon.

A more rigid and faithful enforcement of the law forbidding the throwing of edgings, waste, &c., &c., into the Penobscot, from a point below the two branches of the river at Medway, is required. On the Mattaseunk stream, at its mouth on the Penobscot, is a shingle mill, whose owner pays no regard to the law. A ride along the banks of the Penobscot will convince the most skeptical that the U. S. Government is likely to have a permanent job in dredging out the river at Bangor. On the St Croix, matters are even worse. At Princeton the shingle manufacturers are endangering the river outlet for the immense Grand lake lumber region. The shingle waste is in the form and consistency of a rope-yarn, and almost the tenacity; being of cedar, it is imperishable in water; it masses together, and forms a sort of bed or cushion, through which the water percolates, until mud or other matter brought down by the river renders it solid. Its tendency is to mass together and sink, not float off to any great distance. At a stretch of dead water below Princeton, where formerly in time of drought one could scarcely touch bottom with a setting pole, one can now with difficulty push a birch canoe over a bed of this waste. This matter should be looked to at once, and summary action taken, as too much property in the Grand lake region is in jeopardy from this selfish disregard of the public good. Serious injury, in the formation of obstructions in the river below Princeton, is the result of disobedience to the law on the part of mill owners. We append a slip cut from the Calais Times, which needs no comment:

“Lieut. Thom, who is in charge of government river and harbor improvements in Maine, says in his recent estimate for the year ending June, 1876: The amount available for the improvements of the St. Croix river, Maine, is \$34,185. The improvements were to be made jointly by the United States and the Province of New Brunswick, but the engineer doubts whether any further work will be undertaken at present until some definite legislation is had to prevent the obstruction of the river after it shall have been improved. In order to improve the navigation of Machias river, Maine, an appropriation of \$96,000 will be required, and it is recommended that the channel be so enlarged as to have a depth of six feet at mean low water, for a width of 150 feet, all the way up to the wharves at Machiasport.”

If the expense of these dredging operations could be assessed directly upon the parties who cause them, instead of the people at large who have their own taxes to pay, and reap none of the

profits of the mill owners, we think the evil would be abated at once. If we have legislation upon this subject, let us have rigid enforcement. Our Statutes now are as moral in their tone as "Baxter's Saints' Rest," and about as influential upon the people. It seems to be a prevalent opinion that legislative duty is confined to passing laws as specimens of moral reading, rather than carrying them into effect. Enforcing even injudicious or bad laws would soon insure us legislation more thoughtful, more cautious, more wise.

Our river and harbor fisheries are conducted with too much activity. Other markets opened to us make a demand upon our resources greater than the supply. New devices and improvements in floating pound nets, and other ingenious methods of capture, endanger our resources of breeding stock. The young of salmon, shad and alewives, and other fishes not saléable, are either left to perish in the traps of the weirs, or are turned out upon the shores to perish when taken in the smelt nets. Some method of checking this thoughtless waste should be devised. "After us the Deluge," seems too much the maxim among fishermen. The crop of fishes is limited by the same laws as other crops, and if we destroy our stock or our seed grain we can expect no harvest.

Perhaps it may not be considered within the strict line of our duty to call the attention of the State Government to citizens of neighboring States coming among us to hunt our deer with dogs, in violation of our laws. That part of the offense that comes within our cognizance, is the fact that they subsist largely upon fish illegally captured during the spawning season. Parties have been reported to us hunting around Nicatous lake, and on the Passadumkeag, in the vicinity of Lowell, as also on Union river. Another party is hunting and trapping for fur near Howland, and has destroyed many fish, as is evidenced by the offal and spawn lying around the camp. It is the duty of every good citizen to see that these persons are arrested and taken before the nearest magistrate and bound over for trial. Complainants are entitled to one half the fine. It is an act of generous courtesy to allow citizens of other States to come among us to hunt, and trap and fish, even when incited by the sordid motive of gain, and not of sport. But when these persons abuse our hospitality by violating our laws, they render themselves deserving of the treatment due to vagabonds and tramps. No man who will wantonly violate the laws

of a State in which he is a guest, can put forth a valid claim to the title of gentleman!

