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AN ADDRESS

— ON —

FISH CULTURE

DELIVERED BEFORE THE

LEGISLATURE OF VERMONT,

On Tuesday Evening, November 12th, 1872.

— BY —

MIDDLETON GOLDSMITH, M. D.

RUTLAND :
TUTTLE & CO., PRINTERS.
1872.

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JOINT RESOLUTION INVITING DR. MIDDLETON
GOLDSMITH TO DELIVER AN ADDRESS ON THE
SUBJECT OF "FISHERIES OF VERMONT":

Resolved by the Senate and House of Representatives, That
Dr. Middleton Goldsmith, of Rutland, be invited to deliver an
address, in the Hall of the House of Representatives, on the sub-
ject of the Fisheries of Vermont, at such day as may suit his con-
venience.

FRANKLIN FAIRBANKS, *Speaker of the House.*

L. G. HINCKLEY, *President, pro tem., of the Senate.*

STATE OF VERMONT.

OFFICE OF SECRETARY OF STATE, }
MONTPELIER, NOV. 11th, 1872. }

A true copy of the original.

Witness my hand and official seal, date above written.

[L. S.]

GEORGE NICHOLS, *Secretary of State.*

STATE OF VERMONT.

OFFICE OF SECRETARY OF STATE, }
MONTPELIER, NOV. 11th, 1872. }

Prof. M. GOLDSMITH, Rutland,—

My Dear Sir : I have the honor to transmit to your
address the accompanying Joint Resolution, adopted by the General
Assembly of this State, on the 9th inst.

Trusting that you may be pleased to comply with the invitation
extended, I am,

Yours, very truly,

GEORGE NICHOLS, *Secretary.*

P. S.—The Hall will be occupied on the evenings of the 13th
and 14th insts.

G. N.

RUTLAND, VT., NOV. 12th, 1872.

GEORGE NICHOLS, *Secretary of State*,—

Sir : I have the honor to acknowledge the receipt of your communication of yesterday, inclosing a Joint Resolution of the Legislature, inviting me to deliver, in the Hall of the House of Representatives, an address on the subject of the Fisheries of Vermont, at such time as may suit my convenience.

In reply, I have to state I shall ask to be heard to-morrow evening, Tuesday, the 12th.

Very respectfully,

M. GOLDSMITH, *Com'r of Fisheries*.

STATE OF VERMONT.

SECRETARY OF SENATE'S OFFICE, }
MONTPELIER, NOV. 14, 1872. }

Dr. M. GOLDSMITH, Rutland,—

Dear Sir : Agreeably to a Joint Resolution of the General Assembly, I write you asking a copy of your address on "Fish Culture," delivered in the Hall of the House of Representatives, on Tuesday evening, Nov. 12th, for publication.

Hoping that you will comply with the request of the Legislature at your early convenience, I am, Sir,

Respectfully yours,

M. B. CARPENTER, *Sec'y of the Senate*.

RUTLAND, VT., NOV. 15th, 1872.

M. B. CARPENTER, *Secretary of the Senate*,—

Sir : I have the honor to acknowledge the receipt of your communication of the 15th inst., requesting for publication a copy of the address delivered in the Hall of the House of Representatives, on Tuesday, Nov. 12th. Herein you will find inclosed a paper containing the substance of the address I had the honor to make before the Legislature on the occasion above mentioned.

Very respectfully,

M. GOLDSMITH, *Com'r of Fisheries*.

ADDRESS.

GENTLEMEN:—

I am here to-night, by your direction, to lay before you something of the facts which we, the Commissioners of Fisheries, have gathered in regard to the fisheries of Vermont, as well as those facts which bear some relation to the usual and necessary regulations of fisheries.

The following is a succinct statement of the nature of your fisheries at the present time, and of the prospective changes and modifications entertained by your Commissioners. We have no data sufficient for any reliable computation of the amount or value of the production of your fisheries, except what will appear in the progress of what I shall have to say to you to-night.

