"I wind about and in and out
With here a blossom sailing
And here and there a lusty trout
And here and there a grayling"


Ex-libris
Charles Atwood
Kofoid
BMC

Yours f

Jo ubas

April 25th, 1816

John D. Quackenbos.

GEOLOGICAL ANCESTORS
OF THE
BROOK TROUT
AND
RECENT SAIBLING FORMS FROM WHICH IT EVOLVED

BY

JOHN D. QUACKENBOS, A. M., M. D.

Emeritus Professor in Columbia University
Fellow of the New York Academy of Medicine,
and of the New Hampshire Medical Society
Member of the New York Medical Association, of the American Medical Association, of the American Association for the Advancement of Science

ILLUSTRATED

PUBLISHED FOR THE ANGLERS' CLUB OF NEW YORK
BY
TOBIAS A. WRIGHT
No. 150 BLEECKER STREET, NEW YORK

1916

Read at a regular meeting of the
Anglers' Club of New York
Hotel Navarre, March 9th, 1915

No. 106

Limited Edition of
Three Hundred Signed Copies

CONTENTS

THANKWORD

The author of this monograph takes pleasure in acknowledging his indebtedness to Dr. William C. Kendall of the United States Bureau of Fisheries, who has critically revised its pages in the light of researches made by him in many regions—to the Boston Society of Natural History for a number of the fish figures—and to Walter H. Rich of Portland, Maine, for the color schemes of the blue back and Dublin Pond trouts.

And he owes the inspiration, if inspiration it be, that prompted the thought and feeling in what succeeds to a coterie of congenial spirits, whilom readers with him of the books in the running brooks, now waiting his coming on the farther shore of the river we cross but once.

HALLOWWORD

TO MY FATHER

in commemorative esteem; my beloved companion of the lake and river, creator of my taste for field sports, the embodiment of all that is refined, courtly, humane, self-forgetful, noble, chivalric in the man—long a dweller in that land where earth's fond aspirations are perfectly fulfilled—this little volume is reverently and affectionately inscribed.

FOREWORD

A preface is rightfully an apology, or as a moat defensive to a castle. The apologetic value of this foreword is left to the scholarly reader to determine. But the foss that separates him from the entertainment beyond is doubtless the broadest and deepest he has ever encountered, spread out like the clear waters of a lake of winsome prospects that distract from the object of its passage and are lotus-eaten by the soul. He will find himself held up by vista after vista that will render his approach to what is coming far from tedious, until at the close he is lost in flights beyond the ether.

In few, this prelude represents a most impudent defiance of the canons of literary criticism, for which infraction of law warrant may be found, especially among anglers, who are traditionally careless of statutory requirements and quite ready to plead the threadbare excuse of *ignorantia legis*. Who among us has not gone a fishing the day before the law "went off?" When the fever of impatient expectation reaches its

height, the delirious subject has been known to act on the assumption of Louis XIV., "L'etat c'est moi." So I may be forgiven for taking the law into my own hands and rambling afield among the esthetics and amenities of angling.

The following pages were written by an angler for anglers. An angler is a true sportsman. He takes fish in a chivalrous manner, never for the mere pleasure of killing. He is always humane, courteous, and unselfish. He must be a gentleman. Angling is something more than catching fish, in that it is not a means of obtaining a livelihood. It implies a certain degree of aesthetic culture, and is thus pre-eminently the pastime of the man of letters, the brain worker's diversion. The meditative, benevolent, magnanimous nature of the angler is proverbial—his sympathetic disposition, his regard for the rights of others, his moderation in pursuit of his sport. Angling may therefore be appropriately defined as a "school of virtues" in which men learn lessons of wisdom, resignation, forbearance, and love—love for the lower forms of animal life, love for their fellow-creatures, and love for the God of nature.

The scholarly angler is naturally interested in the history of his craft, a "holy and virtuous recreation" long before the days of Nimrod. He finds in troglodyte tracings of fishes evidence that cave men of the paleolithic age were as susceptible as he to its fascinations. He fishes in imagination with prehistoric brothers who engraved upon their ornaments rude representations of angling scenes and exploits. He examines, in the remains of lacustrine settlements, the fishing implements of the neolithic age. From Egyptian paintings, he learns that angling was considered an amusement worthy of the leisure of the high-born; Mexican pictographs suggest the systematic instruction in this art offered to the Aztec youth; and disentombed fish-hooks of bronze and gold give inkling of the luxurious tackle in use among the subjects of the Incas. Both Greeks and Romans pursued angling for amusement's sake. From the Iliad and Odyssey to Oppian's "Halieuticks," a second century treatise in verse on the natural history of fishes and the ancient methods of capturing them, there were piscatory poets who dwelt on the delights of their favorite avocation.

The angler has a fellowly feeling for them all. He finds the first allusion to fly fishing in the Epigrams

of Martial, wherein is sung the rising of the feast-famous *Scarus* (akin to our tautog) "decoyed by fraudful flies," and delights in the consummate description of this method of angling for trout as told by Claudius Elian in a second century zoology. Ausonius of Bordeaux (4th century A. D.) in his "Mosella" speaks of the Salar (common brown trout) "starred with spots," and then there is a break in the literature relating to this subject until we come to the interesting work of Dame Juliana Berners, prioress of Sopwell Nunnery at St. Albans, the first English authoress and the earliest writer in English on field sports—"A Treatyse of Fysshynge wyth an Angle," printed in England in 1496. This treatise, probably a compilation from monkish manuscripts that are lost, presents detailed instructions for the manufacture of tackle and describes minutely a "Jurie of XII flyes wyth wyche ye shall angle to ye trought and grayllyng." These flies I have had tied by a modern expert in accordance with the directions given in the treatise, and they not only do credit to the taste of "Fishin' Julie," but are without superiors among the novelties of to-day.

