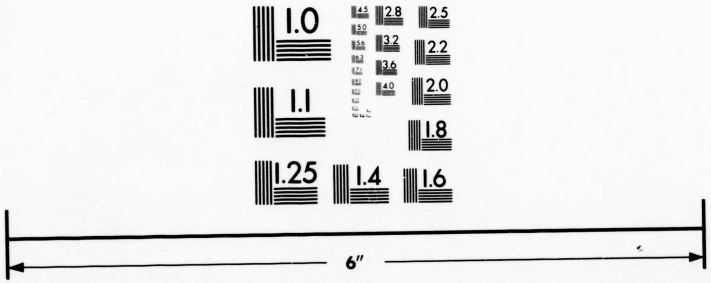
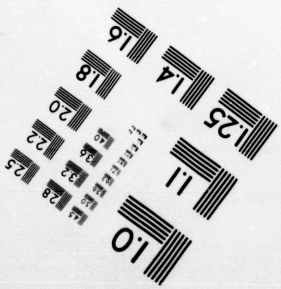
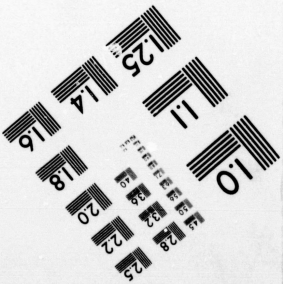


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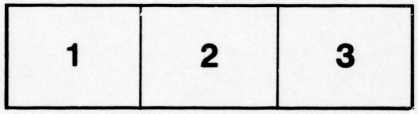
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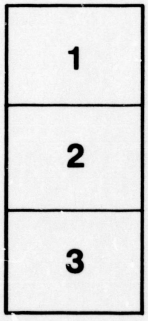
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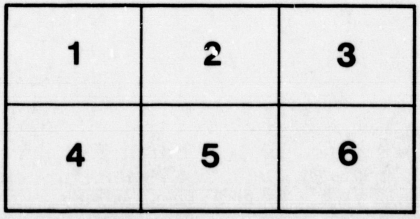
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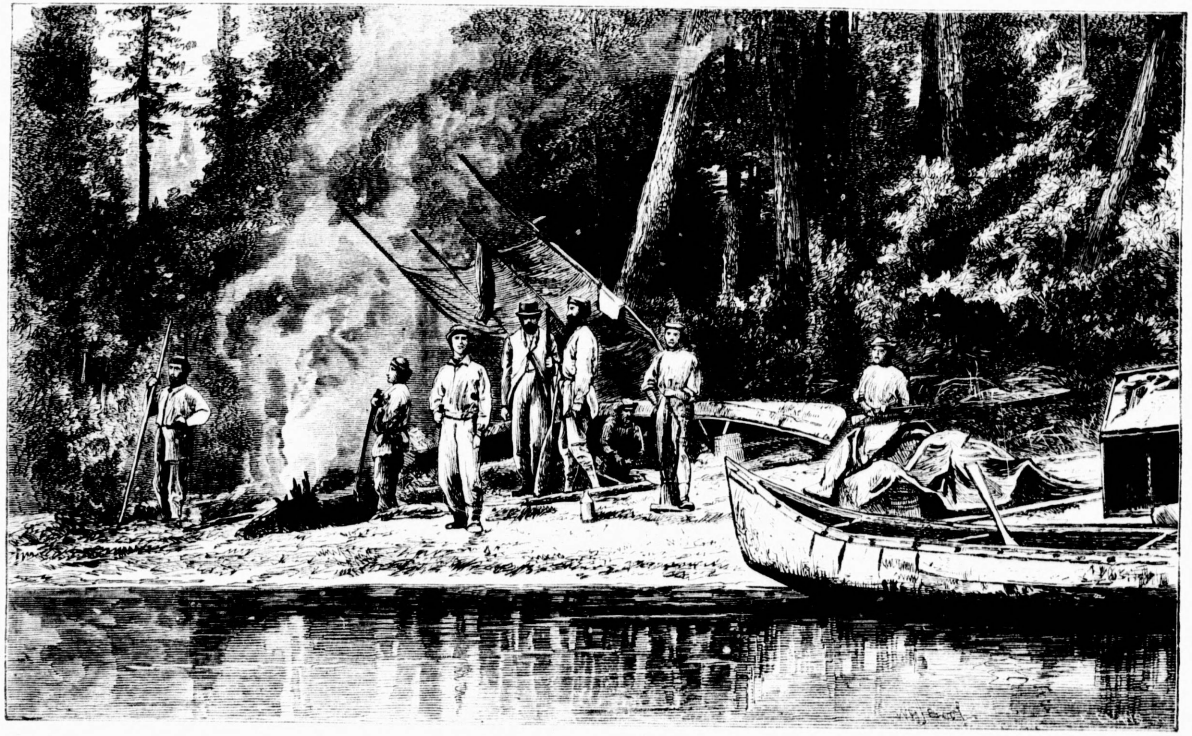




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CAMPING IN THE WILDERNESS.

CAMPING IN THE WILDERNESS.



CAMPING IN THE WILDERNESS.

Field and Forest Rambles,

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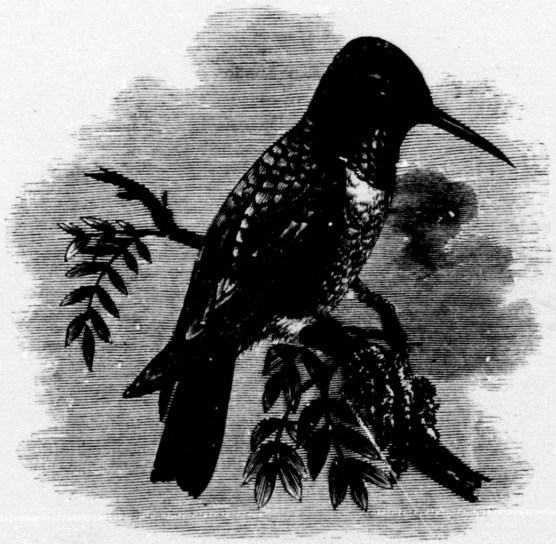
NATURAL HISTORY OF EASTERN CANADA.

BY

A. LEITH ADAMS, M.A., M.B., F.R.S., F.G.S.,

Staff Surgeon-Major.

AUTHOR OF "WANDERINGS OF A NATURALIST IN INDIA," "NATURAL HISTORY AND ARCHÆOLOGY OF THE NILE VALLEY AND MALTESE ISLANDS."



THE RUBY-THROATED HUMMING-BIRD.

LONDON:

HENRY S. KING & CO.,

65, CORNHILL, & 12, PATERNOSTER ROW.

1873.

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I DEDICATE THIS VOLUME

TO

MY OLD COMRADES OF THE TWENTY-SECOND

(CHESHIRE) REGIMENT,

IN REMEMBRANCE OF OUR BROTHERHOOD,

EXTENDING OVER TWO-AND-TWENTY YEARS,

IN VARIOUS QUARTERS OF THE GLOBE.

PREFACE.

THE following studies were conducted during leisure hours snatched from other and more pressing avocations, and have been subject to the frequent interruptions which fall to the lot of the observer who is prevented from devoting continuous attention to his work. This may in some measure explain any want of cohesion and strict systematic arrangement that may be apparent in the method of treating the subjects dealt with, whilst my short residence in New Brunswick disqualifies me from writing an exhaustive treatise on its natural history. Nevertheless I hope, as one of the first attempts towards elucidating the natural history of an important and interesting portion of the Canadian Dominion, that my little volume may receive some favour, more especially on the other side of the Atlantic, where cultivators of this branch of learning have not, until of late years, been by any means numerous. Indeed, considering the inviting fields presented by the New World, it appears surprising how little has been accomplished in what naturalists call Field Studies; for although almost every animal and many of the plants and rocks have been named and described, very little is known of their geographical distribution, which has elsewhere been ascertained by compounding the labours of local and independent observers. The explanation of

this defect, at all events as regards North America, might be accounted for on the hitherto dominant principle that the sole aim of science should strictly be utility as applied to the physical wants and interests of mankind; or, in other words, that whatever learning did not show the all-mighty Dollar in prospective, was at once to be condemned as futile! This dogma, so apparent formerly, is now, however, rapidly vanishing, both in the United States and Canada.

Reverting to the circumstances under which the following observations were obtained, it might not be altogether out of place were I to indite a few further remarks, mostly with the view of recommending the study of the natural sciences to individuals who may enjoy the leisure and taste for like pursuits. Yet I wish more particularly to address myself to the younger officers of the Army and Navy, and to none more pointedly than members of my own profession, whose previous studies render them especially adapted for prosecuting physical inquiries.

Thus, a knowledge of human anatomy, physiology, chemistry, and botany, forming portions of a medical education, is eminently qualified to foster tastes for natural history researches; whilst, on the other hand, the grand principles of the construction and functional agencies of lowlier organisms, mineralogy, and surface geology, would doubtless prove of great advantage in the elucidation of some obscure and hidden forms of disease, their causes, and remedies. The benefits, however, derivable under these heads are so self-evident that further comment seems to me unnecessary. In fine, let me exhort Army and Navy officers generally to try physical studies as remedies for idleness during the many leisure hours spent in often less profitable undertakings, for Nature's field is broad and inviting, so that he who runs may read. To my *confrères* experienced in travel I would bring the matter home in this way—Think of the dreary, listless life on the foreign station; the cankering *ennui* and trying

climate; no books, no recreations, to turn to excepting the one unknown book of Nature spread out before him, which, however, is about the last he feels himself capable of perusing. He may know thoroughly the theory and practice of his immediate calling, but not having been taught to seek an acquaintance with any of the collateral sciences beyond his own, he looks on the teeming beauties of the external world with indifference, so that

> "A primrose by the river's brim
> A yellow primrose is to him,
> And it is *nothing* more."

The topography of countries and physical geography of the sea are to him sealed letters. He may be wandering in regions where no physical inquirer ever set foot, and be surrounded on all sides by natural objects both inviting and instructive. But his eye had not been trained to an inquisitive appreciation of Nature, and it is just as much as he can do to take in a few salient points which, even by comparison with former experiences, fall dead on an understanding already dulled and surfeited by a profusion of much that is grand and beautiful in Creation. It is needless to remark what a panacea for idleness, and its often frightful train of evils, is the study of Nature, and in particular to persons so circumstanced. I am not, however, advocating its cause on the strength of b ing o ly a method of keeping one's hand out of a worse turn, but in the belief that the highest and most important object of all human science ought to be mental improvement (using the term in its most comprehensive sense), and that when pursued with a different aim its effects are often rather pernicious than beneficial. The study of Nature, in particular field-work, when properly cultivated, is assuredly adapted to invigorate discipline, and develop the mental powers, and thus supply materials for the grandest ultimate truths. It robs the mind of contracted and pigmy

ideas, and teaches us to take close as well as comprehensive views of objects, and argue from facts and not from notions, —a Temple of Science, to enter which in a suitable mood of thought will awaken the holiest and most lofty conceptions, and where the mind of the worshipper, instead of being dwarfed as heretofore, will find its powers become colossal, and be expanded by the Genius of the place. "The reason," says Aristotle, "why men do not sufficiently attend to facts is the want of experience, hence those accustomed to physical inquiries are more competent to lay down the principles which have an extensive application; whereas others, who have been accustomed to many assumptions without the confutation of reality, rarely lay down principles, because they take few things into consideration."* So spoke the great Stagirite 2,200 years ago; it cannot therefore be otherwise than gratifying to such of Dame Nature's disciples as have devoted their lives to a consideration of her rich and inexhaustible stores, to observe how her grand truths begin to be appreciated, and that too in academic halls where not long since it was considered an offence to associate natural science teachings with the *humaniora*.

I shall now proceed with the thread of a narrative which began long years since, and has been continued on to Malta, from whence I now take it up.