From Lake Champlain we send to market white fish in six varieties, catfish, ling, bull-heads, buffalo, pike-perch, pike, muskalonge, black bass, yellow perch, sunfish, silver eel, mullet, smelt and an occasional salmon trout. Our smaller lakes yield speckled or brook trout, salmon trout, pike, pickerel, bull-heads, yellow perch, rock bass, suckers and black bass. Our large streams yield a few brook trout, pickerel, yellow perch and suckers. Our smaller streams yield trout, if anything worth the catching.

We have in our waters only one sea going fish, the smelt in Lake Champlain. The only other sea going

fish that have been found in any of our waters are salmon and shad.

The migratory fishes which can be added to our present list, are salmon, shad, and probably herring and sea trout. One of our smaller lakes contains a large quantity of one of the smaller kinds of white fish—several others, the eel.

The new fresh water fishes which, from our present information, it is desirable to introduce into localities fit for their multiplication and growth, are the Otsego bass, the Sebago salmon and the white perch of the Ohio.

The kinds now found in some of our waters which, we think, should be more extensively disseminated, are the white fish, salmon trout, black bass, pike-perch and silver eels.

The kinds of fish which especially need protection, are brook trout, salmon trout, pike-perch (called Lake Champlain pike), black bass, white fish and suckers, not because of the value of the last named for food for men, but for food for valuable fishes.

If each inhabitant of the State should eat one pound of fish per week, at the present average price, the annual cost would be one million nine hundred and eighty thousand dollars. It is safe to say that the present consumption is one million, most of which goes out of the State. It is perfectly safe to say that wise laws, properly enforced, would afford this same amount of food at one-half the cost, and keep most of the money at home. In other words, the most cautious estimate would reckon by this means a certain saving to the people of the State at least \$500,000 annually.

More than this, it is possible not only to diminish the cost, but in so doing to increase the consumption

to the degree that in place of being a simple luxury, seldom seen except upon the table of the well to do citizen, fish-food may be had by the poor as well. Still further, in place of being brought, as it is now, chiefly from Canada or from Boston, fish-food may be had almost at each man's door. Yet, still further, it is possible to supplant codfish and hake with salmon and shad, and had-dock and mackerel with trout and white fish.

As very few persons, who have not investigated the matter, are aware of the economic value of fisheries in inland lakes and streams, allow me to present a few facts in illustration of these values. I find them recorded in "Bertram's Harvest of the Sea." They are quoted from the Report of the British Commissioners of Fisheries. The fisheries of the river Tweed, and that before fish culture had materially improved them, were rented at one time for \$100,000. Those at Speymouth, on the river Spey, for \$65,000. Those on the Tay for \$85,000. Two rivers owned by the Duke of Sutherland, one six miles and the other eight miles long, rent for \$50,000. These are salmon fisheries; and I have cited these examples because the salmon is a kind of fish the introduction of which into our waters is practicable, and in your wisdom may become the ward of your legislation; and because, as will be seen hereafter, properties as valuable as these; properties of as handsome rental as these,—are possible to us, by the exercise of the necessary skill and liberality.

I may state further, as some illustration of the wealth producing function of the Scottish salmon fisheries (for in the instances just mentioned the rental of the several rivers is but the premium paid by fishermen for the privi-

lege of catching salmon in the streams), that the value of the salmon sent to the London market alone,—and this makes no account of those consumed in Scotland, or sent to Ireland and the great interior towns and cities of England—is, reckoning the value at a price per pound twenty per cent. less than that which obtains in this State, for the fifteen years inclusive from 1850 to 1865, eight million six hundred and eighty-nine thousand five hundred dollars (\$8,689,500).

Now Vermont has quite a number of streams fit for the production of salmon. Indeed, I am informed that Scotland has not a single river equal to the Connecticut, if you include its tributaries. Waiving the consideration of the fact that within quite a recent period a number of streams in Europe have been stocked which had never before been known to have salmon in them, Vermont has several important streams fit for producing salmon—fit because, all unchanged in the quality and quantity of water as they are now, they once produced salmon in the greatest abundance. Dr. Williams, in his history of Vermont, states that in his time they were abundant in most of the large streams of Vermont. Thompson reiterates the declaration. They were found in the Connecticut and its tributaries in such abundance that the hired men in the region of these waters were wont to make a stipulation, in their contracts for service, that they should be obliged to eat salmon but twice a week.