In conclusion, we are happy to be able to state that the general good feeling of the people, as exhibited in increased interest in protecting our inland lakes and streams, and in a more kindly obedience and respect for the laws, is reported to us by disinterested observers from all parts of the State, as well as made evident from our own personal observation. It has been our effort to protect and develop the interests consigned to our care, that they may become an increased source of wealth to our State. In this we have met with most encouraging success. It is to us a matter of gratification that while we have sacrificed no public right, we have succeeded in some degree in checking the selfish attempt of a not very moral or industrious class to monopolize and capture and sell that which belongs to the mass of the people. Our lakes and ponds and streams can yield a larger wealth to our people in innocent recreation, as well as in calling to us visitors and money from abroad, than in supporting the squalid existence of the poaching slouch.

Respectfully submitted.

E. M. STILWELL,
HENRY O. STANLEY.

BUCKSPORT SALMON BREEDING WORKS.

To *E. M. Stilwell and Henry O. Stanley, Commissioners of Fisheries, State of Maine.*

GENTLEMEN:—I have the honor to make the following report on the conduct of the establishment at Bucksport for the collection of salmon eggs, during the season of 1874.

It was my intention to purchase a larger number of breeding salmon than in any previous year, and to get them all in June, but a succession of storms interfered so seriously with the catch of weirs upon which I depended for my supply, that by continuing the reception of them until July 23d, I was barely able to place 590 living salmon in the pond, against 652 in 1873, and 692 in 1872. It is some consolation, however, to be able to report to you that from this small supply of breeding salmon I obtained a larger number of eggs, and at a lower cost, than ever before.

No change of importance was made in the *modus operandi* this season. Among the minor alterations, the following may be mentioned: The main enclosure, in which the salmon were confined during the summer, remained the same as before. As an additional safeguard against the escape of breeders from it, the old net was about the first of September replaced by a new one. A more extensive sub-division of the enclosure was made as the breeding season approached, both with the view of facilitating the capture of the fish and of preventing their access to shores where they might spawn before we could get them. The whole amount of nets this brought into use measured in length not far from 3,000 feet, with an average depth of 14 or 15 feet, and several tons of chain were required to weight the bottom. The shed in which the eggs are taken was enclosed, furnished with door and windows and a stove, to guard against freezing in severe weather.

Owing to lack of rains, the waters in the salmon-pond was so low during the whole of the spawning season, that the salmon could not run out of the pond through the outlet that had been prepared for them, and it was therefore necessary to take them out of the enclosure with nets. A strong seine, of sufficient length to sweep the smaller enclosures as soon as the salmon entered them, was the main reliance, and a few gill-nets set in those sub-enclosures that could not conveniently be swept with the seine,

caught quite a number of salmon that might otherwise have spawned on the gravelly shores of the ponds. Constant plying of these nets left the gravid fish so little opportunity to deposit their eggs that the loss from this cause, which had been very great in former years, was now reduced to a minimum. Not a single spent salmon was found until twelve days after the commencement of the spawning season, and during the whole season only eight such were found. The whole number of salmon of all sorts re-captured, was also much greater than in former years.

The 590 salmon placed alive in the pond in the summer were reduced by known deaths to 562, and of this number 519 were caught in the fall, classified as follows :

Full females.....	333
Spent females.....	8
	341
Total females.....	341
Males.....	178
	519
Total of both sexes.....	519

The ratio of females to males was thus almost *two to one*, larger than ever before, a result very welcome, but quite unexpected.

The work of spawning was, on account of the low stage of the water, not began until October 31, several days later than usual. The following tabular statement shows the number of eggs taken daily :

SALMON CAUGHT.

Date—1874.	Males	Females	Eggs taken.
October 31,	44	79	431,700
November 2,	37	51	342,000
“ 3,	8	18	170,000
“ 4,	32	42	351,000
“ 5,	7	12	375,000
“ 6,	4	12	126,000
“ 7,	11	31	282,000
“ 9,	8	21	228,000
“ 10,	10	12	150,000
“ 11,	10	17	189,300
“ 12,	1	16	59,000
“ 13,	1	11	169,000
“ 14,	0	1	—
“ 15,	1	0	—

SALMON CAUGHT—Concluded.

