

"THE HISTORY OF MICHIGAN GRAYLING"

About the year 1855, when the writer was a resident of the City of Grand Rapids, Michigan, a report became current that a new and peculiar kind of brook trout were being caught in certain tributaries of the Muskegon River, and other of the northern streams of the lower peninsula of the state. That these trout differed from the well known "speckled trout" of the eastern states in that the "specks" corresponding to the crimson ones of the latter, in this new species were black, and that there were other marked differences, among which was also mentioned the dorsal fin, which was represented to be of gigantic proportions, and so indescribably beautiful as to have suggested the name of "Banner Trout" from its supposed resemblance to the starred and striped flag of the United States.

The impression became quite general in Grand Rapids, that this new gamey and magnificent trout existed in all of the streams of that section of the state, either alone, or along with the more common kind. A few only holding to the belief that the new species existed there to the exclusion of all others, until about the year 1859, when the attention of some of the sportsmen of Grand Rapids, who had been in the habit of making periodical or business visits to that section of Michigan - the heart of our superb hunting and fishing grounds (haunts) - was called to its investigation.

The subject of this article then becoming discussed was found that not only did this fish abound in most of the streams of the region above mentioned, but that he was often found, along with his royal cousin, the brook trout proper, Salmo fontinalis, inhabiting the same stream, whilst others contained but one of two kinds, and yet in other waters, near by, and connected together, as principal and tributary, no brook trout of any kind had been discovered!

We come now down to the time of the first identification of the new trout as a Grayling.

In the month of June, 1861, Mr. John T. Elliott then and now a citizen of Grand Rapids, about going on a business trip into Mecosta county, Dr. J. C. Parker, also of said city, and a member of the present Board of Michigan Fish Commissioners, suggested to Mr. Elliott, the procuring and bringing home with him, on his return, a specimen of the new fish for examination, comparison and if possible, identification. This was done; and the following is what Mr. Elliott says about it -

"I engaged some Indians and we went to a small tributary of the Muskegon River, that empties into it at a place called 'Roger's Crossing' about four miles below Big Rapids, where we got thirty very fine ones. This brook is not more than four feet wide; but had numerous deep holes, and eddies under logs where the fish lay in great numbers. The Indians were very expert in catching them, by means of hooks fastened on the ends of sticks in this way - to wit:- laying lengthwise on the logs, with face close to the water and carefully getting the hook under the fish they would lift them out. I preserved some in salt and took them to Dr. Parker, to whom belongs the credit of bringing this new fish to the notice of the public. I understood that one was sent to Professor Aggasis, who called it the 'Grayling'."

Up to this time, this trout had been known by as many different names as localities where found. Among which may be mentioned the following:- "Michigan Trout", "Cisco", "Banner Trout", "Shiner", etc.

Some of the Grayling received by Dr. Parker, as above narrated, were exhibited before the members of the "Kent Scientific Institute", a literary association connected with the High School of that city, and the new fish was then identified as a grayling, receiving its first scientific christening of "Thymallus Michiganeuvix".

Nevertheless, we will utter no word in derogation of the high honor and supreme credit justly due to Daniel H. Fitzhugh of Bay City, by whose persistent efforts and untiring labor, ten years later, when greater public prominence was given to this fish. Indeed it may be said to be strictly true, that, notwithstanding the earlier discovery and identification of this rare American grayling, and limited publication therefore from the western slope of the state, to Mr. Fitzhugh properly belongs the credit he has universally received, of being "the father of the grayling", first found by him in the Au Sable River of the eastern slope of Michigan, the outcome of which has been, most unfortunately, to attach to him the misnomer of "Thymallus Tricolor" or that other cognomen, or worse than no name - "Signifes".

To Dr. Fitzhugh's indefatigable labors of love for the preservation and artificial propagation of this rare and beautiful trout, two expeditions of exploration and observation, for the capture and domestication of the grayling, under the auspices of the state have been planned and executed.

The first of these went into camp in the grayling country, in the eastern part of the state on the 14th day of April 1877, and the second on the 30th day of March, 1878. In neither of these expeditions, were any definite and valuable results achieved beyond the taking of any desired number of adult grayling, and the gathering of a small and unsatisfactory lot of artificially impregnated eggs, which never developed into living fish.