This fish once came in great numbers into Lake Champlain, and from it ascended all the penetrable rivers emptying into this body of water. The late Mr. Foquet of Plattsburg once told me that when he was a boy he had often seen the salmon approaching the river at Platts-

burg in such quantities that the line of their movement shoreward could be seen for some distance out on the lake, and that they were so abundant that the price at the fisheries did not exceed twenty-five cents a bushel basket. We get reliable accounts of the abundance of salmon in the Lamoille and Winooski.

If a man should appear before you to-night—one in whose intelligence and veracity you had unbounded confidence—and he should tell you that if you would provide a pathway through the confines of the State—that if you would only bridge over the impassable streams, every calf at weaning time turned loose upon the highway would go away to the distant pastures of the western wilds, and return, each to his owner's door, a full grown 3-year old, fat and ready for the butcher, I take it another spring time would hardly clothe our forests ere every stream would be bridged and every pathway smoothed for this bovine migration. Your Commissioners tell you to-night that, with a like pathway provided for migratory fishes, each salmon spawn, worth five cents weaned, will come back in two years worth \$3, and that each shad hatchling, costing less than a cent, will come back in three years a full grown fish worth twenty-five cents. More, they will tell you that acres upon acres of your barren wastes may be transformed into teeming harvest fields, yielding an annual income, and that without labor, which exceeds the richest acres of farming land. More than this, they tell you to-night that this not only can be done, but that it has been done elsewhere, and can be done in Vermont as well.

Already legislation has so increased the yield of shad in the Connecticut, and some other rivers, that the price has

receded at the fisheries from 40 cents to 4 cents apiece. Experiments on some of the British rivers have clearly demonstrated that analogous changes can be made, and have been made, in the production of shad and herring.

The management of fisheries concerns two great classes—those which live permanently in our waters, and those which visit them periodically.

Allow me, first, to draw your attention to the nature, habits and breeding waters of the salmon—and that, as a type of the migratory fishes—most of the conditions making one of them possible in our waters being the conditions for them all.

Almost all the rivers in Vermont present the necessary conditions for the culture of the salmon. It needs pure water, streams of moderate size, having in their course deep pools and clean, fine gravel beds. For it must be remembered that this fish comes to us from the sea simply to deposit its spawn in localities favorable to the hatching of the eggs and the rearing of the young. When the spawn is deposited, the old fish returns again to the sea, where in the deep waters of the North Atlantic it finds in countless myriads the species upon which it feeds. The whole growth of the fish, except during that of the first year, is at the expense of no fish-food found in our waters. An hundred thousand salmon in Onion River would consume no appreciable quantity of food, nor would they diminish in any sensible degree the quantum of fish of other varieties inhabiting the stream. A salmon stream stocked with trout yields as many trout as if there were no salmon in it.

To stock a river suitable for salmon with it, it is necessary only to hatch the salmon eggs in the stream. The

young fish remain for a season where they were hatched, living upon larvæ and insects like the trout. When they have arrived at about the size of a large brook shiner they go down to the sea, and, there being no insurmountable dam or fall, they come back again every year, growing larger and larger with each season. By the third year they are heavy fish. At even the first return they will weigh 5 lbs. and more. Once introduced, they will reproduce themselves in great abundance, provided only that they are not by prodigal fishing ruthlessly destroyed. The distance which both shad and salmon will travel to reach their spawning grounds is marvelous. Fifteen hundred miles away from the sea they sometimes go. While the salmon seeks clear streams and shallow waters with gravelly bottoms (for this fish deposits its spawn like trout, in holes dug in the gravel, and covered when spawned in), the shad seeks still waters and does not dig holes or cover its eggs. Nor are they able to leap over considerable obstructions, as salmon are; therefore they have been found heretofore in Vermont only in the Connecticut, and in that below the falls at Bellows Falls.