Date—1874.	Males.	Females.	Eggs taken.
November 16,	1	0	—
“ 17,	0	3	38,000
“ 18,	0	1	—
“ 19,	1	2	—
“ 20,	0	4	24,500
“ 21,	0	3	—
“ 22,	2	2	—
“ 23,	0	1	60,500
“ 25,	0	1	—
“ 26,	0	0	9,000
“ 28,	0	1	7,000
Totals,	178	341	3,039,000

The cost of the season's work up to the time of distributing the eggs (March next,) may be estimated at about \$6,000, which gives \$2 per thousand as the cost of collecting, developing and packing the eggs. When compared with the cost in previous seasons, this shows a very satisfactory progress in the direction of economy, in the face of a smaller number of breeding salmon purchased and of the higher price paid for them. The following is a condensed statement of operations each year since the establishment of this enterprise on the Penobscot:

Year.	No. of Breeders bought.	No. of Eggs obtained.	Approximate cost of collecting eggs per thousand.	Ratio of Eggs taken to Breeders bought.
1871,	111	72,300	\$16 25	651
1872,	692	1,560,044	4 25	2,268
1873,	652	2,321,300	2 73	3,560
1874,	590	3,039,000	2 00	5,151

It will be observed that the reduction in the net cost, is accompanied by an increase in the ratio of eggs taken to fish bought. The ratio of the present season, 5,151 eggs for each fish bought, including both sexes, is supposed to be about the maximum obtainable under ordinary circumstances; but if the scale of operation be enlarged, as it can and ought to be, a still further reduction in cost of eggs per thousand may be confidently anticipated.

In regard to the California salmon now undergoing incubation here at your expense, I have to report as follows:

On the 28th day of October there were received 100,000 eggs, which had been shipped you by Mr. Stone from California, nine days before. On unpacking, the temperature of the interior of the box was found to be 70° F., that of the air, at the time and place, being 50° F. As might be expected, the inner portions of the package were in a very unhealthy state and very few of the eggs therein proved good. Those eggs in the outer portions of the package were, however, in very good condition. The whole number of bad eggs picked out to date is 62,600. Of the 37,400 remaining, about one-half are hatched out, making for the most part strong, healthy fish.

Very respectfully submitted.

CHARLES G. ATKINS.

Bucksport, Nov. 30, 1874.



COMMISSIONERS OF FISHERIES.

United States.

Prof. Spencer F. Baird	} Smithsonian Institute, Washington, D. C.

Maine.

E. M. Stilwell.....	Bangor.
Henry O. Stanley.....	Dixfield.

New Hampshire.

Oliver H. Noyes.....	Henniker.
John S. Wadleigh.....	Laconia.
A. C. Fifield.....	Enfield.

Vermont.

M. C. Edmunds.....	Weston.
M. Goldsmith.....	Rutland.

Massachusetts.

Theodore Lyman.....	Brookline.
E. A. Brackett.....	Winchester.
Asa French.....	South Braintree.

Connecticut.

William M. Hudson Hartford.
 Robert G. Pike..... Middletown.
 James A. Bill..... Lyme.

Rhode Island.

Newton Dexter Providence.
 Alfred A. Reed, Jr Providence.
 John H. Barden Scituate.

New York.

Horatio Seymour..... Utica.
 Robert B. Roosevelt..... New York City.
 Edward M. Smith Rochester.

Michigan.

J. J. Bagley Detroit.
 George H. Jerome..... Niles.
 George Clark..... Ecorse.

New Jersey.

J. R. Shotwell..... Rahway.
 G. A. Anderson..... Trenton.

Virginia.

William B. Ball..... Mid Lothian.
 Asa Wall Winchester.

Alabama.

Charles S. G. Doster..... Montgomery.
 Ro. Tyler..... Montgomery.
 D. R. Hundley..... Courtland.

California.

B. B. Redding..... Sacramento.
 S. R. Throckmorton..... San Francisco.
 J. D. Farwell..... San Francisco.

Pennsylvania.

H. J. Reeder..... Easton.
 B. L. Hewitt..... Holidaysburgh.
 J. Duffy..... Marietta.

Ohio.

John Hussey..... Lockland.
 John H. Klippart..... Columbus.
 E. T. Sterling..... Cleveland.

Iowa.

Sam B. Evans Ottumwa.
 B. F. Shaw Anamosa.
 Charles A. Haynes Waterloo.

Minnesota.

A. W. Latham Excelsior.

Dominion of Canada.

W. F. Witcher Ottawa.
 W. H. Venning St. John.
 Inspector of Fisheries for New Brunswick and Nova
 Scotia.