The good Dame's monograph proved a source of inspiration to a horde of succeeding writers who scrupled not to adopt the nun's sentiments and borrow her instructions verbatim. Leonard Mascall's "Booke of Fishing with Hooke and Line" (1590), the next work of importance in England, is largely a reproduction of the Essay of the literary prioress. "The Secrets of Angling," a poem by John Dennys, appeared in 1613; and in 1651 Thomas Barker's "The Art of Angling," the first book in which the reel is described, although some find evidence of its earlier use in certain allusions of Shakespeare, who as a youth pursued the fish fauna of his native Avon. Meanwhile there was published at Lyons (1554) Rondelet's "De Piscibus," from whose quaint Latin the reader may glean many an angling axiom; and he is fortunate who lays hand on du Bartas' "Devine Weekes and Workes," rare book of 1605, thought with good reason to have inspired the pen of John Milton, in which is told the loves and habits of the "speckle-starred" trout that frequents the "swift tumbling Torrents and the sleepie Pooles" (Sylvester's translation). How the angler revels in these old expositions that precede the great classic of 1653, Walton's "Compleat Angler; or, the Contem-

plative Man's Recreation," which has reached its one hundredth edition. Of this book Charles Lamb wrote: "It would sweeten a man's temper at any time to read it; it would Christianize every discordant angry passion." Behither the date of its first publication, at least one thousand volumes have been written on subjects connected with fishing, so that the literature of angling is one of the richest departments of English letters. The enthusiast who wades through this literature may dredge from its mud of commonplace many a pearl of thought and not a little gold of practical suggestion. And, when so informed by the angling writers of other days, he is prepared to receive enlightenment from a constellation of modern specialists, and graduate a proficient not only in the literature of the knightly art, but in every branch of its technic.

And then your angler is a scientician. He discriminates, reflects, strives to master mysteries. Investigation is a favorite divertisement. A trout with strange markings stirs his curiosity. He looks for accurate knowledge regarding its origin and life history. He reaches back into those absolute beginnings that are beyond the stretch of exact cognizance, and becomes deep scienced in the mazy lore. The very rocks with their beryls and garnets and tourmalin prisms, their striations, Indian kettles, and caverns dripping stalactite, speak in voices of impassioned truth. The mountain streams he fishes and the water gaps disclose their story of erosion, of ranges slowly rising, of rivers enforcing their right of way through barriers which vainly sought to block their paths. His pursuit tends to develop in the angler the instincts of a philosopher. He naturally informs himself also regarding the plant life associated with his sport, the pink and snowy chequer of the spring; the mosses, and fungi and ferns; the rose purple fire weeds, blue gentians, cardinal clusters, and silvery clematis tangles of the summer; the waxy stems of Indian pipe nodding their corpse-white flowers over the roots on which they feed, and orchid beauties that tessellate the forest floors or hide their blooming wonders in the wannish-gray light of the fens. He loves to familiarize himself with the phenomena of their growth and multiplication. He knows the language the wild flowers speak—the trilliums streaked with flame, the anemones and arbutus tufts of May, the slipper-shaped cypripediums, the violets that spangle the meadows, the

honeysuckles in orient pearl breathing their odors through the June days, and the blackberry blossoms that Walt Whitman said would adorn the parlors of Heaven. But "born to joy and pleasance," queen of his heart among them all,

"O'er her tall blades the crested fleur-de-lis,
Like blue-eyed Pallas, towers erect and free."

And lastly, as you have inferred, the true angler is more or less of a poet. He is peculiarly susceptible to the beautiful. By beauty I mean a true quality, incapable of analysis but appreciable by a mode of perception, and perfectly real to the perceiver. We cannot define it, but we can realize that it means thought or feeling uttered in some perfect form by the divine reason or the imagination of man. It is the manifestation of an aesthetic idea. The principle that seems to explain it, that lies at the basis of all beautiful impression, is the principle of harmony, which involves the action of God's universal laws on substances and forces of His creation, to realize in each case some specific purpose of His own. In this consists design, the adaptation of means to an end. In this is comprehended the happy fulfillments of function in living things, whereby

Ruskin explained vital beauty.

An aesthetic person is one who can perceive and loves the beautiful. Aesthetic pleasure results from the perception of beauty in nature, art, or literature, in the human intellect, or in character. Ugliness, the opposite of beauty, gives rise to aesthetic pain. Beauty, grandeur and pathos, then—all that can soothe the mind, gratify the imagination, or move the affections—belong the province of the aesthetic, and give rise to feelings which constitute a most important element in happiness. The indulgence of such aesthetic feelings brightens and elevates life. On the other hand, mere absence of beauty, or the presence of what is aesthetically ugly, tends to make men depressed and miserable and hard to live with. Nothing is so insignificant that it has not a beautiful side, that it does not suggest some glimpse of spiritual loveliness; and no pen can depict the power of a soul that recognizes the beautiful in the humblest creations of God, and lives in an atmosphere of poetry—of beauty plus spirituality, of transfigured life.

The art of living is the art of filling every hour of life with beautiful thoughts, beautiful deeds, kindness

graciously expressed. It is life for the best things, the highest things.

Such a life the genuine angler normally lives. He gathers the spiritual interpretation. To him, all matter is ensouled. The quiet woods are conscious. Such a man was my colleague at Columbia University, General William Pettit Trowbridge, Professor of Engineering, and a fellow member of the Hammonasset Fishing Club of New Haven. After his untimely death in 1893, I wrote the following commemorative poem in quatrains modeled after those of Fitzgerald's translation of the Rubaiyat, and entitled it "May Memories." It utters the spirit of true angling as I interpret it, and is here given to the American reader for the first time.