Smelt and herring spawn like the shad, but will pass more difficult obstructions.

Shad, smelt and salmon can come into Lake Champlain. There is now no obstruction to their passage; the Canadian authorities promise to keep the passage free, and to do, at the rapids of the Richelieu, whatever is necessary to improve or maintain that passage.

But no shad or salmon can come above Holyoke dam, on the Connecticut River, by reason of the dam; and until fish-ways are provided for this dam nothing can be done in this State which will restock the tributaries of

the river or the river itself, above Holyoke, with any sea going fish.*

It will be seen from the foregoing considerations that if the Legislature desires the restocking of any of its rivers with migratory fish, it will be necessary to open to them the channels of migration; and of course it is for them to say how this shall be done. Wherever there is a fall to be surmounted, a fall too high at present for fish to scale, ladders must be provided. It would seem,—and this has appeared to be the view taken of it by those legislatures which have taken the matter in hand,—that where the obstacles are natural obstacles, the State should be at the expense of building fish-ways, but that where the obstacles are artificial, those constructing them should be obliged to construct the fish-ways; and, therefore, I have respectfully to suggest that this Legislature will direct that wherever there are dams, or other artificial obstructions to the passage of migratory fish, the builders of such dam or obstructions shall build the necessary fish-ways, when called upon by the fish commissioners to do it, and that the necessary appropriations be made for constructing such fish-ways over natural obstructions in such streams, open to the sea, as the commissioners may select for stocking with shad or salmon.

In regard to stocking ponds and lakes and streams which are non-navigable, it will be necessary for the judi-

* I was asked, on the occasion of the delivery of this address, how it was known that salmon and other fishes always return to the streams in which they were hatched. It was finally determined in this way: "At some of the hatching establishments, like that at Stromontfield, a number of the young salmon ready to go down to the sea were marked in various ways—some by cutting off the little fin on the back, some by inserting little gold or silver rings into their fins. Those having these marks returned in diminished numbers (for only a certain proportion of all turned loose escaped destruction from various causes) to the streams in which they were hatched, and none were ever caught with these marks in any other stream.

ciary or the Legislature initially to determine the boundary between public and personal rights and property. The following questions are to be solved: What acts are necessary to be done to transform the fish, in a pond surrounded with land owned by one individual,—a pond or lake embraced within the original survey,—from their original condition of *feræ naturæ*,—liable to capture according to constitutional provision,—into domesticated animals and private property? The same question pertains to all non-navigable streams, so far as those streams are bounded by lands on both sides owned by one individual. Do the owners of land on Lake Champlain hold any fishing rights in the waters bordering their lands?

Assuming that the State has an undoubted right to regulate and control fisheries and fishing within her boundaries, it is well to glance for a moment at the possibilities in the matter of fish culture in this direction.

The limit of the production in any given waters is the food for fishes existing in or producible in the given waters. For present issues, it is sufficient to divide our fishes into those which are flesh and those which are vegetable eaters. Then again, of these there are some which for various reasons affect or flourish best in deep, and others, again, flourish best in shallow waters. Lakes with bold shores and deep waters are best fitted for certain kinds of fishes, and lakes with level shores and shallow, reedy waters are best adapted to certain other kinds. Temperature, however, comes in to qualify these conditions.

Ponds stocked with predatory fishes are stocked on the Kilkenny cat principle. They prey upon one another. But ponds stocked with vegetable eaters, as well as flesh eaters, are vastly more prolific. The grass feeding fishes

become the food of the predatory. Now it so happens that some of the grass eaters are our best table fish, as, for example, the white fish in their several varieties. Hence a wise policy is that which seeks to establish in each pond those varieties which are, in the first place, best adapted to the nature of the pond, its depth, temperature and food supply; and which, from their habits of life, are mutually inter-dependent.