Various and oft repeated attempts have been made from time to time, both by the States of Michigan and New York, as well as by private parties, to reduce the Michigan grayling to domestication and bring him within the art of artificial reproduction, like others of the family Salmonidae, but without more than partial success until the past season, as a glance at the various reports will show.

Notably, among these or the one most nearly successful, mention will here be made of the expedition of Mr. Seth Green of the New York State Hatchery, to the Au Sable River of Michigan, in 1874, and its results, as embodying the sum total of both the measure of success and failure up to the date of the issue of his new book entitled "Fish Hatching and Fish Catching" in December, 1879.

Mr. Green states, pages 133-135, of above entitled work, that he "dug up one hundred and six impregnated eggs that had been deposited in the natural method", sending them directly to the New York State establishment at Cadedonia, where they arrived, with the loss of one only, on May 4th - himself following with "eighty-large grayling . . . first eggs hatched May 8th, last on the 11th" - fry commenced foraging for food on the 12th. "All swimming on the 15th", saying that, "they are about three inches long in December".

Mr. Green states the "time of incubation" of grayling eggs to be about the same as brook trout. A conclusion without warrant, from the premises, for the reason that he could not have known when the eggs he "dug up" were impregnated.

He describes the fry as "resembling the young of whitefish", but larger - which does not accord with our observations and experience.

His interesting chapter, devoted to this fish, concludes as follows:-

"These are the first and only grayling ever hatched artificially up to the present time, however, March, 1879, the grayling have exhibited no desire to spawn, and do not enter the raceway for that purpose, what they would do if turned out free in our eastern streams, we cannot say, but when kept in confinement, they will not spawn with us, and hence are useless to the fish culturist, whatever they may yet prove to be in the sportsman."

This after five years of possession and persistent experiment.

The Report of the Superintendent of the Michigan State Fisheries for the years 1877-8, issued in the early winter of 1879, gives ample details of the many discouragements, and fruitless endeavors to artificially propagate the grayling from stock fish kept for that purpose, and concludes with the forlorn hope of being able to reclaim him from threatened annihilation by the establishment of a temporary local hatchery on one of the streams, containing them, to be kept up until this that far most obstinate fish shall be pleased to yield up its secret, as to "time and manner of reproduction"!

The hope that is expressed and doubtless faithfully entertained by many, had so nearly been abandoned, that the writer has in his possession numerous letters of discouragement received from those who had repeatedly tried and failed - expressive of their convictions of having been given up all hope of ever artificially rearing grayling from fish held in captivity.

Nevertheless, with faith supreme, amidst all these "Doubting Thomases", the writer undertook, under the kind auspices of the Michigan Board of Fish Commissioners, the task of finding the hidden key that should unlock the icy prison home that held in its sombre shadows, the grayling secret in its grasp.

To this end, in October, 1879, a half hundred adult grayling that had been held captive in the State Hatchery at Pokagon without favorable results, were transferred to the private ponds of Martin Metcalf at Battle Creek in Calhoun County.

When first received, these were placed in a preserve containing an area of about four square rods, and having an average depth of three or more feet, with several small covers, or basins about its irregular border, seemingly suitable for acceptable "fish beds" for natural fish propagation. This pond is fed by copious springs near by, the water of which is highly charged with the red oxide of iron, commonly called "Mineral Springs" - some of which are embraced within its bed; the temperature of the springs remaining very nearly uniform throughout the year at fifty degrees Fahrenheit, most of the ponds ranging from forty-five to sixty degrees, between the extreme of winter and summer.

As an experiment, sixteen of the grayling were soon afterward transferred to a lower and shallower pond, above which they had the liberty of a rapid brook for thirty rods.

Here they appeared discontented, and persisted in going down instead of up stream, as intended; and eight of them jumped four very thin cascades in succession, each having a vertical fall of one foot, and below these, four of the fish scaled a screen wall two feet high, and three feet lengthwise the stream!

Three of them were soon recovered before reaching the Kalamagoo river a hundred rods distant, faded and blanched to the exact color of the sandy bed of the brooklet; the remaining ones escaping search for five weeks, at the end of which time it was discovered amongst a mass of vegetation that had sprung up on a wide-spread bar of accumulated debris with the dorsal fin and about one-half of his fish ship out of water - bleached nearly white by exposure.