With persons who have devoted considerable attention to the physical phenomena of any region, there is engendered an *amor loci* almost like that for one's native land. I can well remember the 24th of March, 1866, when, from the deck of the troopship "Simoom," I watched the familiar cliffs of the above-mentioned island fading in the distant horizon, and how there came over me feelings of regret at bidding adieu to scenes which for the previous six years had afforded me much mental instruction and pleasurable occupation. But having been heretofore a wandering student of nature, and

* "De Gen. et Corr.," 1, 2, 316.

accustomed to sudden interruptions before my programme was completed, I had no alternative but to submit to the decrees of fortune, and break fresh ground where she chose to place me. Our vessel reached Gibraltar in the course of a few days, when I enjoyed a hurried visit to the famous bone-caves of the Rock. Among members of the public services, civil, naval, and military, whose avocations call them frequently, and at very short notice and considerable risks, to sojourn in foreign and often inhospitable lands, there is a small class who, without any professed knowledge of science, collect stores of natural objects, which they freely deposit in home museums or hand over to the cabinet naturalist for description. Such an example, and one of the most pains-taking and indefatigable, was the late Captain Brome. This enterprising cave explorer, by means of the military prisoners under his command, conducted a series of excavations which eventuated in very important discoveries in connection with the bygone history of the Rock, during periods far anterior to any written records, but possibly coeval with the presence of man on this portion of Spain, when there was a direct land communication between the two continents. These researches would therefore be of intense interest to me, in connection with similar phenomena I had been investigating in the little insular group just left; inasmuch as, when the two are compounded, they furnish very cogent proofs of the great physical changes which the entire basin of the Mediterranean has undergone during epochs no doubt far back in the ordinary computation of time, but of modern date in the chronology of the geologist. Nineteen days after leaving Gibraltar we entered the Bay of Fundy, and shortly afterwards proceeded to New Brunswick, where the following notes were taken. These I will now lay before the reader, much in the same form as I have already attempted to describe the natural objects of other lands.

Here I must express my obligations to those gentlemen

who have furnished me with valued information. To the late Governor, the Honourable Sir Arthur Hamilton Gordon, G.C.M.G., my thanks are due for several interesting facts in connection with the local natural history, besides what will be referred to in the sequel. I am also indebted to my friend Dr. Jack, LL.D., Principal of the University of New Brunswick, for many important points in connection with the physical geography of the region; and to Mr. Hannay, for data referring to the early colonization of the Province and the history of the aborigines.

My best thanks are owing to Mr. Pope, of Prince Edward Island, for several observations on the local natural history, as well as a very interesting collection of ancient stone implements found by him in the island.

Lastly, I am indebted to the master-hand of my distinguished friend J. Gould, F.R.S., for the appropriate vignette on the title-page, and also to my esteemed young friend R. De Courcy Laffan, Esq., for valued aid.

To Mr. G. Taylor, photographic artist, Fredericton, I am under obligations for the care and trouble bestowed by him in taking photographs of several of the natural objects in the work.

LONDON, *January*, 1873.

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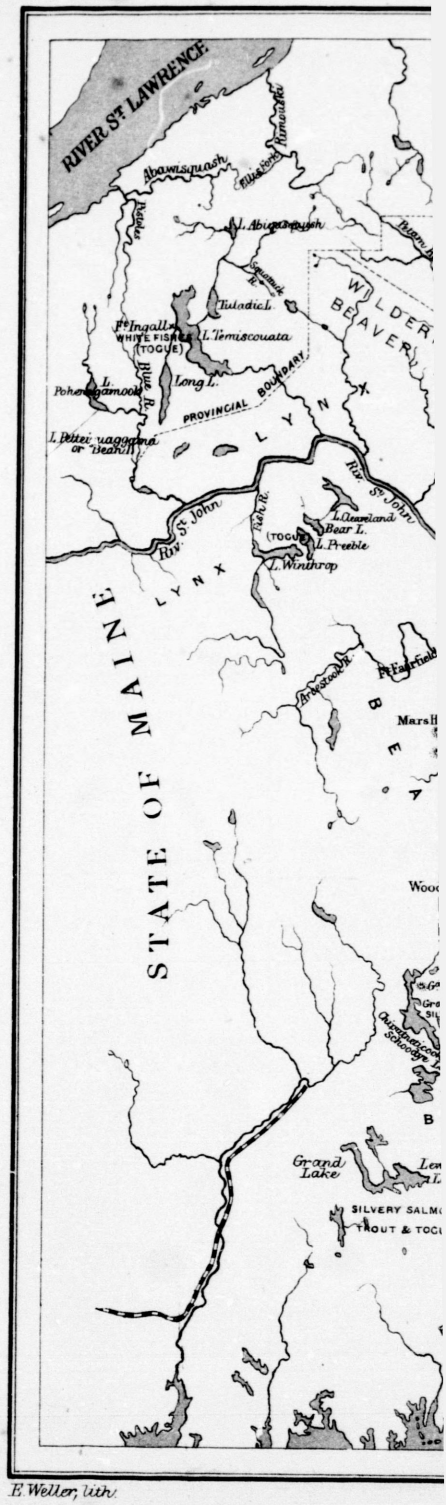
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E. Weller, lith.

Natural History MAP OF NEW BRUNSWICK.

Coal Seams.
Ancient Indian Kitchen-middens.
Directions of Glacial Scorings.

The figures show the height above the Sea level accorded by Robb & Hind.

The dotted lines are the county boundaries.

Henry S. King & Co. 65 Cornhill, London.



SCULPTURE FOUND ON THE BANKS OF LAKE UTOPIA.

CHAPTER I.

New Brunswick: General Sketch of its Resources, Physical Aspect, Climate, and Natural Products—Arrival at St. John—Local Politics—River Scenery—Fredericton—Natives, their Past and Present—Stone Age, Sculptures, Ancient Kitchen Middens—Disappearance of certain Animals during the Historical Period.

WHERE is New Brunswick? asked a young friend when the order arrived at Malta directing our regiment to proceed to this colony. I confess to having had a rather vague notion of its whereabouts on the occasion in question, and I dare say there may be some of my readers similarly affected. At all events, my interrogator and myself were soon informed, inasmuch as, fetching the fine old Imperial Atlas presented to the corps by the late Lord Gough when he commanded the regiment, we traced out the limits of New Brunswick as follows: It lies between Lat. 45° and 48° 5′ W., Long. 63° 50′ and 67°53′ N. It is separated from Lower Canada (now Quebec) by the River Restigouche and Bay of Chaleur on the north, and is bounded on the east by the Gulf of the St. Lawrence; west, by the State of Maine; and south, by Nova Scotia and Bay of Fundy. As compared with its sister provinces—to wit, Nova

Scotia, Quebec and Ontario, including Prince Edward's Island, New Brunswick is comparatively a wilderness region ; indeed, with the exception of the southern portion, little has yet been done towards reclaiming the vast forests about the sources of the Upper St. John River,* and where the Miramichi and Restigouche take their rise. These embrace districts presenting all the features of the primitive forests of other portions of the continent; and, although for the most part thinned by the axe of the woodman, they continue still to maintain their ancient denizens, in spite of the trapper and hunter. The moose, woodland reindeer, bear, beaver, sable, mink, etc., although greatly reduced and decreasing in numbers as compared with former years, are not yet on the verge of extinction; and while the excessive waste and destruction by man of the fishes in the lakes and running waters have greatly reduced their numbers, still, notwithstanding the shutting off of migratory species by means of mill-dams and other artificial barriers, and the illicit use of the spear and net, vast shoals of salmon, white fishes, smelts, shad, etc., continue to frequent a few of their ancient haunts, and require only a safe passage through obstructions, and some consideration on the part of the settlers, to increase and multiply in many inland waters from which they had been expelled.

New Brunswick therefore embraces three degrees of latitude, and is upwards of 200 miles in breadth, and, although the least populated of the four grand provinces composing the Dominion of Canada, is watered by many large rivers, besides noble lakes, all of which now present a remarkable contrast, as regards the numbers of the fishes, with the boundless waters washing its shores. So much is this the case, that, turning to the narratives of the early voyagers and settlers, we find that incredible quantities of fishes frequented localities

* The St. John is 450 miles in length, and navigable more or less to its sources, with the exception of the Grand Falls, distant 225 miles from the ocean ; the falls are about 60 feet in height.

where not one individual now exists; and, on referring to dates, it will be observed that less than a century has sufficed to bring about this extinction. I shall frequently refer to the rapid extermination of many animals through human agency, and to the destructive propensity which characterizes the settlers of the present day—a wanton love of destruction, in many instances similar to that of the Indian, as if a spice of the old savage nature still lurked in them also. No doubt the imprudent use of the spear and net has been the chief cause of the decrease in inland fisheries, but the most effectual modes of extermination have been through mill-dams, and pollution of rivers and their bottoms.

On these points all inquirers are unanimous, whilst it is the belief of many that, by proper surveillance, introduction of fish-ways, and prohibition of nuisances, the salmon will return to his ancient haunts. I am doubtful, however, if this will be a sovereign remedy. I doubt very much whether a salmon will care to go up streams paved several feet deep with decomposing sawdust and rubbish, to find a by no means tempting entrance to the dam, and when that is surmounted another or another expanse of the same bottom before he gains clear water. Surely, small blame to him should he be somewhat punctilious under such circumstances, more especially in rivers choked up by rubbish and lumber for long distances above their debouchures.

There are few rivers better adapted for migratory fishes than the St. John. From its mouth to the Grand Falls, there drain into it no less than fourteen large influents, once the favourite haunts of salmon, shad, gaspereau, etc.; and even now, with all the poaching and obstructions, it is wonderful that any fishes attempt to run up: indeed, almost every second salmon or grilse caught by the rod either presents spear wounds, or is maimed in some manner by standing nets. Not long since many hundreds of salmon were speared on the spawning-beds of the Miramichi River, in order to procure ova for transmission

to the United States! Fortunately, the St. John is too broad to be effectually netted; so that, if its influents were protected, there would not be much difficulty in re-stocking them.

The waves of the Atlantic impinge on shores deeply indented by bays, creeks, fiords, and river estuaries, up which the majestic tidal wave rushes for miles, and mingles with fresh. water far above the usual limits observed in European rivers So enormous is the pressure on the influent waters of the St. John, that a spring tide raises the river eight inches at the capital, eighty-two miles from its mouth. Moreover, the vertical rise in some of the most distant reaches of the Bay of Fundy attains the unexampled height of sixty to seventy feet, or even more. Such conditions, therefore, must doubtless favour the migrations of the finny tribes.

The attractions of the lakes, rivers, and forests, the unparalleled beauty of the foliage in autumn, the glorious sunsets, and the sombre and impressive grandeur of the forest solitudes, are all full of art studies, whilst the disciples of Nimrod and good old Isaak Walton may, by proper selection of season and locality, indulge their tastes to the fullest extent.

The country is exceedingly flat, the highest point scarcely exceeding 3,000 feet above the level of the sea.*

The climate, although far more severe and trying as regard extremes of cold and heat than that of Great Britain, is, with the usual precautions, well adapted to the constitution of the Northman. Of course the coast region enjoys milder seasons than the central and northern portions. The Newfoundland fogs cool the summer heat, and the extremes of winter are tempered by southern winds and oceanic currents,—neither of which, however, extend their influences beyond short distances inland. Indeed, so marked are the differences between the climates of the interior parts compared with the coast region,

* Bald Mountain, near the sources of the Nepsiguit and Tobique rivers, is in one of the wildest and least explored regions of the province. The height of this mountain has not been carefully measured, but possibly it is not less than 2,500 feet above the sea.

that the *maxima* of ten degrees of heat and twenty-one degrees of cold obtain in the former over the climate of the seaboard.

Among the first impressions of Canadian scenery, few are more striking than the freezing, snowing over, and breaking up of the ice on the great rivers and lakes. The short-lived but hot summer is succeeded by the sharp biting frosts of autumn, and a long and rigorous winter, occupying more than half the year. There is no spring worthy of the name; for the rush from winter hoar to refulgent summer is so rapid that the leaf buds and opens out in the course of two days. It is the absence of that gradual transition from one extreme of temperature to another that arrests the attention of the fresh arrival, as compared with the climate of England.