MAY MEMORIES

(*Meo Amico Jucundo*)

The days have come when we were wont to dream
Of blossom'd branch, bird song, and plenteous stream,
 That bosom friend and I. Ah! me, how sad
To word alone the old heart-cheering theme.

THE TALE OF THE FISHES

Alone, for now he sleeps beneath the grass,
Dear comrade, godlike man, death-claim'd— Alas!
Alone by Hammonasett's side I drift
The deft decoys as whispering waters mass,

With thought of him. His form I all but see,
His manly glance, his carriage proud and free,
His jacket dight with purple pinxter-flowers—
Oh! how I priz'd his unselfish love for me.

And oft he pluck'd some wild-blow by the burn,
Pausing its petals reverently to turn,
And read such impress of Supreme design,
That angels might have stoop'd to look and learn.

So side by side we lived as one and lo'ed
The weird inspiring stillness of the wood,
The flow of brook, the summer hush of lake,
The glossy meres where water-lilies bud,

The hum of toiling bee, the nesting trill,
The flush of dawn and sky-set daffodil,
The sacrament of souls as wood glooms fall
And wakes Gray Twilight's voice of "Whip-poor-will."

'Tis gone—I see a grave in city fair,
And tear-swept faces bending low in prayer,
And blanch'd hands stretch'd from sable robes to lay
Pale roses on the lov'd form resting there.

And O my God! I cry, as I along
The woodland ways mid vernal bloom and song—
    That ties like this must break, that earth must lose
Such lives so gentle, chivalrous, and strong.

Yet sweet the memories of that absent friend—
Absent, not lost, Oh! who may comprehend
    Those flashes of his presence at the stream
Dimpled by trout where feathery brackens bend.

The man who gives his softer hours to angling as I have pictured it, who walks beneath the branch and under the simpleness of the sky, impressionable by supreme realities, receives cosmic vibrations impalpable to the carnal touch, thinks thoughts that fade not with the setting sun. He brings home to himself the divine amenities of our gentle craft in which he finds the alembic for jaded brain and woe-tyed heart. For he is *en rapport* with the Soul of the Wild, that mysterious Presence which, to quote from "Tintern Abbey," disturbs one with "the joy of elevated thoughts,"

                    "A sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,

> And the blue sky, and in the mind of man:
> A motion and a spirit, that impels
> All thinking things, all objects of all thought,
> And rolls through all things. Therefore I am still
> A lover of the meadows and the woods,
> And mountains, and of all that we behold
> From this green earth—well pleased to recognize
> In nature and the language of the sense,
> The anchor of my purest thought, the nurse,
> The guide, the guardian of my heart, and soul
> Of all my moral being."

And this must be my apology for presenting the pages that follow.

THE TALE OF THE FISHES

In the summer of 1882, while casting for black bass at Lake Sunapee, N. H., I was asked by a gentleman fishing from a boat nearby to weigh a large trout that he had just caught. The trout had been taken in comparatively deep water, was silvery in coloration, and had a practically square tail. It weighed just 4 pounds. "What is it?" the captor asked. After a moment's thought, I said, "Why, it is a brook trout"—for it was evidently neither a blue-back (*Salvelinus oquassa*) nor a laker with mackerel tail (*Salvelinus namaycush*), and Agassiz had said there were only three trouts in New England. So by exclusion it must be *fontinalis* I did not know for three years that I had discovered on that July day a new species of *Salvelinus* not known at that time to exist on the American continent. But such proved to be the fact. In October, 1885, a boy of the neighborhood accidentally came upon a midlake spawning-bed, an acre or two in area, covered with hundreds of the new fish ranging

from one to ten pounds in weight, and reported his discovery to the Fish Commissioner. Specimens were at once sent to Washington and Cambridge for identification, and there followed an animated discussion of six years duration in regard to the origin of the form, some contending that it was descended from German saibling imported from Europe (none of which, however, found their way into Lake Sunapee), others that is was an overgrown blueback (this species having been introduced from Maine a number of years before), some few that it was a hybrid, and others again that it was an aboriginal variety. Owing to its silvery appearance in summer, it came to be known as the *white trout.*

But the Sunapee fish is not a *trout* at all; it is a *charr*, in common with the so-called brook and lake trouts. Charrs derive their name from a Gælic word meaning *red* or *blood-colored*, and thus appropriately describing the ruddy charms of these fishes. They are distinguished from trout, not only by their more gaudy rose madder or orange coloration, especially at the nuptial season, but also by the absence of teeth on the body of the vomer, a boat-shaped bone in the front part of the roof of the mouth. Trouts (*Salmones*) have a single or double row of teeth on this bone. Charrs (*Salvelini*) have teeth only on the head or chevron of the vomer in the back part of the roof of the mouth, and these often feebly developed. The charrs are more beautiful, more gracefully shaped, more intelligent, wary, and difficult of capture, and more delicately flavored, than the trouts, and hence are more highly treasured by the angler. They are accounted the aristocracy of our *Salmonidae*. The common lake trout (*togue* or *longe*), the blue back, the Dolly Varden trout, a western cousin of our brook trout, and the Sunapee form are charrs. The cut-throat or black-spotted trout of the Pacific Slope, the rainbow trout, with the brown trout of Europe and the Loch Leven trout, both which latter have been acclimated in American waters, are true trouts.