Thus, for illustration, a lake like Lake Dunmore, containing salmon trout and having deep waters, might be also stocked with some of the smaller varieties of white fish. The result would be that the white fish would grow in such abundance as to yield annually tons of food in their own proper persons, and by reason of affording from their numbers additional food for the trout already existing, the trout, from being scarce, would in time become exceedingly abundant. To put black bass, pike, or any other predatory fish into such a lake would only have the effect of diminishing the quantum of trout, without increasing the aggregate amount of fish, and in so doing would only deteriorate the quality of the fish produced, in so far as the bass and pike, inferior fishes, supplanted the trout, a superior fish.

It will be seen from this that the laws necessary for fish culture of one lake are not those best for another, and that in order that the Legislature should be able to legislate intelligently with regard to the choice of fishes to be introduced into various waters, a visit to each lake would be required, as well as a thorough acquaintance with the whole subject of fish culture. Hence it would seem to be advisable to remit this part of the matter to the discretion of the Commissioners of Fisheries.

For the purpose of stocking habitable waters with fishes suited to the waters, recourse is now most economically had to the process of collecting, fecundating the eggs of the various desired kinds, incubating them to the degree most favorable for transportation, and hatching them in the waters the fish are intended to inhabit. For this purpose central establishments, under skilled supervision, are required. Whether this State will choose to have one of her own, or purchase the necessary ova from hatching establishments already erected, is a mere economic question.

Another matter to be determined is the rights of owners of lands on Lake Champlain and on the Connecticut in the fisheries adjacent to their lands. If the fishermen employing nets along the shores of Lake Champlain would simply save the spawn of the fishes they take at spawning time, impregnate it, and place the eggs thus secured in conditions favorable to the hatching of the eggs, the fishing grounds thus stocked with spawn would soon teem with fish. As it now is, there are no adequate personal motives operating upon individual fishermen. For they say, We have no exclusive right to the fisheries at any given place; if we had, or if we could legally acquire them, we should at once and always thus utilize the spawn, which, in the present state of things, goes to absolute waste. It seems probable that the establishment of riparian rights by the State, vested in adjoining land owners, or in the State itself, would tend largely to increase the fish supply, provided the fishing was controlled and regulated by competent authority.

The regulation of the fisheries is a *sine qua non*. One great evil to be prevented is the wanton or wasteful de-

struction of fish at certain seasons. An instance of this pernicious practice is found in the pike fisheries in Lake Champlain in the early spring. The pike, during the months of March and April, seeks, for the purpose of spawning, the shallower parts of the lake, and the streams running into it, in such immense quantities, and are taken in such vast numbers, that they cannot be disposed of, for the reason that the supply is much greater than the demand. That which is true of pike is true also of other fishes, so that, in practical effect, the present modes of fishing,—while they tend to the gradual decrease of the finer sorts, gluts the market at those seasons in which fish are kept with difficulty, and therefore will not bear distant transportation,—tend in the same degree to produce great scarcity during all the other seasons of the year.

In order, therefore, to keep up our present supply, and especially if we desire to increase it, it will become necessary to frame such laws and regulations as will prevent this wholesale destruction, and will maintain for each tribe a sufficient close time during the spawning season as will secure the spawning of a number of eggs sufficient to secure the abundant reproduction of all the desirable varieties.

In circumstances in which a close time, from economic considerations, as in shad fisheries, may not be desirable, such close time may be compensated by the artificial hatching *in situ*. This is done in some measure, and successfully, in the Connecticut and Hudson Rivers. And it is done thus: At certain points, which for obvious reasons are at the head of the shad waters, men are stationed, at the spawning season, with nets and seines, who capture the mature fish, and, gathering the spawn, hatch out the

millions of young shad sufficient to produce the quantity of shad required by the commercial necessities of those rivers. The cost of these establishments may be paid by the State out of the public treasury, or by a royalty gathered from the fisheries. The cost of such establishments is almost nominal, since all of the fish caught are as well fitted for the market after being used for the purposes of propagation, as they would have been had they been used for no such purpose. Indeed, not more than 10 per cent. of the fish taken in any one draught of the seines are ripe. The sale of the fish goes a great way towards the whole expenditure.