Placed in a covered trough, from which twilight was excluded, along side of one of his fellows in normal condition, the contrast was most striking; but far less wonderful than the change that was wrought in a few short hours. Thus protected almost entirely from the light, four days had scarcely intervened before it became impossible to recognize the one from the other!!

Yet others of the grayling were apportioned among different ponds; varying in distance from the springs, and depth of water to that of ten feet or more.

In the preserve first above described, the grayling seemed contented, and early in January, 1880, there appeared indications of pairing, in the seeking of some of them of the retired cover, or basins, before mentioned from which vicinity, all intruders were sharply driven.

Daily, and oft-repeated observation during the month following, gave unmistakable evidence of the approaching, spawning season in the movements of several pairs, but none passed far up the open raceway, or tarried, for more than a moment, above its mouth; the possession of which was sharply contested by severe battles.

During this month, a small female was killed and inspection disclosed, by actual count, 777, apparently nearly ripe eggs.

About the first of March, another small female was dispatched with results exactly similar, save only that the eggs appeared to be perceptibly larger and nearer ripe than before. A change in the color of the fish became more and more discernible. The males, for the most part wearing a richer half yellow, half crimson tint, the colors fading imperceptibly and curiously blending and changing, as the fish passed by below the observer, in the slanting sun-light.

With all of these accumulating evidences before him, the writer feeling convinced of early and complete success, could not help giving voice to his convictions in conversation with Michigan's most worthy Superintendent of Fisheries. He also communicated the gratifying promises to Mr. Sth Green of New York - the latter of whom responded that he had "no faith" in any such favorable result - whilst Mr. Putnam simply replied that he "hoped" all would end well, but feared that we would not succeed where so many had utterly and signally failed.

Hence it happened, that a third expedition to the grayling country - partially planned long before - was not abandoned, but undertaken in order to "render assurance doubly sure", in the early spring of 1880, to be executed by Mr. Metcalf at his discretion.

This expedition went into camp on the west bank of the Hersey River in Osceola county, about one mile north of Reed City, between the track of the Grand Rapids and

Indiana Railroad, and river at a point where the two run parallel from the north and but a few rods apart, on the 25th day of March, 1880.

This river is a tributary to the Muskegon, flowing from the northwest toward the southeast while the upper branches of the Pere Marquette, are in close proximity to the west, flowing in an opposite direction, and from the opposite side of the "divide" or watershed between these two streams.

The point selected proved to have been well chosen, because of the Railroad facilities thus afforded in every direction - it being intended, after "interviewing" the grayling and other denizens of the Hersey, to proceed to the Pere Marquette for a like purpose; and then away to the north, over the long line of the G. & I. which crosses almost numberless brooks and rivers literally "swarming" with either "speckled trout", "grayling", or both, every few miles of its way.

On March 27th, but two days after reaching camp - a dispatch from Battle Creek to "Camp Metcalf" on the Hersey, conveyed the gratifying fact that the first ripe grayling eggs had been artificially taken and successfully fecundated from the grayling denizens of the Battle Creek ponds!

On April 4th, ripe eggs and milt were taken at camp, and very soon thereafter, simultaneously with the above intelligence thence transmitted, and by its suggestion, the adult grayling in the State preserves at Pokagon were overhauled and their condition found to almost exactly correspond with those at Battle Creek and those freshly taken captive from their native waters!

Who could longer doubt that the long sought for "key" had been found and that the "grayling problem" was solved at last?

There only remained the demonstration, in the artificial hatching the eggs and rearing the living fish.

But, in order to render the promised success certain and complete, the work of the expedition was not allowed to rest, but Mr. Metcalf and his son yet tarried on the bleak banks of these northern rapidly running rivers daily wading to the am-pits in water at from thirty-four to forty degrees, amidst such snow and wind storms as only the great northwest can boast of, through floods unprecedented, that held the waters far above any known high water mark until the July sun sent the almost unceasing storms by which the early spring of the year 1880 will be long remembered, howling back to their northern homes - never doubting for one single moment the successful issue as a final reward for so much of privation, toil and suffering.