Our discussion regarding the Sunapee saibling brought out the fact that there were congeneric sea-run forms in Canada, and that our fish and forms like it of a highly variable Alpine charr, were indigenous to the Northland. So we decided on the evidence that it was home-grown—a representative relic of a race

once widely distributed—when all our lakes were cold and pure and pebbly, but gradually becoming extinct as the great glacier melted toward the north and the waters in its wake grew warm. It is known to survive in three New England lakes, Sunapee and Dan Hole Pond in New Hampshire, and Flood's Pond in the town of Otis, near Mt. Desert in Maine—all three very deep and excessively cold, and well stocked with the native food of the saibling. In many other lakes it has presumably been starved out and killed by rising temperature, as has been the case in Europe, charrs having become extinct in some waters, notably Loch Leven, almost within the memory of living men.

Changing conditions modify fish forms, and it was suggested that this charr now known as the *Salvelinus alpinus aureolus* from its golden hue, was the parent type from which our charrs of the brook and lake differentiated. The lake trout, however, can not be a derivative from this square-tailed fish, but is rather a variant from some older fork-tailed stock, which, together with the remote ancestors of the saibling group, is divergent from a still earlier common primordial forbear—a theory strengthened by the discovery of fossil trout in deposits of the cold Pleistocene Period. But the close relationship that exists between the Sunapee saibling and the common *fontinalis*, and the existence of an intermediate form in Dublin Pond, N. H., half way along in the process of differentiation, with structural peculiarities, points of coloration, and habits peculiar in part both to the ancestral saibling and the derived brook trout, establishes my contention that our beauty of the brooks, as conditions changed in post-glacial time, differentiated from this quaternary charr.

The distinguishing features of the Sunapee fish are the presence of basi-branchial teeth as described between the lower extremities of the first two gill arches; the total absence of mottling or vermiculation on the dark sea-green back and excessively developed fins; inconspicuous yellow spots without a suggestion of areola; a slightly emarginate tail; a small and delicately shaped head, diminutive aristocratic mouth, liquid planetary eyes, and a generally graceful build; a phenomenally brilliant nuptial coloration, recalling the foreign appellatives of "gilt charr" and "golden saibling."

It hugs the pure polar depths of the lake at a temperature of 38 to 45 degrees Fahrenheit under the pres-

sure of 100 feet of water, until the penetrating chill of autumn reminds it of its connubial obligations. These are met the last week in October by the ascent of a serried column many thousand strong to a rocky shoal set in the geographical centre of the lake. Every saibling capable of procreation seeks this spawning-bed for it is the only one in the lake over which a current sets toward the outlet. The constant change of water implied in such a current is necessary to the life of the eggs. Their healthy development depends upon aeration. All this, the parent fish are instinctively aware of, so they will not deposit eggs on any other reef no matter how otherwise well adapted or convenient, nor on the motionless sandy bottoms.

As the pairing-time approaches, the Sunapee fish becomes resplendent with the flushes of maturing passion. The steel green mantle of the back and shoulders now seems to dissolve into a dreamy "bloom" of amethyst through which the daffodil spots of midsummer blaze out in points of flame, while below the lateral line all is dazzling orange. The fins catch the tones of the adjacent parts, and pectoral, ventral, anal, and lower lobe of caudal are striped with a snowy white band. There are conspicuous differences in intensity of general coloration, and the gaudy dyes of the milter are tempered in the spawner to a creamy white or olive chrome, with spots of orient opal. The wedding garment nature has given to this charr is indeed agleam with heavenly alchemy.

And its pursuit and capture with a five-ounce six-strip and delicate tackle baffles description, for the game qualities of the white trout are estimated to be double those of the *fontinalis*. To land a 4-pound saibling in his prime implies the sublimination of vigilance and dexterity. The fish holds the coign of vantage. When he stands back and with bull-dog pertinacity wrenches savagely at the line—when he doubles in a desperate dash for liberty, the angler is at his mercy. But, brother of the sleave-silk and tinsel, when you gaze upon your captive lying asphyxiated on the surface, his last mad rush for life frustrated, his last wintle over, a synthesis of qualities that make a perfect fish—when you disengage him from the meshes of the landing net, and place his icy figure in your outstretched palms, and watch the tropæolin glow of his awakening loves soften into cream tints, and the cream tints pale

into the pearl of moonstone as the muscles of respiration grow feebler and more irregular in their contraction —you will experience an erethism of internal exaltation that the capture of no other fish can excite. It is this after-come of pleasure, this delight of contemplation and speculation of which the scientific angler never wearies, that lends a charm absolutely *sui generis* to the pursuit of this Alpine charr—a fish of which it has been said that one can not study its fascinating past as an autochthon and familiarize himself with its impressive life habits without conviction, as he becomes acquainted with the wonderful evolution implied in its survival, of the existence of a God.

And this is the fish from which has diverged our "gold-sprinkled living arrow of the white water, able to zigzag up the cataract, able to loiter in the rapids, whose dainty meat is the glancing butterfly" (Myron Reed). Can we wonder that he is the one perfect fish in all the world? God be praised that he had the good taste to abandon in the course of his evolution the lacustrine depths where we never should have known him, and give his life to the riffles that chatter through the enameled champaign and to the stately flow of the silent river under the demitints of the soundless forest.

The missing link between these two fishes that I confidently designate as such, is the pale gray or silver trout of Dublin Pond, N. H., called after the great naturalist *Salvelinus agassizii.* Since the country was opened and its fish fauna were noted by man, the brook trout and this unique salmonoid have lived together in the cold, deep (125 ft.) spring-fed pond under the shadow of Monadnock mountain. The two species have used the same spawning beds from date immemorial, though at different times, and have never hybridized. Under similar conditions, the Alpine and the brook trout have co-existed in Lake Sunapee, the ancestral fish following, like man and the higher mammalia, but by watery channels, the retreating ice fields, and swarming into the granite basin of this lake excavated anew for its reception by the erosive power of the glacier and filled with melting snows. Here it was all but exterminated, owing to the depredations of its enemies, the yellow perch and the miller's thumb, when black bass were introduced in 1868 to destroy these enemies in turn and afford it a chance to increase. Fish

culture has since added many millions to its ranks.