Towards the end of October, soon after the hard-wood forests have cast off their gorgeous autumnal attire, and those beautifully coloured leaves that hang so gracefully and decorate so grandly many a spreading maple, now lie stiff and faded on the soil; when the snipe and woodcock have left the alder swamp, and with all the summer birds of passage are on their way to Florida and the south, and the time has arrived when the hare and weasel are turning grey; then it is we look forward to the severe frosts that are to close up the navigation and cause the steamboats to beat a hasty retreat seaward. First, there forms some shore ice along the banks, then portions float downwards, and, provided a north-wester is blowing, these soon coalesce and run in fields, gliding silently onwards. The passenger steamboats which plied daily during the summer months are in readiness for immediate departure, and probably before two days they have gone, for the sheets of ice begin to join, consolidate, get packed, and forced under and above one another, so that there is no knowing how soon the river may be frozen over completely. Sometimes without any premonitory appearances there is an equal freezing all over, and the surface becomes like a mirror in a single night; but oftener, from the pressure of the floes, the surface becomes very rough and un-

even. As the words pass from mouth to mouth, "The river has closed!" idlers stroll toward the bank to witness adventurers with their long poles picking their way from hummock to hummock, until at length they gain the shore. Next day it is perfectly safe; skaters are seen wherever the ice is unbroken, and horses and sleighs cross. The river is now hermetically sealed for the next five months, unless at what are called "air-holes," where several blocks jammed together cause an eddy which does not freeze up for some weeks afterwards. The latter is one of the dangers in skating and travelling on the rivers, until the safe portions have been indicated by sticking pine saplings along the routes. Should an unsuspecting traveller fall into one of these open air cavities, he will most assuredly be carried under the ice if the current is at all strong, his only chance, in the absence of assistance, being to swim against the current. One afternoon I saw a skater plump into one of these dangerous places, when suddenly another, observing the accident, pulled off his coat, and as he skated past the man in the water, tossed it towards him, who caught the sleeve, and was dragged out by the impetus wherewith the other was going. The feat was done so cleverly that I asked the performer if he had been accustomed to save persons in that way, and he told me that he had pulled many out of air-holes, and that provided one is a good skater and can get near enough to the individual, there is no more ready and efficacious method. On another occasion I observed a skater fail, when another pulled off his coat and dashed toward the drowning man, who caught it, and was lying on the ice in a shorter time than I take to write down the fact. The best skating takes place immediately after the freezing-over. Sometimes when the ice is glare and smooth, a good skater can in a few hours go down from Fredericton, the capital, to St. John, over eighty miles. The climate inland is dry, cold, and bracing, with a clear atmosphere and most exhilarating, so that when well wrapped up one absolutely does not feel a temperature many degrees under zero

so much as a few degrees under freezing in a damp, raw atmosphere. I have often thought what a change to the fishes this freezing over of the rivers must be. In all but total darkness for months, first dimly supplied through their ice roofs, then a heavy fall of snow, and it is eternal night to them until the breaking up in April.

About the middle of November skating is brought to a sudden termination by snow filling up all the rough, uneven surfaces of the rivers, which are now converted into unbroken plains, with the mighty waters flowing on silently beneath. All now is winter-like; the sleighs glide along to the music of many a merry bell; every one is well muffled up, for the severest frost takes place before Christmas. The wood-cutter has gone to fell trees, a solemn silence reigns in the forest, save the cracking of the branches at night from cold, which now and then attains to 37° below zero of Fahrenheit. We take long walks on snow shoes,—the sporting community in particular, in order to get themselves into working order for the reindeer and moose hunting. Looking along the bosom of the St. John, all is one vast mantle of snow, save a black spot here and there representing a man fishing for cusk through a hole in the ice, or a dead bullock or horse dragged to the surface to await the breaking-up in spring. February and March bring more and more snow, which is piled up in great masses along the streets above the pavements,—some three to four feet on an average covering the country, and quadruple that thickness where it has drifted; then there is no travelling save by sleighs and snow shoes.

At length, towards the end of March, the struggle between the sun and the cold begins to show signs of terminating in favour of the former, for the day is lengthening out, and although there is hard frost at night, the heat softens the surface by midday. The migratory thrush, better known as "Robin," comes in about this time, and the snow bird and Pennsylvanian sparrow utter their welcome measures on fence and

tree; and the crow draws nearer to man. There is skating and trabogging in the early part of the day. The latter requires me to state that this amusement is performed by means of small sleighs with broad polished runners, on which two or more are seated. When on some beaten path, or where the surface snow has become so hard and glazed as to bear a heavy man, then with feet or sticks we guide the sleigh as it flies down the slope, the only drawback being the trouble of pulling it up. Again, these pleasant social gatherings break the monotony of the short, dull winter's day, and accordingly old as well as young often take delight in the harmless and healthy pastime in spite of many a mishap of a very ludicrous nature, such as when some unapt steersman lands his fair burden in a snow wreath, or dives thereinto head-foremost, so that the feet only are left visible above the surface.

April showers begin to tell on the river, and balmy south-easters, like the Fohen of the Alps, eat away the snow which vanishes before our eyes. It is getting unsafe to cross the river, and the ice is giving way round the margins, and is rising in the centre so that the water on the surface runs off by the sides. We hear of the gradual opening up of the navigation from the mouth upwards, and of large fields having broken up and run out. Still we can cross the river with a pole, but no horse is safe. At last it is only after a frosty night that we can venture over, and then the raftsman, accustomed to run from log to log, is about the only one brave enough to venture across. Sometimes when he is in mid-river the whole mass begins to move, and he has a narrow escape. Now comes the grand *finale*—the enormous pressure from above piles vast sheets pell-mell on each other, or sends tons upon tons of solid ice (blocks often averaging twelve to twenty-four inches in thickness) against the bank, tearing up soil, and pushing everything before them.

Occasionally an island in mid-river, formed of alluvium, and famous for its splendid crops of hay, gets completely covered

with stones pushed up by stranded icebergs. It is not the detached blocks that do the harm so much as large fields of ice; these come along at the rate of about three miles and a half an hour, with an enormous *momentum*—so much so, that in one instance a wooden house, built on a jetty on the bank, had its upper story completely carried away by the advancing icebergs, which absolutely cut the building in two just as the inmates were making their escape. The ice, covered with stones, logs, and rubbish, crushing and seething in huge hummocks, forms a perfect picture of chaos. I have thought in the pell-mell arrangement that there is some similitude between the river then and the rugged surface of a lava field broken up and fissured.*

The inhabitants on the banks of the St. John look forward to this breaking up with interest, less now, however, since the railway has made them independent of water carriage; still, at all times, it effectually dispelled the dull monotony of the long winter. At length the cry that the river is going sends the anxious to gaze on the remarkable scene. "It has started!" exclaims one, and just as the already shattered mass has commenced to move, there is a jam somewhere, above or below, that causes the shore ice to rise up, and hummock after hummock standing on edge, scores and rubs the banks; now ploughing up the soil, then impinging so heavily on the solid pier made of huge pine trunks, that it absolutely knocks a hole through them as one would push his finger through pie-crust.

The damming back caused by the floes riding over and submerging each other, often becomes a serious matter with the inhabitants located in the intervales or river valley along its banks, thus causing the water to rise and flood the surface to a dangerous extent, as I will show in the sequel in the case of the capital, when the banking back raised the waters so high that the town was inundated.

* See page 277.

Reference will also be made to the fertility of the surfaces annually overflowed by the river. These islands and river valley flats produce luxuriant hay crops, which are stacked in barns placed on more elevated points, but which, however, during the breaking up of the ice in spring, are sometimes carried off bodily, and go to form the heterogeneous flotsam and *débris* observable on such occasions, drifting pell-mell with the ice floes. During one such occurrence a large shed-full of hay was seen passing Fredericton perched on the shattered tops of a huge ice island,* when an adventurous person, springing from berg to berg, managed to attach a rope to the structure, which was eventually brought ashore. It takes two or three days before the chief body of ice has run seaward, whilst masses continue piled up along the banks for a few weeks. By the end of April, the loud scream of the steamer's whistle attracts every one to the landing, and, although not a blade of grass has yet sprung, and not a bud opened out, yet with all the mud and mire consequent on the thawing, we are delighted to welcome back this harbinger of civilization, and to look forward to six months of something like what we had been accustomed to in old England. Looking at the above phenomena as exponents of periods unrecorded, I must say they are of intense value to the geologist, for granting they may be feeble in force, still, as I will attempt to point out in the conclusion, they have important bearings, which he will always do well to study when attempting an interpretation of far-back epochs in the earth's history.

One of the most interesting and suggestive subjects in connection with the natural history of this region, is that referring to the early condition of the aborigines, and the

* The St. John, for reasons stated, cannot, of course, be a rapid river. During the inundations, it has been roughly computed, by Dr. Jack, LL.D., Principal of the University of New Brunswick, to flow at the rate of about five miles an hour; but subsequently, and when frozen over, the velocity is very much less.

causes which have brought about the marked deterioration of race since the advent of the whites; nor are the results of civilization and reclamation of the primeval forest, on the lower forms of life, much less worthy of attention. The migrations of the birds, their numerical prevalence as compared with former years and other lands, together with the local Reptology, Ichthyology, etc., also furnish new and instructive data. The Botanical productions offer a wide and very interesting field, and have not hitherto, as a whole, been accurately tabulated. The Geology is extremely inviting, and affords materials of great scientific and economic value. Such are the main features of the country to which reference will be made in the following pages.

A strange enchantment creeps over the traveller—more especially should he possess an inquisitive mind—when, transplanted to a new country, he finds himself surrounded by a diversity of natural objects; some perfect strangers, others similar, or so closely allied to what he had seen before, that they at once recall associations of far-distant countries. But first impressions being hastily formed, are very often anything but correct; nevertheless they create materials for pleasant after-reflections. I cannot, for example, forget my first impressions of tropical scenery as displayed in the luxuriance and verdure of the Seychelle Islands, nor of the plains of Hindoostan from the tops of the western Ghauts, the colossal grandeur of the Himalayas—to wit, my first glimpses of the Vale of Cashmere, a bird's-eye view of a Tartar steppe, Egypt from the Pyramids, the Nubian Desert, Switzerland, and the Alpine tops and valleys from the Righi, Vesuvius, etc.; all of which, in spite of years, remain still so indelibly impressed on my memory as to appear but visions of yesterday. But the enjoyment derived from a contemplation of Nature is oftener better appreciated by reflection afterwards than at the time. Perhaps the reason may be, to some extent, that we are

too busy in studying the attractions of objects to turn towards a general meditation on the pleasure in connection with the scenery, climate, and incidents of travel. All these come back in the form of agreeable recollections subsequently, especially if conjured up under circumstances likely to make them more appreciated. Thus I often recall very pleasurable remembrances of foreign lands merely by comparison with less agreeable scenes at home, and particularly when contrasted with dismal London fogs and uninviting landscapes.

I must acknowledge, however, that it was an extremely bitter April day when our vessel cast anchor in the harbour of St. John, New Brunswick. The snow had scarcely disappeared, and the noble river, flooded by up-country thaws, was pouring its gelid waters into the Bay of Fundy, whilst the great tidal wave, compressed on either side, was rapidly rising to levels far above what are seen elsewhere ; at all events as compared with the shores of the Mediterranean which we had lately left. Recounting first impressions, I may briefly, *en passant*, jot down the chief novelties that greeted us on the above occasion ; to wit, the muddy streets and wooden side pavements, which give one an idea of walking over a log bridge ; the busy, bustling inhabitants and their wharfs crowded by piles of timber ready for shipment. Naturally, there was always a regular exodus from the city of the inquisitive to see new comers, which they were in the habit of repeating weekly on the occasion of the advent of the steamboats from the States, just like the squireen who comes down from the domain to see the coach come in ; and why not ? But withal these were troubled times as compared with ordinary occasions, for cannons were bristling on the heights of Carleton opposite, and the St. John Militia were out. In fact, the good folks on shore were in a ferment, for there was a threatened Fenian invasion, which we had been ordered on from Malta to assist in repelling. At all events the mandate came to us to "Clear decks!" "Bank fires, and prepare to depart at the shortest

notice!" So sending the non-combatants on shore, we hung about in harbour during the next ten days, expecting either to sail, or what was, I suspect, more congenial to the tastes of some of us—viz., an order to disembark and make ourselves comfortable on the mainland.

These were anxious days, however, to many, but possibly far less serious than rumour stated; at all events, to us, they were uncommonly uncomfortable, seeing that a cold north wind blew down river, and often a chopping sea prevented the inquisitive from landing to view the lions of the place, thus driving us to become victims of that horrid tedium and "that awful yawn which sleep cannot abate." Being tied to the ship, we felt the restraint the more that it was forced, whilst diversities of opinion as to the crisis seemed to indicate that the step was unnecessary, some politicians who came on board asserting that the whole affair was a hoax got up by our American cousins to bother John Bull on account of the precious Alabama. Others looked with earnest faces at our red coats, and remarked that "Colonel Harding and his fine fellows had not come an hour sooner than wanted"! At length the rigour of martial law slackened, and availing myself of the opportunity, I proceeded on shore for the purpose of examining a remarkable fragment of Old Red Sandstone which fringes this portion of the southern coast, and overlies a series of strata supposed to belong to the same age as those of Ontario, in which Sir William Logan discovered the oldest known fossil, named the *Eozoon Canadense*.* As our captain's gig dropped astern of the transport "Simoon," and was being rowed towards Carleton, numbers of fishing boats were seen dragging nets heavily laden with the well-known American shad named the "Alewive," which at this season crowds the harbour before proceeding up the rivers for spawning purposes: indeed so burdened were several of the nets that the wonder was how

* See Dawson, *Quart. Jour. Geol. Soc. London*, vol. xxi., p. 51; and Carpenter, ditto, p. 59.

the meshes held together.* I thought of the poor Maltese fisherman who so often slaves all day and catches little, and of the adventurous natives of old Albion, who frequently go forth on the same errand never to return, while here among crowded steamboats and heavily-laden wood vessels, the hardy New Brunswicker encloses such great multitudes of fishes that his net fills the boats until they wellnigh sink.