Inasmuch as the raising of the fish in private preserves is fast coming, in this State, to be a settled branch of industry, promising to those who pursue it, to be a profitable branch of industry, it would seem to be well for the State to pass such laws as will favor, protect and foster this industrial measure. It so happens that in this, as in most matters to be learned, demonstration is a more available teacher than literature can ever be. A State hatching establishment, involving, as it does, breeding as well, situated at some central point, like Montpelier or Rutland, would do more for the rapid dissemination of a knowledge of the best methods than all the reports which could possibly be scattered through the State. Beside, at such an institution, there could be determined by skilled experiment all these economic questions as yet but poorly determined, and which lie at the bottom of the whole matter of this branch of fish culture. What is the cost of a pound of trout expressed in pounds flesh? What

are the most available sources of fish-food? How can worthless animal matter best be utilized in the feeding of domesticated fishes? What kinds of fishes can be most economically reared? These and many kindred questions must be answered before fish husbandry can be successfully established as a domestic industry. No one is so well able to do this as the State. No experiments undertaken by individuals would carry with them the authentic character of those performed under the sanction of the commonwealth.

Besides, the present state of science of fish culture indicates that we may have much to gain by introducing new varieties, not noted to our waters. The measures necessary to bring this about can be carried out successfully by no one but the State.

It so happens that the expense involved in doing all the State can do, is exceedingly small in comparison with what may be effected by it.

The preservation of trout in our mountain streams implies much more than the mere increase of food or revenue from their exportation. Trout fishing is a treasured recreation. The opportunities for its practice brings hundreds of the residents of cities to enjoy it—to fill our hotels—to ride upon our railways—to patronize our livery stables, to consume and make home markets for our agricultural products. To learn our industries, our mines, our forests, our manufactories, and often to invest in them. To learn our ways and people, to breathe in health and elastic vigor with our mountain air; to feast their eyes on our grand old hills, clad in vernal green.

It helps to lure our children back to us for a season,

in the summer time ; back from the din and whirl of busy cities ; back to the peaceful hearths of our quiet homesteads, where, upon the altars of their fathers' homes, they renew again the covenants of love and brotherhood. Surely, in even this workaday world, this is worth something.

It would seem that, in view of the preservation and perpetuation, ownership might be the most effectual means. While trout are, in some sense, everybody's property, no one is especially interested in their preservation. If a hunter falls in with a flock of wild turkeys, he will shoot if he can every one—not leaving a single hen or gobbler, and this whether he needs them or not, whether he can eat them or not—in part from that inherent love of slaughter which taints our blood—in part from the vanity of killing largely of game. From whatever cause he kills them all. Now, if he owned the flock, whether he loved roast turkey or not, he would kill them as they came into condition, and would be sure to save a gobbler and a hen or two. It would hardly be wise legislation, having in view the largest production of mutton, to declare all sheep *feræ naturæ*—wild animals, as the law now holds trout and other fish to be. Rather legislation should seek to confirm ownership, and provide severe penalties for killing anybody's sheep except one's own. That which seems to be wisdom in the one case may probably be wisdom in the other. At all events, the present laws for the preservation of trout are wholly inadequate. For, as nobody owns them, there is no sense of wrong doing in destroying them in the juvenile mind. And I need not remind my hearers that it is somewhat

difficult to enforce a law which does not appeal to the moral sense of the people. In most foreign countries the fish, living in a stream running through occupied lands, are held to be the landlord's private property, as much as the grass he never sowed, or the trees he never planted. So that every man or boy who poaches upon his neighbor's streams knows that he is a thief—feels that he is a thief, and is punished as a thief. In such countries the streams are productive properties. Productive to the owner in fish or in rental—productive to the commonwealth in that, being husbanded and protected against indiscriminate slaughter, they add to the food of the people. I am clearly of the opinion that no legislation will be effectual in making trout abundant in our streams, save that which makes them in certain waters and on certain conditions private property, and as such protects them.

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An address on fish culture, delivered be

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