The Dublin Pond trout has perplexed the most eminent ichthyologists. It has been classed as a lake trout (*namaycush*), for its tail is somewhat forked and it attains a weight of 3 to 4 lbs.—as a lissome pattern of the brook trout—as a mere color variation of the same fish—and Agassiz decided that it was an independent form allied to the deep water charrs of the Swiss lakes, and predicted that it would be found elsewhere, for he did not believe nature made this beautiful fish for *one little pond* in New Hampshire. And he was right. The subsequent discovery of Alpine forms justified his assumption. And Dr. W. C. Kendall, of the U. S. Bureau of Fisheries, has called my attention to the existence, north of the St. Lawrence, of charrs classified as *fontinalis*, that are more nearly allied to the ancestral saibling group than to the brook trout—true intermediate congenetic forms that strengthen the induction. Some years ago I described in the *American Angler* one species resembling the Dublin fish in build and coloration, specimens having been sent to me from the Province of Quebec—as pale and opalescent, with furcate tail and hardly visible lemon spots, that looked to me as its Dublin congener appeared to a local writer—like "a bar of mother of pearl."

The charr in question is closely allied to the Sunapee saibling, favoring this fish in its deep-water and lake-spawning habits (on stony shallows, and not in the outlet—there are no inlets) ; in the presence in some specimens of teeth on the root of the tongue; in its deeply notched or lunate tail; and in the absence of mottling on its back of "solid green with silvery glints." But in its habit of rising to the surface in search of insect food during May and early June, when it readily takes a fly, worm, or minnow; in its assumption of occasional vermilion spots aureoled with blue or lilac halo; and in the characteristic marbling on the dorsal fin and upper lobe of the caudal, it resembles the brook trout. Whereas this latter fish can change his shades in twenty minutes to adjust himself to a color environment, he can not at will marble his fins and back with vermiculations and punctulate his ocellated skin with spots of fire in lilac frame, to engage the eye and rivet the affections of his paramour. No Michael Angelo was He who fashioned the temple of this exquisite fish form made perfect through millennia of differentiation

in the evolutionary process—for the pleasure of man. And the lacustrian charr that has for thousands of years affected the mysterious depths of Dublin Pond represents a lingering "relic," Dr. Kendall suggests to me, "of a southward distribution of the *intermediate race*" with many representatives still surviving in Canadian waters—the present-day derivative having become specialized in the common brook trout we all know and love so well. The very mention of that name fills each of us with eagerness. Another month or two and he will be awaiting our deftly offered temptations in the nearby streams—and is he not associated with all that makes our Northern spring the very proxy of Heaven?

In that glad season atween June and May—
When chlorophyl tints leaf and bud,
And incense breathes from field and wood
Of blooms run idle through the days
Of languid clouds and mountain haze,
When music such as art knows not
Bursts from each joyous feathered throat,
And endless factors swell the bliss
Of a soul-spelling synthesis—

I can but obey the call of the wild, and am constrained to repeat the old, old invitation, but couched in verses of my own making:—

Come, gentle friend, and hie with me
  Through pastures violet-pied,
To wet the yellow May fly
  In the rude stream's foam-beat tide,

Where broidered in azalea spray
  The thickets blush recluse,
And towers beside the queachy path
  The sky-dyed flower-de-luce.

Come, float your lure o'er dusky pool,
  Heart-clutched by surging hopes,
Where melt in one a hundred springs
  Sped from high-blooming slopes.

A rise! a fish! How flit your looks
  'Twixt certainty and doubt—
'Tis mine to watch your rod respond
  To rush of steel-struck trout.

And now among the fern he lies,
  A roseate blaze in green;
What brush may paint, what pen describe
  That symmetry and sheen.

And as his glorious colors fade,
  Deep thoughts crowd rathe and rife,
For pictured in the lapsing stream
  Is limned the tale of life.

How much in common we enjoy
  These pleasures of the rod!
They cement friendship here, and lift
  To commerce with our God.

Since this paper was written, Dr. Kendall has discovered in Christine Lake, in the township of Stark, Coos Co., N. H., a beautiful fish form intermediate between the Dublin Pond trout and the brook trout, thus undeniably confirming the author's theory of evolution. The Kendall fish represents a more advanced degree of the differential step toward the *fontinalis*, nearer to it than any other divergent form. The Dublin Pond charr is a late divergent, but the new species is still more recent. It is small, rarely attaining a weight of half a pound, but game. Its mackerel shape is more graceful in outline than that of the brook trout. The tail is decidedly forked. The colors emulate those of the Sunapee saibling, the sides being profusely dappled with carmine spots surrounded by bluish aureoles. The dorsal fin is barred as in the case of the brook trout.

Dr. Kendall is preparing a monograph on this species, illustrated with colored plates.