The interesting locality famous for the beautiful specimens of fossil plants met with in the above-mentioned Old Red Sandstone beds is fully a mile distant from Carleton. The "Fern Ledges," as they are familiarly called, comprehend shelves of shale covered by seaweed, which the geologist must remove before cleaving the rock, when he will disclose most beautiful and perfect impressions of ferns and numerous other cryptogamic plants, many of which have been described by Mr. Hart and Dr. Dawson,† and doubtless more remain for the assiduous palæontologist.

One of the chief characteristics of New Brunswick scenery is its flatness,—the traveller's difficulty being to attain an elevation wherefrom a prospect can be obtained. Excepting the ridges and low hills in the neighbourhood of the city of St. John, and the higher lands in the northern part of the province, it is rare to meet with an eminence commanding anything like an extensive view. To him, therefore, who has sojourned on the Continent of Europe, there will come an occasional feeling of disappointment—such as that which strikes the tourist on the Nile, when, in the absence of monuments of antiquity, he is continually surrounded by

* "The annual catch of this shad in the harbour of St. John varies from 12,000 to 16,000 barrels, and sometimes reaches 20,000 barrels." This represents an enormous weight of fishes, seeing that a barrel is calculated to contain about 196 lb. of flour. Of course a smaller figure would be required for fish, unless when packed herring-fashion.—See *Perley's Catalogue*, p. 208.

† Hart, Appendix A., p. 131, Bailey's Report, and Dawson, *Acad. Geol.*, p. 514; and *Jour. Geol. Soc. London*, vol. xvii., p. 296, 1862.

mud banks, and patches of cultivation, or the eternal sameness of the desert. This, however, should not perplex the student of nature.

The St. John derived its name from the early voyagers, but the circumstances under which it was so designated are not altogether clear.* To the natives it was known by the name Wollastook, or Awolostook, which signifies "big river." It is indeed a grand and noble river, for, independent of its navigability, there is an annual inundation like that of the Nile, at the spring freshets, when the low or carse lands become flooded, and settlements insulated, so that when the retrocession takes place, irrespective of irrigation, there has been a deposit of fertilizing mud thrown down, which serves to nourish the grass, and produce remunerative hay crops, especially on the islands. It takes several hours to steam up-river, and there are many turnings and twistings which open up some varieties of woodland scenery. Near Fredericton are "the narrows," a sudden bend in the river's course to be particularly referred to in the sequel; then the spire of the handsome cathedral comes in view; and finally a pretty

* Mr. Hind writes: "One of the earliest historical notices of the River St. John dates from 1598, when it was called 'Riviere de la Grande Baie,' or 'La Baie Francaise,' as the Bay of Fundy was formerly designated. This occurs in the letters patent confirming the appointment of the Sieur de la Roche, Lieutenant-General au Canada, Hochelaga, Terre-Neuve, Labrador, Riviere de la Grande Baie (St. John in the Bay of Fundy), Norembegue (the present State of Maine), et les terres adjacentes.—(L'Escarbot.) In the admirable Report by the late Dr. Robb on the Agriculture of the Province, reference is made to the discovery of the St. John by 'Champlain, on St. John's Day, in the year 1604;' and in Monro's New Brunswick there is a quotation from Haliburton's Nova Scotia, in which the name St. John is stated to have been given to it because it was discovered on the 24th of June, the day of the Festival of St. John the Baptist. Mr. Munro says also that this noble river was discovered by Dee Monts. It is clear from L'Escarbot, that the river was known previously to 1598. But in 1604 Sieur de Monts visited La Riviere de la Grande Baie, and *changed* its name to the St. Jean."—*Report on Geology of New Brunswick*, page 28.

little country town surrounded by trees, and spread out on a broad alluvial flat, which, like a rounded promontory, is washed in front and two sides by the St. John.

In honour of the House of Brunswick, Fredericton has its Queen, King, Brunswick, George, and Charlotte streets. As at St. John, wood houses and wood pavements predominate; indeed everything is timber, and its wharfs groan with piles of the same material; altogether a thriving, bustling little town, now brought in direct communication with the sea-port by a railway which is being extended further northwards. Although dwarfed as regards size by the city just named, still, from position and antiquity, Fredericton claims to be the capital, although shorn of the little grandeur of the older days of irresponsible governments, when the mother country was teaching her colonies how to walk. But now that the infantile stage, as we may so designate the past, has given place to adolescence and a promising manhood, what between railways, and other latter-day features of the industry and enterprise of this hardy people, there is to all appearances a bright future for little Fredericton. The city of Frederick (how the "k" has got out of the modern orthography I cannot say) was founded by the early settlers at this point, chiefly because the situation was central, and about the highest navigable station for vessels.* However, steamers of small draught, with paddle-wheel astern, find their way up even to the Grand Falls, which are 125 miles above Fredericton. At the latter the river is about three-quarters of a mile in breadth. Among the institutions of the past *régime*, there is still an Upper and Lower House of Assembly, and a Governor, although the province is but an integral portion of the Great Dominion, and by way of comparison has not half the demand for this paraphernalia of government as, for example, either Scotland or Ireland; but perhaps it is as well to let the present generation live out their old associations. I

* Fredericton, as the crow flies, is about sixty miles inland.

must not, however, in these very cursory remarks, omit notice of the University of New Brunswick. The planting of a tree of knowledge in this wild wilderness, dates far back in the Anglo-Saxon occupation of the land, and although originally established on models of the old country, it has fought a hard battle for many years. How indeed could any one expect sons of the reclaimers of the primeval forest to care much for classical educations, more especially when their progenitors attained their positions by manual industry and mere endurance?

Thus the college for many years had to be content with the products of the distant schools in backwood settlements, and endure some prejudices by no means encouraging to the ardent and able professors who have long reflected so much credit on the institution. Times, however, have altered, and, moreover, as New Brunswick proceeds on its onward march of civilization, this handsome structure, perched on the terrace cliff overlooking the thriving little bustling town and lovely scenery of the St. John, must, doubtless, in process of time come to the front, and be the centre of intelligence and learning in south-eastern Canada.

So much for this the central city and capital of the province where my head-quarters were located for three years, and from whence I made various excursions in quest of the materials described in the following pages.

The first and foremost subject of interest to the student of nature in every country is the natural history of its aborigines, wherever this can be traced with any accuracy; but even the antiquary who picks up the rudely fashioned stone implements of the Somme Valley, or even the more polished weapons of the same material, must often be disposed to speculate on the probable habits, appearance, etc., of peoples who lived in the remote ages of which history has preserved no record. Therefore, in the New World, what between the short time that has elapsed since the Stone Age, and the presence still of waifs and strays of the same race that then existed, he is enabled to

derive lessons and apply comparisons with far greater certainty than could be obtained from a mere consideration of the mute records.

Before proceeding to a consideration of a few points in connection with the present condition of the native Indians of the region, I may state that I made it an occupation to visit their encampments wherever opportunity occurred; moreover, being frequently brought in contact with the hunting members of the community, and having volunteered professional services during sickness, I could at all events judge for myself as to their social life and habits. It was soon apparent, however,



NOEL MITCHELL, A HALF-BRED MELICITE HUNTER.

that very little of their past history is to be obtained from even the most intelligent; inasmuch as, even apart from their persistent indifference to treat on any subject connected with either their past history or present condition, there would seem to be an absolute incapacity to comprehend the meaning of such inquisitiveness on the part of the interrogator. In fact, there is a sort of silent and dogged bluntness of the understanding, whether natural acquired through the force of unfavourable circumstances under which they have been placed; so much is this the case, that I was sometimes in-

clined to the belief that many acts of ingratitude shown for favours received, were also the result of pent-up animosities associated with an inherited distrust of every mark of consideration shown towards them by the conquering race; and probably this is true to some extent, although it would appear to be owing, in no small degree, to an undemonstrative character natural to them.

I am, however, perfectly aware of the unsatisfactory condition one is placed in who has to narrow his observations to a small spot on a large continent. For this reason, and from the absence of any personal experience with reference to the natives of the adjoining regions, I am bound to state frankly that these notes are very limited; nevertheless, as far as opportunities occurred and circumstances permitted, I hope there will be found some points of interest, not only acceptable to the general reader, but what the author had also much at heart at the time, an acquaintance with the character and modes of life of the primitive inhabitants of the region, considered from the stand-points from which the antiquarian and ethnologist view such subjects. Moreover, to the naturalist, wherever he is placed, and however tempting may be other branches of science, there must always be a welcome field of research in endeavouring to trace the natural history of his own species back into unrecorded times, more particularly in the New World, where the transition from savagery to civilization is, comparatively speaking, but of yesterday.

Our speculations, therefore, with reference to the habits, modes of living, and appearances of the stone-folks of ancient Europe, receive suggestive data from a study of the existent races of North America.

A strange fate, indeed, is the apparent doom of the red Indian!—already driven across the continent by the great wave of European civilization, which, having overwhelmed the mass, has left a few stragglers behind, whilst the greater portion has either entirely disappeared, or been repelled to the slopes

of the Rocky Mountains, where they are making a last stand against the white man, with whom they have nothing in common, and from whom they borrow only the worst traits of his character. Moreover, so indifferent are the aborigines everywhere to the examples of their European conquerors, that to this day, even in the chief cities of Canada, the *beau-idéal* of fashion with the Indian squaw is a cast-off black hat for a head-dress, and a dirty blanket for a shawl. Thus, shod in her native mocassins, with her battered features and stealthy gait, she may be seen prowling about the streets in broad daylight, at once a conspicuous and sad picture of utter wretchedness and poverty. Such was the first example of a New Brunswick Indian that attracted my attention during a saunter along the streets of the pleasant country town just mentioned. In fact, I can picture almost every item of her attire and aspect; to wit, the short stature, green and yellow complexion, big coarse features, and capacious mouth, black eyes and hair; the old battered hat which none but an Irishman would covet, a glaring red cloth round her neck, and blanket across her shoulders. There she stood at the corner of a street, gazing listlessly at the red-coated soldiers just arrived from Europe, who in groups returned the inspection with far greater signs of wonder, and some droll epithets, which I trust, poor creature, for her sake, she did not understand. A little further on, and who is that dark-complexioned man staggering forth from a spirit-store? A stout, sturdy-looking fellow enough, with a bloated countenance, and voice hoarse with sottish gibbering: he has just been twitted by a passer-by on his drunken condition, and has tendered a rude response in broken and all-but-unintelligible English. He sees me, knows I am a fresh arrival, and straightway asks if I "have any cents for a drink." "Bill, you have had enough!" replies another wayfarer; at which he again responds in language not by any means parliamentary, and continues muttering and barking forth exhortations for money. He is

dressed in the cast-off raiments of gentility, but they are a long way too short for him. His coarse features are deeply pitted by smallpox, and like his hands swollen and chapped by cold and debauchery, whilst the straight unkempt black hair strews his shoulders. Such were the two first specimens of the aboriginal inhabitants of New Brunswick that came under my notice : I had hoped exceptions to a general rule, but further acquaintance with the race showed this not to be the case.