Being remonstrated with by one of Michigan's most worthy and accomplished members of her Board of Fish Commissioners, for staying longer, after victory had been seemingly achieved, response was given as follows:- "Not yet have I ever seen the end of the grayling spawn, when this is over -

"On Jordan's stormy banks I'll stand!
And cast the fish alluring fly.
Over her bars of shimmering sand,
Where the sly trout and grayling lie.

"No threatening storms of snow or rain
Belated March lends April now -
Nor the tempestuous hurricane
Shall chill the ardor of my vow.

"From his cold icy haunts to sift
The secret of the Grayling's spawn.
Unlock his mystic bolts and lift
The breaking shadows of the dawn.

"Then to my southern nest I'll hie,
Where heart and home and treasures are
And here no longer 'cast the fly'
From wild-wood banks of tangled fir
Nor longer will I worship God,
With hook and line and fishing rod!"

From observation of the habits of the grayling, both in his native fastnesses, and in artificial enclosures, the attentive student must be convinced that the parent fish do not penetrate to the very sources of the rivers, nor seek so shallow waters as do brook trout proper, for spawning beds; but choose rather, the deeper places where the water whirls in eddies, and in the darker "holes" and twilight under sunken logs where the current jetty tends to "scour" the bottom and clean the sand, but not with sufficient force to lift the lighter grayling egg from its chosen cradle.

During the spawning season, here the ripe and ripening parents will be always found dropping immediately down stream and scattering to cover as the work for which they annually migrate is accomplished.

All through the nesting season, we searched in vain for any considerable number of adult fish, or a single one of the young of the previous year's hatch, in the little brooklets, and up to the head springs where the brook trout will go if they can get there, and where the "fry" will be found until a year old.

The use of the "net" as well as "fly" determined the same thing, by gathering both old and young from the deep water.

Here let me ask the question - How many of the most experienced disciples of Walton have ever seen the grayling fry?

Grayling make their annual visits to their spawning grounds to be sure, like all other of the finney tribes; and then scatter, the larger mainly falling down stream; but the grayling occupy a relatively mid-way position, and have a less wide range than the brook trout. For instance, in the Muskegon River proper, very few are ever met with, and these pass but a very little way from the mouths of the tributaries containing them, and have never, it is believed, been known to crop that river! Since in none of the southeastern tributaries are grayling found; even though its branches flowing from the northwest are full of them, and the confluence of some of these opposite tributaries are in close proximity!

Whether the character of the water flowing from the northwest charged, as it is, with the red oxide of iron, and its waves and bed abounding in the infinite and infinitesimal egg larvae and parent of the cyclops, and other small crustaceae is necessary for the existence of the fry, in their natural condition; and the opposite shore is lacking or deficient in these essentials, appears to be, at the present time, one of the unknown quantities.

As has been seen, the grayling do not tarry up stream so far as brook trout, neither do they seek out the various little shallow brooklets that make up the mid-way branches of these great Michigan rivers - unless indeed where, as in many cases, such smaller branches meander through the thick mases of dark cedar swamps, abounding in deep dark holes and basins.

In his normal condition which doubtless will be modified by domestication, as in other instances in the animal kingdom - wherever a large lakelet breaks the thread of a stream or the brook spreads out over a shallow bottom for a considerable distance, letting the bright sunlight stream in, unbroken, nature seems to have set about to the animal pilgrimage of the grayling for spawning purposes.

Hence it has happened that fish culturists who wait for the usual signs of the mating and spawning of brook trout in the management of the Michigan grayling will wait for that which is not likely to occur.

There are many striking peculiarities that mark this fish, and distinguish him from all his cousins, beside his before mentioned habit of confining his periodical migrations to certain local lines and limits, and others already noticed, important among which and most perplexing of all to the fish culturist, must be mentioned that of the retention by the females of her eggs for an indefinite length of time when from lack of suitable spawning grounds, or other necessary conditions, unknown to the writer, until they become over-ripe and incapable of impregnation. The body of the female thus holding her eggs over, becomes distended by reason of an abnormal development of the ova so held, often and usually resulting in disease and death to the parent fish - and always, so far as known and believed, resulting in the loss of every egg.

We have ourself found individuals thus holding over far into July, and numbers of fishermen familiar with this fish in his native home, ever that they have so found them all through the summer months!