Specimens of the Lake Christine trout, received by the author on February 21st, 1916, through the courtesy of Hon. Frank J. Beal, Commissioner of Fisheries and Game in the State of New Hampshire, closely resemble the brook trout, but differ from that fish principally in the shape of the tail, the absence of mottling on the dark back, and the peculiar sea-green cast. The red spots are numerous and haloed in blue. The fish might well be described as almost a *fontinalis.*

AFTERWORD

NOTES ON THE PLATES

In illustration of what I have said regarding the evolution of our trout, let me show you first the family tree which extends its roots into Mesozoic if not Paleozoic time. Back in the Carboniferous Period, many times more than one million years ago, when the United States lay under the ocean, lived a fish whose fossil remains are represented in picture of fossil, (Plate No. 1) as restored by Dr. J. S. Newberry, late Professor of Geology in Columbia University, and you will note that this fish of the Carboniferous Sea has a well marked adipose dorsal fin, and hence perhaps is entitled to figure as the remote progenitor of present time salmonids. We are obliged to look far behind the fossils of the recent Pleistocene deposits and ferruginous sands of Idaho—where an entire large fossil salmonid has been found (*Rhabdofario lacustris*)—and of Oregon, for the veritable ancestor of our salmon race. Dr. Jordan records the print of an adipose fin in a period immediately preceding the Pleistocene. Professor Bashford Dean of Columbia University, following Zittel, carries the origin back into the Cretaceous Age. Professor Newbury figured the fish in Plate No. 1 which antedates Cretaceous forms by two geological ages (Triassic and Jurassic), but appears this side of the devonian or "Age of Fishes." The broad gibbous or convex tail suggests fitness to battle with mill-race currents. That's what a truncate tail is for; and it is conceivable that tails, the main organs of propulsion, should square where whirlpool rapids are to be stemmed and the mechanical needs of the swimmer become imperative. The wide paddle blades of the salmon provoked the comment of Ausonius in his *Mosella:*

> "Latae cujus vaga verbera caudae
> Gurgite de medio summas referuntur in undas"—

The whisking strokes of his broad tail bear him up from the bottom of the raging stream quick to the surface.

In Neozoic time, quite near to man, although many thousand years from us, trout and salmon and smelt

like the familiar forms of the present age, were spread over the Northern Hemisphere, the smelt and salmon swarming up the rivers as we see them to-day—the male salmon putting on the hooked lower jaw in the breeding season, a provision of nature, by the way, to prevent him from picking up the eggs of the female fish as fast as they are deposited, and for safeguarding her from caesarian section by his sharp teeth when he squeezes her abdomen with his jaws to facilitate the extrusion of the eggs.

All this is inferred from a few detached fragments which it would be uninteresting to exhibit. The bones of this family being imperfectly ossified and easily destroyed, fossil remains of salmonids are rare.

From these Pleistocene ancestors, we can readily follow the lines of evolution with their diverging forms as indicated in the diagram of the Family Tree.

The salmon separated into the Atlantic and Pacific forms, differing morphologically in the number of anal fin rays, the Pacific *Oncorhynchus* probably, as at the present day, paying the death penalty for his first and only sexual pleasure. The trout divided and subdivided as I have already described. While you follow the genealogical tree, you are to remember that two tendencies inhere in all fishes, viz: the one, to remain loyal to the specific tribal form; the other, to diverge from the original type in efforts at adaptation to new conditions of existence. Recent fishes have diverged only in minor details from their ancestral stems, because their aquatic environment has retained its general characteristics. Hence the evolution of our fish fauna implies ages of time.

Plate 3 represents the Lake Sunapee saibling, the upper specimen in summer uniform as I first beheld it in 1882, the lower in the paint of autumn. You will remark the absence of aureole in all the American and foreign specimens of the Alpine charr I shall show you. To get the spot effect, you seem to be looking through holes in a dark veil of mist to catch the nuptial tones beneath. Note the shape of tail, the large fins, and the entire lack of mottling on the back.

The Blue Back of Maine (Picture No. 4) is plainly a congeneric form. Like the Windermere charr, it enters streams to spawn, thus affecting a habit of the brook trout. Unlike its Sunapee relative, which is extremely sensitive, especially to changes of water,

the blue back is remarkably tenacious of life, capable of revival even when kept out of water for an hour or two. I have examined specimens of a large sea-run blue back charr (3 to 4 lbs. in weight) from the Godbout River in Canada.

There is another blueback trout in Lake Crescent, a mountain lake of Washington, 700 feet above the sea, more than 500 feet in depth, and extremely cold. This blueback (not a charr, but a true *Salmo*) is a deep water dweller, has a nearly square tail, is dotted with small round black spots, and attains a weight of 10 and 12 lbs. It is thought by some ichthyologists to be a form of the steel head.

Note how thickly our blueback is starred with small red spangles. The character and distribution of spots on a fish may change in time with change of water and climate. After a long residence in New Zealand, the English brown trout which had been introduced there and had access to the ocean lost their red spots and donned the silvery sheen of the sea trout (*Salmo trutta*). And the trout of Loch Leven, Kinrosshire, Scotland, (*Salmo levenensis*) (Picture No. 5) when removed from his native waters is reported to modify his distinctive coloring. I fished this loch in June, 1886, paying $7.50 a day for the privilege, and took numbers of this trout which is one of the gamest in the world. In my opinion, it is a landlocked sea trout, and I am supported in this belief by such authorities as Dr. Parnell, Yarrel, Sir John Richardson, Dr. Günther, and my friend Maxwell Scott of Abbottsford. I bought 30,000 eyed ova at Howietoun and brought them over on a Cunard steamer, hatched the survivors of the voyage, and planted 20,000 in my stream at Lake Sunapee. One was subsequently caught that weighed 10 lbs.; but as these silvery fish with black spots and 11 rays to the anal fin, are practically indistinguishable from ouananiche with which the lake is stocked, the success of the plant can not be determined.