The form and features of the native of New Brunswick, as far as I could determine from the present race, seem to resemble the Esquimaux rather than the Red Indian of the south and west. The stature was to all appearances short, but now the admixture of white blood has changed the original. Still the coarse features, thick nose and lips, large mouth and prominent cheek bones, rather small eyes, and a fulness of the soft parts of the circumorbital region, black and straight hair, are maintained even when it is clear there has been a continued intermixture. Of course the female shows the half-bred conditions more clearly than the opposite sex ; and although the skin is often pale, the dark eye and hair, with an absence of any disposition to curling, are prominent characters and generally present. As to the cranial development, in the absence of materials it would be impossible to speak with certainty ; none of the skulls I have examined could be authenticated as genuine, and were exhumed from graveyards known to have been used by the tribes since their contact with the whites ; moreover, the present race is particularly sensitive about any interference with their ancient burial-grounds, so that, excepting in out of the way places, it would be extremely difficult to obtain specimens of the true Micmac or Melicite skeleton. Looking at their race characteristics, the Indians of New Brunswick furnish a good illustration of a people rapidly progressing towards extinction, without having preserved any written or monumental record ; indeed, were it not for implements of the chase picked up occasionally, we should have few

other data to establish the existence of the human inhabitants of the region previous to the arrival of the first European travellers. But small as these memorials happen to be, they furnish much valuable information to the archæologist. Thus, without a literature of any sort, not even the faintest attempt at a trace or scribble of what could be styled writing is noticeable on any of the relics, and what is equally unsatisfactory are the narratives or so-called traditions we hear from the lips of the more intelligent natives. In fact, to listen to their talk is to give ear to what sailors call "long yarns" savouring strongly of the imagination of the narrator. Many of the old terms are obsolete, and replaced by French or English words, so that their language, as now spoken, is corrupt to a degree ; indeed, to attempt to recover any portion of their unrecorded history from these miserable remnants appears to me a profitless undertaking. They nevertheless maintain a good deal of their ancient manners and mode of living. The majority are employed in hunting, fishing, building canoes, making baskets, mocassins, and fancy bead-work on leather or birch bark. A few have taken to the agricultural pursuits and manual labour of the white man, but it is apparent that nothing comes so natural to them, or is so congenial to their tastes, as the pursuit of wild animals, and consequently the hunting portion of the community are in request, being much employed in directing expeditions after moose, caribou trapping, etc., more especially among the military officers, whom the poor creatures will miss now that the British force has been withdrawn ; indeed, they may well believe their best friends have nigh departed, and mourn the loss over the wigwam fire, in camp and forest, of the gentlemen who invariably paid them handsomely, and treated them with the utmost kindness in spite of many acts of ingratitude and their dogged indifference, which after all may, as just observed, be inherent.

No doubt one of the greatest barriers to the social improvement of the Indian is the total absence of education, in par-

ticular among the female sex, and consequently a dogged indifference to benefit in any way by the examples or advice of the pale-faces. Thus, whilst the males are brought in contact with the whites, and in some cases receive the rudiments of an English education, the squaws stick to the lodges, and, as a rule, talk only the native language, with all the narrow-minded prejudices consequent on their exclusive habits. They are in general ugly, and probably from constant indoor life and unsanitary conditions, get soon aged in appearance. Marriage takes place at puberty, so that it is not uncommon to hear of females who have born fourteen to fifteen children, more than half of whom die before or during dentition. I was astonished at observing the absence of parental affection, even among the most respectable members in the villages. Love, as it exists in civilized society, has seemingly no place with them, but after all this is not to be wondered at, seeing they are sprung of the great Algonquin race, whose language does not contain the verb "to love."* Scrofula, consumption, and various other diseases dependent on abnormal modes of living, are prevalent in their camps; indeed the infantile mortality is appalling, as I have good cause to state from personal inquiries; indeed, scarcely one-half of the children arrive at the age of puberty, and, with few exceptions, all die by what may be designated "preventible diseases."

Moreover, it would seem that any admixture with the white race has added neither strength nor stamina to the Indian, nor sharpened his intellectual faculties, and most assuredly not improved his morals; however, it must be taken into account that there has been a very great change in his habits, and a substitution of unhygienic modes of living for the healthy nomadic existence of former days. We cannot therefore maintain that the mere cross has eventuated in the undoubted failure in strength and stamina which characterize the New Brunswick Indians of the present day as compared

* See Lubbock, "Origin of Civilization," p. 58.

with their progenitors. With reference to the hereditary and transmissible diseases, such as have just been mentioned, it is highly probable that they owe their origin to unsanitary conditions of living rather than to any direct transmission from the whites. Thus, a wooden shed badly built suffices for a winter covering, without further preparation to exclude the intense cold; here, round an over-heated stove, the squaw and children huddle, while wretched ground pallets of rags form their bedding; there is no household comfort or economy whatever, whole families living from hand to mouth. Of course there are exceptions; such, however, is the pitiable condition of the majority. But of all the besetting demons that ever danced destruction around the Indian, that fiend has been drunkenness. If only temperate habits could be formed, and more trouble taken by the whites in encouraging them to set out their villages on the models of the settlers, and in making the aged comfortable, and in holding forth inducements to the well behaved, instead of the live and let live system hitherto pursued, there might still be hopes of prolonging their existence; but as matters have been, and continue to go on, it seems clear that there is a race between the red man and the larger quadrupeds who shall be the first to disappear from the land where both once flourished and multiplied! Unfortunately, however, he is of obdurate heart and slow to adopt our manners and customs, the force of habit being strong within him; moreover, he soon finds that his ways can never be our ways, and that, do what he may, even to his utmost, he cannot manage to place himself in other than a doubtful equality with even the poorest and humblest of white men; indeed, it is the case that, whether pure bred or half-caste, nay, even without any traceable blood of an Indian in his veins, he carries traits of character and habits which more or less exclude him, irrespective of caste, from the society of all excepting his own people. I was often amused with what doubtless is a relic of the conciliatory

language practised by the early settlers, in hearing residents address the Indian with the prefix "Brother." Brother Indian, forsooth! He will never be a brother to the white man, whom it might better become if, instead of fraternal epithets, he contributed something more solid in the way of material help; at all events he might try to do his very best, so as to let his poor brother die out in a respectable manner.

It is not four hundred years since the early voyagers, who first came in contact with the natives of New Brunswick, found them living in wigwams made of birch-bark, and using canoes of the same material, without any apparent knowledge whatever of metals save native copper, which they hung about their persons in the shape of ornaments. In fact, like the aborigines of other portions of the continent, they were nomadic hunters, living entirely on the wild denizens of the forest and water, in the pursuit of which they used weapons made entirely of stone and bone, little aware of the vast mines of iron underlying more than one encampment where we now pick up their stone implements.* But rough as were their weapons in general, not a few show the very perfection of polish and finishing. They had flint knives of divers sizes and shapes for skinning beaver, mink, otter, deer, and bears; arrow-heads to penetrate the thick fur of the first, and spear-points of large size wherewith the reindeer and moose were slain, and the sturgeon's mailed hide pierced; axes to split fire-wood and dig through the ice; wedges of divers dimensions and degrees of workmanship, and the war axe with which they fought their deadly foes, the Iroquois of the banks of the St. Lawrence, or the natives of Newfoundland, with whom, according to tradition, they carried on wars and formed

* For example, the vast iron mines of Woodstock, which furnish an excellent quality of iron, giving an average ratio of 32 per cent. in the samples. See Hind's Report, p. 161, and Prof. Bailey's Report on the Mines and Minerals of New Brunswick, p. 58.

national alliances for its prosecution.* Indeed, although the present generation retains scarcely a tradition of any value or accuracy, their old misunderstandings with the Mohawks are still religiously preserved and utilized in many native villages for the purpose of frightening the children into obedience; moreover, several of the aged entertain an inherited dread of the name, and would fly to the woods at the sight of a Mohawk.

The Jesuit fathers seem to have been the pioneers of civilization in New Brunswick, as well as elsewhere in the northern portion of the continent, followed by the white trapper and trader, who exchanged iron tomahawks for furs, when the Stone Age passed away, and with it the decline and decadence of the Indians, so that the entire recollection of the stone and bone weapon days vanished from their minds in the course of a few generations.† But to their forefathers it was a Golden Age, which, however, as time rolled on, was soon forgotten, until, by degrees, they were compelled, in their struggles for existence, to yield inch after inch of their noble forests, and dwindle down to a handful of degenerate beings, preyed on by poverty, disease, and vice, which, in the ordinary course of events, must exterminate the race before another century or two have passed away.

Referring back to the beginning of the sixteenth century, and the state of civilization in which the early voyagers found them, it appears that the races of this portion of north-eastern

* "Acadian Geology," p. 42.

† Nowhere in the province are stone implements met with in such abundance as on the banks of Grand Lake, Queen's County, where the ancient race had evidently large encampments, and the Melicite still hunts the musk rat; also on the Tobique River above the Grand Falls. I have often deputed native hunters to procure specimens, and on eliciting their impressions thereon usually received a laugh of ridicule at the idea of such weapons being used in the destruction of the large animals; indeed, some looked on them as children's toys, and in no instance were their real histories guessed, unless by men who had picked up the information from Europeans.

America were not so far advanced in civilization as many of the neighbouring tribes, to whom the use of copper and iron was known long before the advent of Columbus. This, however, may have had something to do with the climate and physical condition of the locality, and more particularly the abundance of means of subsistence which did not necessitate excursions beyond their own native forests and rivers. The aborigines of New Brunswick then comprehended, as now, a seaboard and an inland tribe, speaking dialects for the most part similar, and related by blood to the great Algonquin race of the St. Lawrence and westward.* According to the French missionaries, the seaboard tribe, Micmacs or Souriquois, alone were estimated, in 1611, at from 3,000 to 3,500, not to speak of the St. John and other Indians of the inland race called the Etchemins, Eteminquois, better known at the present day as the Melicites, who were then probably more numerous. Now, I believe, the two tribes do not number over a thousand souls.

The stone implements met with throughout the Canadian Dominion and Northern United States present similarities in form and workmanship. But what appears remarkable as compared with the Old World, is the finding of very rudely chipped tools along with the highly polished,—a circumstance suggestive of their contemporaneity. It appears, as I shall observe presently, that when we come to examine the Canadian celts, and take into account the exact purposes for which they were fabricated, and consider carefully the conditions under which a primitive people would have existed as regards climate, food, and so forth, these discrepancies in regard to the sequence of the stone ages in the two continents admit of

* Moreover, the similarities of many words to Old World roots have been considered by American philologists as eminently suggestive of a European migration westward, and this is considerably strengthened by comparison of the languages of the Old World with the various dialects of the great Algonquin language, as pointed out by Mr. Rhand, missionary to the Micmac Indians of Nova Scotia, in an appendix to "Dawson's Geology."

explanation, at all events as regards Canada. At the same time, it is not improbable that either partially or wholly the same may apply to certain regions of the Old World, where the two are found together.

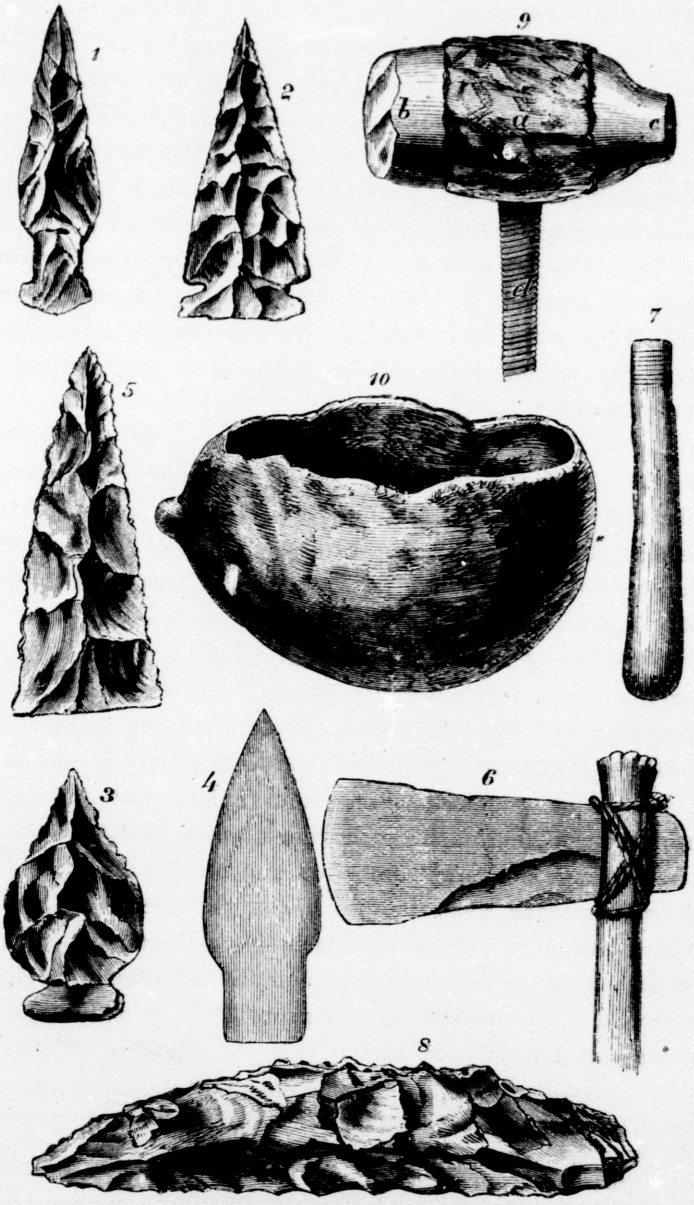
In New Brunswick, as elsewhere in North America, there does not appear to be any evidence of a Bronze Period. Although copper is met with in small quantities in the Devonian strata, and was known to the aborigines, they seem only to have used it as an ornament to adorn their persons. The Iron Age, as before stated, came in rapidly, indeed so quickly that the present generation is ignorant of stone implements having been used by their forefathers, just as much apparently as we are of the owners of the flint tools of Europe. The iron tomahawk, therefore, soon took the place of the greenstone celt, and was their chief object of barter with the early French voyagers and traders. Thus the long, narrow, adze-shaped iron hatchet, stamped with a "Fleur-de-lis," * is occasionally picked up along the great river valleys.