Even in their native waters we found some in this condition so late as the middle of May, and in our own ponds, both of those captured last spring and others of the catch of previous years, numbers so held their eggs.

Such fish become listless, and so devoid of activity, and bereft of their natural faculties and instincts as to be often taken out of the water by the hand without struggle.

All but bursting with their burden of over-ripe eggs, the slightest manipulation causes them to be extruded; every one of which is found to be stone dead! In color a little shade lighter than fully ripened unfertilized eggs, and quite as large, often and usually larger than live ones lately fertilized, they appear otherwise nearly natural; and the careless observer concludes that the spawning season is not yet over; but a chance egg dropping into water, betrays its lifeless character in the loss of its orange tint almost instantly.

Some few of the females thus holding over are believed to gradually void their eggs and recuperate; but the great majority seem to dreamily linger along in comparative isolation from their fellows for awhile, frequently becoming the victims of the disease called "fungus" - though not always. They are finally seized with a sudden spasum, in the struggles of which they will jump a foot or more out of the water; and

at its end - which lasts but a moment, they are dead.

The original habitat of the Michigan Grayling presumably included all of the rapidly running streams to the north of and including the Muskegon and its branches; since he is now found in both the eastern and western portions of this division of the state; and in various of its streams, at intervals, up to the extreme northern limit of the lower peninsula, and was an inhabitant, within the early recollection of many living witnesses, of the Boardman, Boyne, Jordan, and other rivers where he is not now found in any appreciable numbers.

Dr. E. S. Holmes of Grand Rapids, President of the Michigan State Sportsmen's Association, informs me that when he first visited the Boyne and Boardman, some twenty-five years ago, at least one half of his catch of fish were grayling - the proportion of the latter gradually diminishing year by year. Indeed, it is said to be within the memory of some, when no brook trout were found in either of the rivers above mentioned, a fact now supposed to be true as to the Au Sable, Manistee, Pere Marquette, Hersey and other of the notable grayling streams. Yet the writer caught a "speckled trout" in the Hersey, near Reed City in 1872, and last season, no less than seven were taken out of the same river near that point!

Now, by what means, and in what manner these apparently new-coming strangers are introduced, and so suddenly appear, it is not our purpose here to discuss any more than it is that either puzzle or paradox, of how a vegetable growth appears at times and in places where no possible seed could conceivably have been planted.

With these facts in view, it is confidently predicted, that the more voracious maw, and predacious habit of the brook trout will render him at no distant day, the royal ruler and sole salmonoid inhabitant of all such streams as give him entrance,

Whether this result is imaginary or not, and if nay, but in accord with that Darwinian discovery of the "survival of the fittest", we leave for the cogitation of the curious.

As for ourselves, we incline to that other opinion, that the tendency is the other way and that the "fittest" to live often die. "Whoever the Gods love, die young", is a pretty trite old saying - and that the young grayling, that do not live, die very young - and at the mouths of brook trout if any are around - one needs but to trust a dozen month old grayling fry with a single "chicken trout" to be convinced.

The reason for this is plain. Brook trout fry appear from the middle of December to February 20th in the grayling latitudes, while the latter do not break the shell till April 20th, and the wee tiny, grayling baby is no match for a troutlet of some age - therefore, it is of just the right size and consistency to be "sucked in" by the mouthful by his formidable cousin of cannibal propensities. Hence it appears evident, that the trout must supercede the grayling in the same stream, as certainly as that the tender chicken, or chick turkey must make room for the intruding weasel or detested skunk. And not because of or in accordance with that wonderfully happy law of nature, of the "survival of the fittest".

From the above cause, and others to presently appear, the grayling is fast disappearing from Michigan waters, and will, together with his gamey and beautiful kinsman, at no very distant day, be numbered with the things that were and are not - unless some effectual bar shall be erected to prevent the indiscriminate "slaughter of the innocents" and universal use of our most superb fish breeding grounds as deposits for the dust of saw-mills and sewers for everything that is vile under the sun.