So near akin to the Loch Leven trout that some observers have declared both to be variations of the same species is the brown or yellow trout of Europe, which I am noticing here because it has been so largely introduced into the streams of the Eastern United States. But from the view point of my investigations it is not to be confounded with the silver clipper-built land-locked beauty of Loch Leven, with black crosses

on his escutcheon and no red band across the second dorsal. The yellow trout is the darling of the British heart, and in our waters it has won the affections of many an American angler. The *salmo* of the Scottish loch was unquestionably a recent sea-going form. The brown trout has from time out of mind been a non-migratory resident of lake, river and brook. As you see in the picture which presents the markings characteristic of the fish in its native burns and ponds, it is golden with purplish reflections along the back and sides and more or less covered with black and vermilion spots. The tints and character of the speckles differ with the habitat. Those trout that live on crustacean food flaunt the most brilliant hues and their meat becomes blood red, with the creamy curd between the flesh flakes.

In certain American streams, the brown trout has developed game qualities superior to those of the native brook trout sharing its place of abode. It puts up a better fight and does full justice to its Anglo-Saxon name of *Sceota*, a shooter or darter. On the Navesink the fisher whose creel is largely made up of brown trout is considered more expert than he who principally baskets the *fontinalis.* It requires greater skill to provoke a rise from the European stranger, for through his longer association with intriguing white men he has learned to distrust everything offered as food, and scorns a fly clumsily dropped about his hiding place or a live bait plumped into the water near his nose. He is so cunning, shy and suspicious of everything unusual, that the man who lures him to his death must possess extraordinary intellectual gifts and experienced skill to match against his inherited instincts refined to an extreme in a novel environment. And this is why we not unfrequently hear of a big trout somewhere in the Catskills holding his own throughout the season in some deep pool where he laughs at the miscellany of deceptions devised to tempt him by importunate summer guests. He simply knows. He is never caught off guard. He is never too hungry to ignore the denatured flutter of the artifical fly, the cramped wriggle of an impaled worm, or the limping sprawl of a transfixed grass-hopper. To circumvent such a monarch is a feat worthy of the most accomplished craftsman.

This beautiful fish that looks so innocent grows rapidly where food is abundant, and in the Thames

attains a weight of 20 lbs. A specimen was taken in Lake Sunapee in the spring of 1910 from a plant of fingerlings made by the author in 1897 that weighed 14 lbs. Large brown trout are voracious scourges, and for this reason the popular immigrant should not be planted in waters inhabited by the fontinalis unless the risk of thereby exterminating the latter fish is understandingly accepted.

This is a digression; but now that we are in Europe, mention may be made of a few British charrs, among them the famous Windermere Charr of the Lake District in England, which runs about a half-pound in weight. The white margins of the fins resemble those of the Sunapee saibling.

Nearly related to it are the Enniskillin or Cole's Charr of Lough Eske, one of the smallest of the British species never exceeding a length of 6 to 8 inches (A 12); and Gray's Charr, the so-called fresh water herring of Lough Melvin, Ireland (A 12), both inhabitants of the depths (all charrs love cold water), and coming into the shallows during October and November in obedience to their spawning instincts.

The Torgoch (*red belly*) or Welsh Charr (A 12) inhabits several lakes in North Wales. It seldom exceeds 12 inches in length; while its congener, the Alpine charr of Scandinavia and the Orkneys (A 9), in some localities attains a length of three feet.

And finally, to me one of the most beautiful of all, the charr of Loch Killin, (Plate No. 8), Inverness-shire, 2,000 ft. above sea level (A 13). The excessively developed fins are noticeable.

All these charrs were formerly taken when spawning, as they were inaccessible at other times. They are described as coming on to their beds in "cart loads." In common with the salmon and trout, they are thought to be of marine ancestry, the remoteness of their habitats from the ocean sufficiently explaining why many modern derivatives have lost their sea-running instinct.

The chief American representative of the forked-tailed charrs is our Lake Trout (*Namaycush*, an Indian name, *togue* or *longe*) also a deep water fish but a surface-frequenter when the water is cold just after the ice goes out in the spring and in the late fall spawning season. It is nearer to the Alpine charr than to the fontinalis, having teeth on the basi-branchials or so miscalled hyoid bones.

In passing, permit me to remind you that our common smelt, with its European cousin, is a salmonoid, by some classified as a charr, and that there are on both sides of the Atlantic anadromous as well as land-locked forms, anatomically the same fish. The name it goes by is pure English,—*Smellit*—its scientific name *Osmerus* perpetuates the Greek root *osme*, an odor—and you may recall its peculiar cucumber fragrance which Willoughby in the 17th Century likened to that of violets—"*gratis simum violae odorem spirante.*" The Germans designate it as *Stink fisch.* (*Stink* in Old English means merely to have an odor, without reference to its quality.)

And now a moment with the Dublin Pond trout, (Plate No. 9), the New England representative of the intermediate race, the Canadian forms of which may be those designated by Suckley as *Salmo hudsonicus* and which appear to be without mottling on the back, possess basi-branchial teeth and favor the saibling in shape. Old inhabitants speak of the Dublin trout as coming on its beds "in cartloads" and of the farmers feeding bushels of them to their hogs. I ask attention to the color markings that have begun to appear on the fins but are absent on the back, and to the blue aureoles encircling some of the spots. The Dublin fish represents a relic of a southward distribution of the intermediate race as the Sunapee and blue back trouts are surviving southern forms of an Alpine or Arctic charr, the probable centre of derivation of the brook trout being south of the St. Lawrence.

And last is our transcendent beauty, the Angel of the Brooks, among all the fishes the Lord Paramount of our affection (Plate No. 10). It has taken millions of years at the hands of the Divine Artificer to bring to its present perfection the finished product. In our comprehending admiration of it, we are indeed carried into the very presence of the God who fashioned it in the aeonic march of events—the God who kindles and extinguishes suns and constellations.