Referring to what may be called types of the weapons and implements of stone used by the Indians of New Brunswick, the arrow heads, figs. 1, 2, and 3, represent the usual pattern. No. 2 seems to have been used extensively, and is always the best finished, with an acute point and sharp cutting edges. The smaller point, fig. 3, made of white quartz, chipped or polished, is also not uncommon, and occasionally all may be collected in the same situation.

Fig. 5 represents a very rudely shaped spear head, nearly nine inches in length, from an old encampment on the Tobique river, where the natives, and their foes the Mohawks, were wont to engage in desperate fights.

Stone hatchets of divers size, some very finely polished, such as fig. 6; others are so rudely fabricated that, unless used for wedges or ice axes, it would be difficult to imagine the pur-

* I have seen specimens of this adze from the banks of the Miramichi River.



WEAPONS AND IMPLEMENTS USED BY THE INDIANS OF NEW BRUNSWICK.

pose for which they were applied. These are sometimes met with in numbers huddled together, and, in consequence, it has often occurred to me that they were merely implements in the first stage of manufacture. Now when we consider that the country is covered with snow for nearly half of the year, and take the rigours of the climate into account, together with the necessities of a sparsely distributed population subsisting entirely by the chase and fishing, we might well believe that they would lay in a supply of weapons for winter use, and nothing is more likely than that the unfinished tools were merely chipped into shape, their polishing and finishing being left to such time as necessity demanded.*

Fig. 8 is the common form of knife. I believe flakes of flint were used for the same purposes. The club-shaped implement (No. 7) of greenstone is a foot in length, and highly polished; it was discovered, with several stone arrow heads, including fig. 3, and some hatchets, in a spruce-bark coffin containing the remains of a warrior. Unfortunately, the above is the only one of such-like relics that I had an opportunity of examining; its larger extremity is bevelled off to a blunt edge, with several rude transverse lines at the further end. It would be difficult to guess the precise use to which this celt was applied. I showed it to several old Indians, but one only ventured an opinion to the effect that it might have been used for separating the bark from birch and other trees. Scoops and smaller stone tools, besides hooks and needles of bone, are met with on the sites of old encampments and under the foundations of the log huts occupied by the remains of the tribes, who, like remnants of other primitive races, still display a preference for their ancient haunts, lingering on in small

* Dr. Dawson, referring to the stone implements of this region, remarks ("Acadian Geology," p. 41) that both the chipped and polished were used at the same time for different purposes. This is probable, no doubt, to some extent; but several spear heads and stone hatchets appear to me so imperfectly fabricated as to be at best inoperative as war implements, and certainly next to useless for the chase, wood-cutting, or ice digging.

colonies on the sides of certain bays, rivers, or lakes which had been favourite hunting and fishing grounds from time immemorial. For example, there is a small detachment living in huts on the left bank of the St. John, opposite Fredericton. Here, among the *débris* of the middens, I have picked up skulls of the sturgeon, or bones of moose, mink, beaver, and other animals which they continue to hunt, just as will be noted presently, obtains in the case of the ancient refuse heaps of their forefathers; indeed, in a perpendicular section of the river alluvium on which the above encampment stands you may mark successive deposits of these remains to the depth of several feet. I failed to discern stone implements in undisturbed strata, but on the beach by the river's margin, and probably washed out of the bank, several stone celts and arrow points were found by the natives. Thus, from the conical shaped birch bark wigwam of the Stone Age, down to the wooden hut of the Iron Age, the same people have sojourned on the old hunting-grounds where, to all appearance, the Melicite and Micmac will end his days, like the last of the Mohicans.

Fig. 10 represents a stone pot, deeply blackened by smoke, found in the Province, and, as far as the local implements are concerned, may be considered unique. It has been deposited in the Museum of St. John, where I noticed also the curious hammer, fig. 9, which is a stone celt perforated for the handle, with a belt of ferruginous cement (*a*) welded round the middle, no doubt with the design of adding to the weight: *b* is the cutting edge, and *c* the heel. The celt is about four inches long by two inches in breadth.

Reverting to the finely polished specimens. Many are so exquisitely fashioned, particularly the arrow edges, that the present race often express wonder how their forefathers fabricated such tools without employing metal; indeed, Noel Mitchell, and other Melicite Indians, who deigned to take any interest in my endeavours to glean this amount of knowledge of their progenitors' habits, were fairly at a loss to realize the

following method, and even laughed to scorn the idea of such very finely chipped edges as of fig. 2 having been done by pieces of bone, and it was no use attempting to persuade them. Nevertheless the probabilities are, that as at the present day, among the Pitt River Indians of California, the same custom was more or less prevalent among the eastern races. Of the former, Lieutenant E. G. Beckwith, of the U. S. Army,* says:—

"One of them seated himself near me, and made from a fragment of quartz, with a simple piece of round bone, one end of which was semi-spherical, with a small crease in it (as if worn by a thread) the sixteenth of an inch in depth, an arrow-head, which was very sharp and piercing, and such as they use on all their arrows. The skill and rapidity with which it was made, without a blow, but by simply breaking the sharp edges with the creased bone by the strength of his hands—for the crease merely served to prevent the instrument from slipping, affording no leverage—was remarkable."

Although flint seems to have been always preferred when readily procurable, inasmuch as the most perfectly shaped and artistic weapons, at all events, that I have seen, were made therefrom; nevertheless there were many hatchets of soft friable sandstone, with a shallow groove near the heel, the wedge-shaped extremity indicating some use distinctly different from that of a hatchet; perhaps they were war implements, or used in felling deer in deep snow: the latter custom, as will be shown in the sequel, is still in vogue and extensively pursued by both natives and Europeans, in spite of an Act of Parliament prohibiting the barbarous practice. Talking of the Sioux Indians of the Upper Missouri and Minnesota Rivers, Dr. Muller† remarks: "Arrows of the

* "Report of Explorations for a Route for the Pacific Railroad," vol. ii., p. 43 of 2nd Report.

† Page 61, "Report of Surgical Cases treated in the Army of the United States from 1865 to 1871." Washington.

same tribe are not always made of the same size and material, and are shaped by the savages according to their prevailing fancy: the Toutons on the Upper Missouri, for instance, using both iron arrow-heads, also those made out of flint. In the same quiver of an Indian belonging to any one tribe, a great variety of different shaped arrow-heads will be found, which proves that the same tribe follows no special type, but fashions them according to any kind of taste."

With reference to other relics of the past race, tobacco-pipes of stone, very rude in construction, are found on the islands in the St. John, where the aborigines of old were wont to spear the salmon, bass, or sturgeon. Their antiquity, however, may be doubted. The natives, moreover, have a tradition that it was not very long ago that the Indians smoked only their native willow bark (*S. nigra*), which they even now mix with tobacco, or use alone when the latter is not procurable.

The absence of pottery, as far as I have noticed, seems remarkable; and I scarcely think if it had been in common use there would have been an absence of traces in the middens and old encampments; but so small a portion of the region has been examined, that I shall not be surprised if further disclosures confirm the presence of clay-made ware of some sort. I mention this especially in connection with the stone pot just referred to. The absence of sculptures of any sort on bone or stone is also worthy of notice, if we except a very remarkable object figured in Dawson's "Acadian Geology," and said to have been found on the banks of the Kennebeckasis, one of the influents of the St. John River. This work of art, according to the above authority, "is three feet in length, and is composed of a hard conglomerate, occurring *in situ* in the vicinity of the place where it was discovered. It has the aspect of a rude attempt at the execution of a sphinx or cherub, and may have been a monumental stone, or the ornament of a gate, or the charm of a medicine-man." *

* "Acadian Geology," p. 45.

Nothing further is known of the relic, only that it was dug up when making a cellar in a district far from any locality where such things were likely to be fabricated, thus leaving little doubt as regards its antiquity.

The next (see vignette on page 1) is if anything more interesting, and represents a human head in bas-relief, somewhat exceeding the natural dimensions. It is cut on a slab of red granite, and was discovered in a perfectly accidental manner lying among blocks of the same rock on the banks of the beautiful lake of Utopia, at the southern corner of the province. The outline of the features is exceedingly clear and distinct, the nose and forehead forming almost one straight line, somewhat like that seen on Mexican sculptures. I spent several days in the locality searching for further relics, and more especially the remains of a temple building said to have existed at one time on a bluff overlooking the lake, of which, however, not a trace was observable. I believe these two sculptures are the only ancient remains of their kind that have hitherto turned up in New Brunswick,—I might even say Canada and the Northern States. The skill displayed on the medallion clearly indicates a high knowledge of art, never attained by the forefathers of the present Indians; moreover, if it be not the work of a preceding race, it might be one of the trials of skill of some clever Jesuit father in the early days of colonization! Indeed when a drawing of this sculpture was displayed at the Boston Natural History Society, some members pronounced it a very modern imposition, and asserted it to be a likeness of the great Washington! I took pains, however, to satisfy myself on that point, having been assured by my friend Mr. Wetmore, of St. Stephen, to whom it was presented by the workmen, that he saw the moss growing on the slab, and was among the first to visit the spot, when he inspected it *in situ*. It has been deposited by this gentleman in the Natural History Museum of St. John.

Ancient Indian kitchen middens may be said to be found along the entire Atlantic coast line of the American continent. With reference to the region now under consideration, they are found on the shores and islands of the Bay of Fundy, and other portions of the coasts of New Brunswick, and the adjoining State of Maine; the conditions of the animal remains indicating in some instances considerable antiquity, whereas the shells in other cases point to more recent interments. I examined several of these heaps on the islands in the Bay of Fundy, and along the fiord of the St. Croix River for many miles. Although a large number had evidently been levelled and utilized for top-dressing, enough remain to show that, whether as articles of food, bait, or both, the aboriginal races collected vast quantities of the well-known clam, and *qua-hog*, besides two species of oyster (*O. borealis et Virginiana*), and the common forms of *Natica crepidula solen*, etc., the debris of which strew the coasts of several of the inlets in the Bay of Fundy, their numbers evincing the profusion of each species. It has, however, been asserted by no less an authority than Dr. Gould, that all, especially the three first species, are becoming rapidly extinct north of Cape Ann, Massachusetts.*

It is likewise stated that their disappearance has been in part, or altogether, owing to the saw mills in the vicinity of the beds, and that the clams, once plentiful in situations on the coast of Maine, have vanished since the lumber mills were erected in their neighbourhood. Whatever may be the cause, there is certainly something remarkable in the decadence of this shell-fish, as I shall also have occasion presently to observe of a duck which frequented the same area. Mr. Wyman, in 1867, examined several shell heaps near Portland, in Maine, and in Massachusetts, when he found stone and bone imple-

* "Mollusca of Massachusetts," and Sewall's "Ancient Dominions;" also Hitchcock's Report, "Scientific Survey of the State of Maine, 1860," p. 292. It is worthy of notice that drifted shells of the *O. borealis* are met with in abundance on the shores of Sable Island, in the Gulf of the St. Lawrence, as I am informed by Dr. Gilpin, of Halifax, Nova Scotia.

ments, also fragments of hand-made pottery, and remains of upwards of twenty quadrupeds and birds, all belonging to recent species. But the most interesting of his finds were perfect limb bones of the great auk, now extinct, which he moreover believes did probably linger on in the Bay of Fundy after the advent of the first settlers; and Mr. Wilson has lately shown that the bird was not rare in certain parts of Newfoundland within the remembrance of the present generation.*

A good idea of the contents of the kitchen middens met with on the islands and shores of the far-famed Bay of Fundy may be gathered from the following instance. I examined one of several mounds on the coast of an inlet named Passamaquoddy Bay.† The above lay, along with other mounds of a similar shape, on a flat facing the sea, and had the greater portion destroyed by the wash of the waves at high tide, disclosing a perpendicular section composed almost entirely of clam shells interspersed with mussels, whilks, and the common planorbis. The former (especially the mussel *Mya arenaria*) were extremely abundant, and for the most part in fragments; however I procured several very large ones, averaging 4½ by 3 inches in breadth, which the fishermen of the neighbourhood told me were very much larger than any recent specimens they had seen. The other animal remains belonged

* See Wyman's "American Naturalist," 1868; and "Newfoundland and its Missionaries," by the Rev. W. Wilson, Cambridge. Mass., 1866.