On everyone of the grayling rivers we visited, and most of the trout streams, as well, a full tide of choking dust filled the current for many miles, driving every salmonoid before its remorseless waves; and from many of the smaller brooklets they have already been confessedly annihilated. On the Pere Marquette River, nets and spears were also plying, in open daylight, in defiance of law and at one place on the Pere Marquette River, near Baldwin the County seat of Lake county, we counted nineteen men and boys with spears in their hands "punching everything they saw that had -" as they replied to a question - "a fishes head on" !!! A month later, at Boyne Falls, boys and men, were everywhere taking trout with hook and line, using the little yearling for bait for larger fish by thousands! - not in violation of any law! Little thinking, and probably caring less, for the inevitable consequences, that such a course must soon end.

And yet, some of these truly good, innocent and pious people (!) "affected a wonderful sensitiveness upon the subject of fish preservation (?) when reverting a fact of our "taking away" a few hundred "live trout" for fish cultural purposes! ! !

And right here, I cannot refrain from stating the fact - known of all men visiting that point - that the principal proprietor of the site of Boyne Falls, and who owns or controls, the great saw mill situated in the heart of that beautiful little city, permits its polluting flood of vile dust to flow almost uninterruptedly, like a deadly upas, into the otherwise wonderfully pure and transparent, wending cascade that rushes, glistening and sparkling, as it leaps along its winding, plunging, headlong zig-zag way, down to Michigan's great inland sea.

Casting the "fly" from her banks immediately below the mill at a time when the dust was running and when it was not, told only too well what we need not, perhaps, make mention of here - viz:- that the dust drove every trout before its full and turbid current.

A few hours of rest, as of a night, or over Sunday, and we could pull ashore the "speckled beauties" at almost every step.

Down to its mouth, and up, up, up, up to the very sources of this rushing torrent did we climb to an altitude of 300 feet above the little city of Boyne Falls, threading through the tangles of cedar swamps, and winding through the maple forests where the "stalwarts" have stood for centuries, and the clear sparkling waters first kiss the sunlight, as they leap out from beneath towering hemlocks, and from a soil as rich as the sun ever saw - where neither monster maple, sky piercing hemlock or virgin soil as yet broken by the hand of civilization; we wended our way with the ever present brook trout for constant companionship, and the little fry readily taken by the bare hand at every step.

O ye starving millions of the pent up East! - Never before did we realize the full import of the sage advice of that old "Son of York", to "Go West Young Man" - although we have beheld almost every portion of the great southwest and west. Never before have we seen any place where the man of limited means can so easily, quickly and certainly secure to himself a comfortable home in a country so near market and environed by avenues of trade and commerce that must soon make this now almost wilderness, the rival of Central New York, which it so nearly resembles in soil, timber and every natural endowment; if it shall not, when cleared of its forests, even outstrip that "Garden of the Empire State" in all that goes to make up a rich and prosperous community. Nearer to markets, with railroad and lake communications to every quarter of the habitable globe, arable lands at from four to eight dollars per acre, is such a

temptation to any one to enter the wilderness and especially to the emigrant seeking a home, that once seen, it cannot be forgotten.

I know it is the general impression, even in central and southern Michigan, that the northern portion of our state is one vast wild waste of pine barren, away up toward the north pole somewhere near to the spot where Sir John Franklin's bones have lain so long undiscovered, but that false notion is now fast being dispelled, as the tourist and traveller of today is rapidly and pleasantly whirled over the long line of the Grand Rapids and Indians; past tasty farm houses, surrounded by young orchards, bearing their luscious burdens of tender peaches, apples and other fruits of supposed warmer lands further south. - Sees in swift panorama, swirling villages and thriving cities that have here sprung up as if by the Magician's wand, within the past few years, for more than one hundred miles along the artery of this already great avenue of trade and commerce.

But this is en passant -

Having considered some of the peculiarities both of the grayling and brook trout as well as glanced at the causes of the gradual diminution of each; let us now see if there is no remedy within reach whereby our magnificent American representative of the grayling may be rescued from threatened extinction and the brook trout also prevented from following and sharing the same fate?

As has been seen, the chances for the joint propagation and protection of both in the same waters, is very small indeed, - not from any natural antagonism between them, or that the two sub-families will not "lie down together in peace", so that "a little child shall feed them", but first - because of the differences in time of reproduction and size of the young, as before noted, and second - for the reason that the brook trout is, par excellence, a carnivorous fish; and of such voracious appetite, that when driven by hunger he will not hesitate at the seeming impossibility of swallowing whole, one of his own flesh and blood of more than half his size and weight! - So that, when the trout and grayling do lie down together; as they assuredly will - without apparent thought of harm on the part of the trustful grayling, it is the old, old story of Jonah and the Whale - with the grayling on the inside.