When I was only a lad of eleven, good old Dominie Fowler of Monticello introduced this fish to me. I was captivated. I lost my heart then and there, and never, in the long years of my life, have I felt impelled to ask the object of my passion to return it, as did the poet his Maid of Athens. And yet I may appropri-

ately conclude in registration of my purpose as the enamored Byron, transferring the sentiment in impassioned Greek from the Athenian maid to the idolized fish form—

Hear my vow before I go
Zoe mou sas agapo.

Plate I

FOSSIL OF THE CARBONIFEROUS AGE

Suggesting an extremely remote ancestry for our Salmonidae

FAMILY TREE OF THE SALMONID RACE

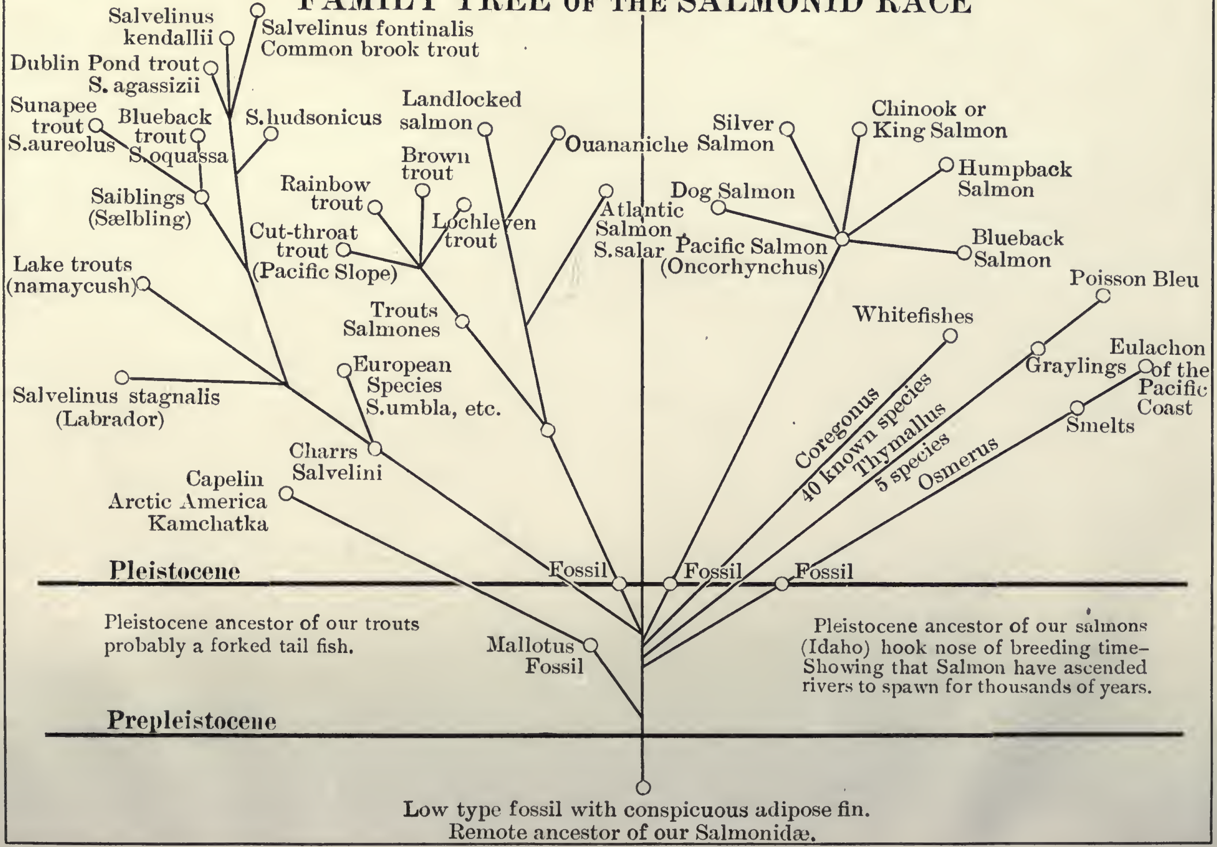

Plate 2

Plate 3

THE LAKE SUNAPEE SAIBLING

June and November garb

Caudal fin less markedly emarginate than in several of the foreign charrs.
Specimens on the spawning beds at Dan Hole Pond in the town of
Ossipee, N. H., where the Aureolus is native, weighing from
ten to fifteen pounds, October, 1915.

Plate 4

THE BLUEBACK TROUT OF MAINE

S. oquassa, practically extinct in the Rangeleys through the depredations of landlocked salmon, an introduced fish

Plate 5

THE SILVER TROUT OF LOCH LEVEN, SCOTLAND

The Loch Leven trout never has crimson spots on its body nor red on the adipose fin. The common brown trout is never without them

Plate 6

THE CANADIAN RED TROUT (S. marstoni)

Closely related to S. oquassa and S. aureolus of Sunapee

Plate 7

THE BROWN TROUT (Salmo fario)

or Von Behr Trout, the common brook trout of Europe

Plate 8

THE PERFECT CHARR OF LOCH KILLIN, SCOTLAND

Nearest of all in general appearance to the Sunapee saibling

Plate 9

THE GRAY TROUT OF DUBLIN POND, N. H.

Nuptial garb—an intermediate form

Plate 10

THE BROOK TROUT (S. fontinalis) male

The derived form, believed by Kendall not to occur north of the drainage basin of the Great Lakes and the St. Lawrence River, nor back of the Labrador coast, *S. hudsonicus* and *S. marstoni*, taking its place in the lakes and streams

BROOK TROUT (S. fontinalis)

Young female in spawning condition, from a living specimen 7⅝ inches long, 14 months old, hatched at Wytheville, Va. The conspicuous parr marks are noteworthy.