† There has been a controversy regarding the etymology of this word. It appears, from Dawson's "Acadian Geology," (p. 2), that the learned author, with the natural desire to maintain a becoming derivation of the name under which he has associated the geological features of Nova Scotia and New Brunswick, disputes the conclusions of the Commissions on the Settlement of the North-eastern Boundary, who assert that Acadia is derived from the native name of the fish "*pollock*," whereas according to Mr. Rhand it means "place of residence." Whatever may be the real etymology of the word, I must state, as regards the Passamaquoddy Bay,—whether as they assert it is derived from *Pos* (great), *aqua* (water), *aquoddie* (pollock), or not,—that this fish is common in the bay, and its remains are plentiful in the shell heaps.

to the following. The beaver, repelled and now exterminated within a radius of 90 miles, seems to have been plentiful in the neighbourhood, to judge from the fragments of bones and entire jaws and teeth dispersed throughout the heap. These did not however differ in any respect from individuals now inhabiting the northern rivers of the province.

A jaw of the little field mouse (*A. Gapperii*) was met with. It is also a denizen of the locality at the present day. Remains of the Virginian deer were likewise plentiful, and several of its long bones showed by their longitudinal fractures that they had been split for marrow. All the bones were very light and dry, and readily adhered to the tongue. It is requisite to observe that the surrounding country, in particular the valley of the Maguadavic River (River of Hills), has been a favourite resort of this deer from time immemorial, no doubt in consequence of the rugged outlines of the country; however, the numbers annually captured in snow-drifts, and destroyed in early spring when the thaws set in, are to all appearances in excess of the births, so that there is every likelihood of its extinction taking place before long, which, as regards New Brunswick, would be complete, seeing that the animal is localized in its distribution, being all but confined to the river valley above mentioned. I found besides numbers of bones and jaws, evidently of pollack and other large fishes, including scales of the sturgeon now also plentiful, and the arrow point of bone, shown in plate, fig. 4, also fragments of bone hooks and worked pieces of the Virginian deer's horns turned up with fragments of charcoal. But neither in this kitchen midden, nor in two others partially explored by me on the same coast line, westward, were layers of charcoal found such as Professor Chadbourne describes in shell mounds examined by him on the coast of the adjoining State of Maine,* indicating that fires had been made on the heaps. From

* See "Maine Nat. History Society Proceedings for 1859;" also "Report on the Agricultural and Scientific Survey of Maine," p. 290.

the general arrangement of these middens on flats, and along shallow shores, it seemed likely they had been the refuse heaps of wigwams placed immediately behind them, such as the Fuegian is forming at this day. Moreover, we find them nearer home in many a fishing village, and in front of Irish cabins; indeed within a stone throw of these old shell piles you may come on temporarily erected bark wigwams of the same sugar-loaf shape used by the ancient Melicites, whose descendants repair annually to St. Andrews with their basket-work and wares. Moreover there is difficulty in picking one's way to the cabin door through the filth and garbage they are too lazy to convey from the immediate precincts of their dwellings. Thus this custom of savage man still lingers on in civilized life.

But there is another trait of character of the wild man which we have refined, and that is, the love for the chase and destruction of wild animals. When this is pursued to the exclusion of everything intelligent beyond the mere slaying, there is engendered that potent impulse a longing for the pursuit,—in other words, a craving that is never satisfied, and seldom cries "enough" as long as there are birds or beasts to be killed. If we give way too much to this in early life, our tastes will soar no higher, and we may bid "good-bye" to mental culture ever afterwards. Thus the youth who thinks of nothing but sport, grows up, like the savage hunter, a fine fellow indeed; but unless he can separate the pleasures of the gun, rifle, rod, and chase from his business, it is not much mark he will make on the civilization of his day; for after all, he has been reverting to the habits of primeval man, and displaying a spice of the old times when "Wild in woods the noble savage ran." It is in this way that the love of the chase, and of wild countries, come to us so readily; indeed there are few who have wandered in the wilderness but get to like it so that the refinements of civilization become irksome. There is the charm of freedom in savage life, which

once realized is never forgotten, and if pursued for a length of time creates a desire to be away from, at all events, the centres of civilization, so much so that of the two states of existence, we learn to prefer that which seems to have been the original of man. In fact, is this not an instance of a reversion or throwing back, as Mr. Darwin calls it, to the traits of a common progenitor?

Referring to the gradual extinction of the larger quadrupeds of the region, it may be stated that the walrus, once very plentiful on the shores of the province, has now been repelled to the Frozen Ocean. It was common in the Gulf of the St. Lawrence as late as 1770, where important stations, such as Point Miscou, owe their former notoriety entirely to the walrus hunting: indeed, since the commencement of the present century there appears no record of the animal having been seen in Canadian waters;* but what is of more singular import, and far less explicable, is the disappearance of the bird commonly known as the Labrador duck (*C. Labradorius*), from the Bay of Fundy and other portions of the adjoining coast. I give this on the authority of my friend Mr. Boardman, whose extensive acquaintance with American ornithology, and more especially of the region I am considering, entitle his opinions to every consideration. He assures me that the pied duck was very plentiful up to late years in many of the bays along the New Brunswick coast, and also in the New York market, but has now become very rare, so much so, that its name is recorded among the *desiderata* of the Smithsonian Institute. It is very unlikely that this migratory bird has been exterminated by man; the causes of the extinction of the great auk, which could not fly, and the persecution of the walrus, beaver, etc., with all the odds against them, are evident; but the causes of the extinction of certain shell fishes and the duck are not so apparent.

* See Gilpin, *Trans. of Nova Scotia Inst. of Nat. Science*, vol. ii., p. 126.

CHAPTER II.

Backwoods Men—Influence of the Climate on the Anglo-Saxon—Modes of Living—Thoughts on Emigration—French Settlers of Tracadie, Leprosy — Charms of Forest Life — Native and European Myths —The Puma, Lynx, Wild Cat—Sable and its varieties—Mink, Weasel—Fisher Cat, Skunk and Otter—Increase of the Wild Quadrupeds of Nova Scotia—On Species Making—Bear—Influence of Forest Reclamation on the habits of Animals—Fox and its Varieties—Albinism and Melanism.

BEFORE proceeding to details in connection with the fauna and physical characters of the region, I will record my impressions in relation to the influences of this sub-frigid climate on the European settlers, also certain conditions of living which appear to me to exercise baneful influences on their health.

To one just arrived from Northern Europe there is assuredly something disappointing in the outer aspects of the middle aged of both sexes inhabiting the remoter districts of New Brunswick. Where he expected to meet burly, well-nourished farmers, sallow, weather-beaten countenances and spare, sinewy frames predominate among men of forty, while the pallid faces of the women indicate often ten years in advance of their real ages. The question naturally suggests itself, What is the cause or causes of this anomaly? In examining the sanitary aspect of the question, it soon becomes apparent that several important influences are at work in connection with the habits, food, and climate. It is possible I may not have recognized one-half of the causes, but according to what came under my notice, the following seem to produce

deleterious results on the general health of the rural communities. It is evident, in the first place, that the winter climate is trying to the Anglo-Saxon, and requires him to make exertions in order to maintain the animal heat.

The first settlers, pursuing the course still practised by the woodcutters in the wilderness, lived in log-built shanties, which they heated by open fires. Of late years stoves in the centre of the apartment have been substituted, for the reasons that they consume less wood, radiate heat better, and are more convenient for cooking purposes, whilst the former only diffused heat in front, and created an in-draught of cold air from the door, thus chilling the backs of the inmates. Indeed, this is more noticeable than it may seem to the general reader, as all will allow who have sat round a log fire in a hut when the thermometer was several degrees under zero. But at the same time there can be no question that the log fire was, in some respects, the healthier of the two; and as the intense cold invites crowding around the fire, it is a usual custom for the whole family to pass days in the dry, stove-heated atmosphere of their small cottages, so that in spring they look pale and shrivelled. So apparent is this, that no one who has passed a year in the interior of Canada but must have been struck by the pallid aspects, especially of the women and children, who, as matters of course, are more within doors than the men. Such a mode of existence, prolonged for nearly half the year, coupled with salted provisions and general sameness of diet, has, unquestionably, evil effects on the general health, exciting constitutional diseases, such as consumption, dyspepsia,* and the scorbutic states frequently observed among the badly-fed residents of wilderness districts.

* I have frequently been impressed with the belief that the majority of cases of disordered digestion so prevalent among the settlers in remote districts are greatly owing to the bread or beans not being properly cooked. The latter, as is well known, are highly indigestible when carelessly prepared, as shown by the combination of the sulphur and phosphorus pro-

Moreover, the extremes of cold are trying to constitutions not originally strong, and we can well believe the privations of the early settlers did pretty well demonstrate nature's rule, that the hardiest and strongest only survive; indeed, considering the difficulties to be encountered, it is highly probable that only persons of this description thought of emigrating. Probably, therefore, the secret of acclimatization is a good constitution and due attention in maintaining a healthful condition of mind and body. Having resided for several years both in hot and cold climates, I have been struck with the circumstance that fresh arrivals feel the extremes less during the first year or two than subsequently, which may be accounted for in some ways from the novelty of the situation and attractions of a new country, more especially if the individual keeps both body and mind in healthful exercise. As to the colour of the hair and complexion, or rather temperament, in connection with a foreigner's susceptibility to the diseases of very hot and very cold countries, I do not think any very definite rule can be laid down: however, as far as my observation extends, I did not notice that dark or fair complexioned Europeans were more or less susceptible to the diseases of one or other, but I suspect it is the opinion of every one who has looked into the subject carefully, that the persons who stand all climates best have vigorous circulations with good digestive organs and skins easily tanned, which means nothing more than rude health; nevertheless, there being so many intermediate states usually admitted as healthful conditions, it is difficult to particularize the exact temperament that will fulfil these ends.

I have always noticed that although persons may sojourn for long periods in trying climates, and enjoy their usual health, still when exposed to vicissitudes there is no mistaking the advantages of the former over all other inter-

ducing flatus, otherwise, in combination with the articles above stated, they form a diet in every way suited to the labouring man.

mediate gradations, whether of dark or fair temperaments. Persons who readily lose the natural glow of health, and become pallid on exposure to great cold or extremes of heat, for example, are not easily browned by the sun; such are soonest fagged by inordinate bodily exertions, although the individual will sometimes refuse to admit what is palpable to the looker-on; still there is no mistaking this simple fact, and its general application. I have had much experience of the physical requirements of the British soldier, and after over a score of years' observation, am well convinced, in order to support the fatigues and hardships which he is daily called upon to undergo, that, irrespective of stamina, no man ought to undertake to meet the vicissitudes of tropical sun and soil until he is at least twenty years of age. My own impression is that, whether as a colonist or belonging to the army, he who has to fight against the climate of Canada on the one hand, and Central Africa or India on the other, should be fully developed; therefore the minimum age ought not to be under twenty-five. This I know full well would bring few recruits to our depôts, but it is a case of pounds, shillings, and pence which the ratepayer will do well to consider.

After all, the men who have made the most marked impression on the history of civilization have been, as a rule, the possessors of a *mens sana in corpore sano*, I mean where the hardships of sun and soil have to be overcome. Some have fallen victims to one or both before the battle was over, whilst others, like Livingstone,* weathered the storm. All fulfil the natural law whereby the strongest gain the day, or, in other

* Many practical illustrations of what has been stated are fresh in my memory. Without particularizing individual instances, I may observe that several of the men of mark who have aided in extending our Indian empire, have been famous for their great activity and powers of endurance, perhaps in some cases selected; but I opine in the majority of instances their chief recommendations were indomitable pluck and enterprise, with powers of endurance which carried them through difficulties where nine out of ten of their compeers would have succumbed.

words, the vigorous, and healthy, and the happy survive and multiply; and it would be well if all intending reclaimers of the wilderness, whether bound for Canada or elsewhere, did fully realize the hard struggles before them,—inasmuch as, however inviting the prospect may be beforehand, or to the casual on-looker, in serious practice there are many obstacles to be overcome which demand the full exercise of vigorous manhood, and unusual patience, energy, and perseverance. We can easily suppose, therefore, that the privations of the early Canadian settlers must have pretty well demonstrated these facts with reference to the climate.