There are many spring lakes and brooks in our country in which no fish, of any kind are found - notably in Michigan, and certainly containing no predatory fishes. Into these, it is believed, the grayling might be introduced with reasonable prospect of success. The fact that he is not found in lakes to which he has access, is no proof to the contrary, for the reason, among others, that these so far as known, are the breeding grounds of pickerel, black bass, and other of our most ravenous fish sharks.

That the grayling will live and thrive in much warmer waters than brook trout, we are well assured, both by analogy and experiment.

With the knowledge already acquired, and such friendly legislation by the general Government, and auxiliary aid in the several states, as the most progressive fish culturists desire, and ought soon to secure, it is confidently anticipated that the fish to which this paper is mainly devoted - and most interesting of all our finney hosts, shall be preserved and perpetuated; and that fish food of every desirable kind will abound throughout the land, and its pursuit because both a health giving pleasure and source of profit to all the inhabitants of our wide-spread domain.

We will now return to the grayling camp on the Hersey, and follow the footsteps that led to their rearing the past season.

Storms unprecedented and fearfully high water, tearing madly from their ordinarily extremely rapid courses, prevented the taking of but a very few grayling from the Hersey, until far into April. A few ripe eggs were taken and duly fertilized on April 2nd, which were lost in the great flood following. Afterward more were taken, many of which were lost as before, some were shipped to Battle Creek, a few more were forwarded to the New York Hatchery at Caledonia, and a few placed in a Holton Hatching box, in a miniature hatchery established in the basement of the mill at Reed City, for the purpose of ascertaining whether the water of the Hersey is necessary or more suitable for grayling propagation than elsewhere.

Since leaving Reed City, I have learned that those left in charge of Mr. Norris in his mill, all died in from five to seven days, as did those fish taken at Battle Creek and all taken at Pokagon.

These sent to Caledonia, by request of Mr. Seth, Green, died on the way - as I am informed by him - weather turning very warm for this season of the year. It was then May 6th.

No certain means were at hand at Reed City, for determining the temperature of the water; but it is believed to have been not far from forty degrees. At Battle Creek, prior to April 23rd, the date on which my eldest son reached home, a considerable quantity of eggs had been taken and apparently duly fertilized. These were placed under varying conditions, and in water ranging all along from thirty-four to fifty degrees without hatching in any numbers. A few did break the shell at fifty degrees - but none lived a single day, - appearing to expire at the very moment of birth.

The failures and disappointments above cited, served as steps toward that success afterward attained, however, since my eldest son, Foster M. Metcalf, immediately after reaching home, assigned to himself the task of not only saving the considerable quantity of eggs yet on the trays, and supposed to be near maturity, but to try every possible expedient that had been suggested to each and all of us during this trying period of our investigations and misfortunes.

Through sleepless nights and restless, watchful days, he kept constant vigil over his precious charge of tiny eggs that day by day, like fleeting dew departed from his longing sight. Gradually raising the temperature, one egg finally did hatch - at fifty degrees, but the frail new born thing was dead! And thus perished the last grayling egg taken prior to April 20th. On that day every adult grayling carried by him from Reed City, was manipulated, but not one ripe egg was found! Although the fish had started on their long journey chock full of eggs, they had been mostly voided on the way, and the "milt" of the males had so discolored the water as to give it a seim-milky appearance. Over-hauling the grayling that had wintered at Battle Creek, ripe eggs and milt was obtained and placed in water at a yet higher temperature, as also were more taken a few days after from ripening fish carried from the Hersey, the details of which as gleaned from our record book, appears below:-

To Wit:- "Eggs taken at Camp Metcalf, on the Hersey River, in Osceola County, on April 20th and 21st, taken to Battle Creek on the 22nd and placed in Holton Hatching boxes, temperature fifty-five degrees, and

transferred to troughs on May 3rd, a few hours after hatching had commenced, water sixty degrees - last egg hatched on May 7th".

"Eggs taken from grayling received from State Hatchery at Pokagon in October, 1879, on April 24th were placed in a Parker revolving drum, the invention of Dr. J. C. Parker of the Michigan State Board of Fish Commissioners, water sixty degrees, commenced hatching on May 4th - then transferred to troughs, water sixty degrees - last hatched on May 8th."

Average period of incubation about thirteen and one-half days.

Although we failed of hatching healthy fish, below fifty-five degrees - there were other differing conditions, such as food supply, etc., etc., etc., which perhaps, had something to do with the successful rearing at higher temperatures; although it must be conceded that the eggs, fry, and mature grayling, if they do not require, at least, prefer a higher temperature than brook trout. In fact the adult grayling will live in water without change or aeration, long after brook trout confined with em, are dead. In some other respects they are more hardy, and tenacious of life; but the eggs are much smaller, more delicate and tender, of less specific gravity, and require greater care in their treatment. The newly hatched fry, too, are exceedingly frail and tiny - in fact so very small are they, that a person might look into a pail full of clear spring water containing thousands, and not see one of them! Wire cloth of fourteen meshes to the inch - such as is used in screens for confining trout fry, offers absolutely no bar to their free passage, even before the food sac is absorbed.

In rearing the grayling the trouble begins right here, as with most other fish, and when it is considered how very small they are - and that a grayling of any size will choke to death in trying to swallow food that brook trout of the same size, will "get away with" by the hand full - the cause of the trouble becomes apparent. They must be fed very slowly, often, and of the finest kind of fish food; such as blood, or cream, diluted with water at first, the periods apart of feeding gradually widening, as the young get older. At a week old they will feed on the ova of the smaller fresh water crustaceae, called cyclops, with which many probably the beds of most, spring brooks abound. These eggs are laid in shallow places, and adhere to the stones, blades of grass, or anything pendant in the water wherever it ripples rapidly, from January to July, in the latitude of central Michigan. At two weeks of age the fry may lunch on the larvae of the same, or the eggs of the larger crustaceae, commonly called schrimp, of which class there are many kinds, after which they will if driven to it by hunger, partake sparingly of the old standby - "bonny clabber", or "lobbered milk" - but they don't seem to take kindly to it, and I don't know as they should be blamed very much.

The growth of the grayling I judge to be more rapid than brook trout. With us they have kept even pace with the highly prized California mountain trout, which we hatched at the same time. The average is about the same, that is, the weight - the best trout measuring five and the longest grayling six inches in length at this date. November 20th. It being bourne in mind that our C.M.T. are of a very late hatch.

Before closing this letter, we should say something more in reference to certain peculiarities attaching to the grayling ova.

When first taken, ripe grayling eggs, in normal condition, vary in tint from a bright straw to a rich orange; the color focalizing in a few moments after fertiliza-

tion, at the egg center, leaving the outer portion perfectly clear and transparent. They so appear to the naked eye for about twenty-four hours when the food sac begins to show itself, increasing rapidly to about one-half the diameter of the egg: and, like the rest of it, perfectly transparent.

In five days more, the nucleus develops into a huge pair of eyes, and a hairy like body, which latter lies curled around the sac, and becomes endowed with life; as is evidenced by the "kicking" of the restless little embryo.

When the period of incubation is nearly spent, the shell suddenly shrivels, and one might be led to think that no life existed within; but at a spasmodic "kick" of the inmate, or a slight brush of the feather, out jumps the little grayling, as clear as the water itself, save only the two black specks which serve for eyes. On close inspection, the food sac and body are discernable; but the former is quite small and soon absorbed.

There seems to be a disease affecting grayling eggs to which the ova of other fish are not subject. This first becomes visible in the appearance of a minute opaque white speck on the outside of the egg, which soon develops into a film-like web and rapidly spreading, covers its entire surface. At the slightest attempt to move the egg, the web is broken into infinitesimal fragments; and is diffused over the screens and all its contents; carrying the contagion, and certain death to every egg to which any portion of these gossamer fragments are allowed to adhere.

The only remedy yet discovered is a constant and careful scrutiny of the screens and a prompt removal of every infected egg; no matter how insignificant the "speck" may appear; and a thorough elimination of every fragmentary filament. If left in the trays the eggs all become white, and coated with that radiating finger growth common to all dead fish ova.

(Signed) - M. Metcalf

Battle Creek, Michigan

November 20, 1880.