The most unhealthy seasons of the year are during the thaws of spring, and in autumn at the setting in of the cold months, when the rapid transitions of temperature invariably create sickness. Consumption is always most fatal in midsummer, after the variable weather. Inflammations of the lungs, especially pneumonia, are prevalent in winter, the latter being the disease *par excellence* of the climate, which carries off the aged and persons whose constitutions have been undermined by intemperance, and is the chief exciting cause of consumption. It seems that alcoholic drinks here, as in all very cold countries, recommend themselves, and no doubt, under certain conditions, are beneficial; but both whites and Indians seem perfectly unable to withstand the allurements of whisky drinking, so that they are either confirmed drunkards or teetotalers, the latter to an extent often injurious to weakly individuals. It is a frequent subject of remark that the second and third generations of Europeans born and brought up in the colony have not the strength nor stamina of their forefathers, and this is evidently a general rule,—the result, perhaps, of several influences. Looking at the subject in what seems to me its proper bearings, it will be observed that the original reclaimers of these vast forests must of necessity have been a temperate and hardy race, dependent entirely on their own exertions, distant from the demoralizing temptations of

towns, and surrounded only by the bare necessaries of life; while their children inherited the lands they had cultivated with far less demand on their energies; and finding that their patrimony could always bring enough to maintain them in idleness, they neglected the farm, and the soil became impoverished. In this way whole districts, once famous for their fertility, are now worn out entirely from the prolonged system of constant demand without adequate remuneration.*

The settler in the wilderness districts spends the year between the woods and the farm, and no doubt, of the two, he infinitely prefers the former, where he is not over-worked, and always gets a good dinner and pay for a hard day's work. But as soon as he has driven the logs down the streams, he must hasten to his home to till and saw enough to maintain his family during his absence. Sad experience has long since established a canon that no branch of industry can prosper as long as there is ready access to alcoholic drinks; hence none are allowed, tea being substituted and used extensively at each meal. Thus, while pork, fresh meat, beans, molasses, and home-baked bread are the sole articles of food in the lumber camp, he lives more sparingly in his home, where salted pork is often the only animal food in the larder from year's end to year's end. The result is, wherever the sameness of living has been pursued for some time, there is never much difficulty in recognizing its effects on the outward aspect of the inhabitants.† Here, unlike the United States, the infusion

* In the rural districts agriculture is still very primitive, whilst horticulture is very much neglected; in fact, neither have received anything like the attention they deserve, and apparently never will until the forests are exhausted and the settler thinks more of his farm than of felling trees.

† During my wanderings in the forest districts I was constantly applied to for advice regarding conditions of ill-health demonstrably the result of long-continued subsistence on one sort of food; scurvy and diseases resultant of mal-assimulation being especially common. It would, I feel, be beneficial to health in the rural districts if more wheaten bread was used and less buckwheat, which, although it tastes well, is poor in nitrogenous substances and fat; moreover, the custom of serving up both

of fresh blood from northern Europe is small, and intermarriages keep up a repetition of one stock, so that, when continued generation after generation, I have no doubt the conditions just referred to would, in combination with climate, produce a deterioration of race which nothing but the former and a change of living are likely to obviate.

With reference to the reclamation of the forests and the persons best suited to cope with the rigours of the climate and other difficulties, although I do not wish to enlarge on this subject, I cannot resist recording a few remarks in connection with emigration, more especially my own impressions (such as they are) regarding the description of men best suited to contend against a trying climate and reclaim the primitive forests. I think it will be the opinion of persons unprejudiced in every way, that the young agricultural labourer, with a perfectly sound constitution, and accustomed to the hardships and fatigues incident to his calling, is by far the best pioneer of cultivation in the backwoods of Canada. Such do not soon get disheartened through the asperities of the soil or weather, and being unaccustomed to great expectations, are more easily contented with the small returns that, as matters of course, will attach themselves to the fortunes of the first settler. While on the other hand, as has not unfrequently been the case, gentlemen farmers, and officers of the army, settle in the wilderness; the latter, captivated by the shooting

buckwheat and wheaten cakes hot, and often undercooked, must be pernicious to persons of weak digestion. Mr. Hitchcock, in his "Scientific Report on Maine" (p. 358), makes the following observation on the apparent effects of buckwheat on the physique of the French settlers in the more secluded portions of the State: "It may be a matter of fancy on our part, but we thought we could see some connection between the physical energy of the farmers in that section and the crops that they raise. There was an apparent listlessness and lack of physical stamina in those Acadians who cultivated little else than buckwheat for bread, compared with those who paid attention to the culture of the wheat and other cereals. Whether the buckwheat diet was the cause, and the debility the effect, or *vice versâ*, we will not here attempt to decide."

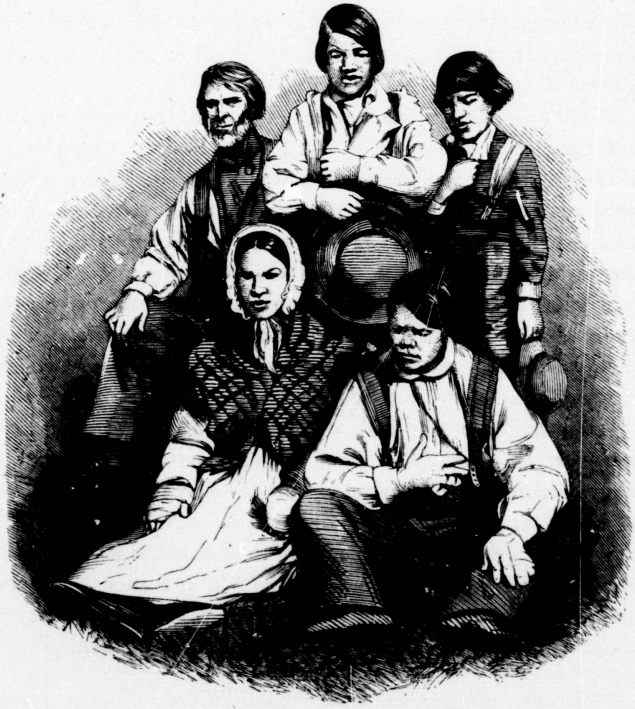
and fishing, as much as the independence and novelty of the life, have turned their swords into Canadian ploughshares. The first, I opine, will find their prospects poorly realized; and to the second, I would be very much inclined to say, "Don't! Do not reverse your social position and aspirations for the doubtful chance of bettering your circumstances at the expense of undoing all that education and refinement your parents may have even stinted their purses to provide for you!"

No doubt the war one has to wage against nature on the one hand and climate on the other is, as regards New Brunswick and like countries, best suited to such as have never been accustomed to a much better state of existence, and whose inclinations are in keeping with the society with which they are destined to associate. I speak entirely of the wilderness districts and their reclamation. In the numerous towns and cities of Canada there is ample room for the exercise of the best intelligence and enterprise, but there, as everywhere else, one must know how to proceed.*

An example of the evils of intermarriage in combination with unsanitary modes of living, such as have been detailed, is shown among the French settlers on the north-eastern frontier of the province. Descended from the early Norman colonists, they speak their mother-tongue and maintain the old religious faith; indeed, so exclusive are they, that it is rare to hear of any one marrying out of his own sect. Moreover, so closely are they bound by family ties, that in one district (Carraquette)

* During my peregrinations in New Brunswick I was frequently struck by observing how the national characters of the settlers are displayed in the appearance and management of their farms, even in the second and third generations born in the country. The tidy, well-kept, well-fenced farm of the Englishman and thrifty and canny Scot, and the wretched cabin, the slatternly and dilapidated precincts of the Irish, with the eternal pig roaming about wherever it listed, are so conspicuous that in travelling through forest clearings I could generally guess the nationality of the owners.

it is a usual occurrence to give marriage dispensations. Thus hereditary diseases are common, and of all others that terrible scourge Elephantiasis, or Greek Leprosy, has maintained a prominent position among the maladies of these poor creatures for many years. Indeed so frightful have been its ravages, that



FRENCH LEPERS OF TRACADIE.

the Government was obliged to build a hospital in the district for the especial treatment of such cases. This very wise measure has had the good effect of isolating the disease, but sometimes the wretched victim, rather than undergo forced detention in the dismal lazaretto, betakes himself to the woods, and is

there surreptitiously maintained by friends. No doubt the dietary contributes towards developing the inherent predisposition: indeed many of the afflicted attribute their conditions to feeding on salted fish for lengthened periods, and in consequence of the prevalence of the disease in families, there grew a belief that it was communicable by touch. This, however, has been clearly proved not to be the case, whilst on the other hand the hereditary transmission is indisputable, as shown by careful observations made by Drs. Bayard and Wilson of St. John. Considering the scientific interest connected with the natural history of this formidable malady, I have made an abstract in the Appendix from the report of these gentlemen, showing the consanguinity of the inmates of the lazaretto at the time of their inspection. The repulsive aspects of many of the unfortunate beings are too shocking to relate, and although a good deal has been done to ameliorate their conditions, still, from all I could learn, there are few public charities in the province more deserving general support than the leper hospital of Tracadie.

I made an ineffectual attempt to visit these poor outcasts, but at a season of the year when travelling is very difficult in consequence of thaws; indeed I got as far as the mouth of the Mirimachi River, and was within forty miles of the lazaretto, when a continuance of May floods carried away bridges and destroyed the usual route along the north-east coast. Never shall I forget the four days spent in traversing these sixty miles of New Brunswick forest in a wretched waggon yclept the "Royal Mail," when after twenty-four hours' struggling over the most villanous of roads, we halted at midnight at a country inn, where I slept on the floor, with the mail-bags for a pillow. How the driver of the diligence fell asleep as we were rattling down a steep hill, and by way of bringing the negligent whip to a sense of duty, his neighbour, a Presbyterian parson, nudged him so violently as to knock the culprit from his box; the meeting with the skipper of a German vessel in

a farmhouse, where we stopped to dine and change horses; and the story of a pursuit after his crew who had deserted him in Miramichi Bay a few days previously, together with many other incidents of travel which occurred under anything but pleasant circumstances, are all duly chronicled in my remembrance; alloyed with the kindness and hospitality of my friend Dr. Benson, of Chatham, to whom I am further indebted for his able report on the lepers, and much valued information in connection with the interior economy and condition of the Tracadie asylum. Although prevented from making a personal inspection of the hospital, I must not leave the subject without some further notice of the establishment, and therefore transcribe the following excellent description by the late Governor, the Hon. Sir Arthur Gordon, already published in "Vacation Tourists" for 1863. Talking of the origin of the leprosy, Sir Arthur says:—

"There is an obscure and doubtful story that, some eighty or a hundred years ago, a French ship was wrecked on the shore of the county of Gloucester or Northumberland, and that some of those who escaped from the crew were sailors of Marseilles, who had caught in the Levant the true eastern leprosy, the terrible *Elephantiasis Græcorum*. However this may be, there is no doubt that for many years past a portion of the French population of these counties has been afflicted with this fearful malady, or one closely allied to it—probably that form of leprosy which is known to prevail upon the coast of Norway. About twenty years ago the disease seemed to be on the increase, and so great an alarm was created by this fact, and by the allegation (the truth or falsehood of which I have never been able satisfactorily to ascertain) that settlers of English descent had caught and died of the disease, that a very stringent law was passed, directing the seclusion of the lepers, and authorizing any member of a local Board of Health constituted by the Act, to commit to the Lazaretto any person afflicted with the disorder. After being for a time established

at Sheldrake Island, in the Miramichi River, the hospital was removed to Tracadie, in the county of Gloucester, where it continues to remain.

"The situation of the Lazaretto is dreary in the extreme, and the view which it commands embraces no object calculated to please, or indeed to arrest, the eye. On the one side is a shallow, turbid sea, which at the time of my visit was unenlivened by a single sail; on the other lies a monotonous stretch of bare, cleared land, only relieved by the ugly church and mean wooden houses of a North American village.

"The outer enclosure of the Lazaretto consists of a grass field, containing some three or four acres of land. Within these limits the lepers are now allowed to roam at will. Until lately, however, they were confined to the much narrower bounds of a small enclosure in the centre of the large one, and containing the buildings of the hospital itself.

"Into these dismal precincts I entered, accompanied by the Roman Catholic Bishop of Chatham, the Secretary to the Board of Health, the Resident Physician, and the Roman Catholic Priest of the village, who acts as Chaplain to the hospital.

"Within the inner enclosure are several small wooden buildings, detached from each other, and comprising the kitchen, laundry, etc., of the establishment; one of these edifices, but newly completed, is furnished with a bath—a great addition to the comfort of the unhappy inmates. The hospital itself is a building containing two large rooms, the one devoted to the male, and the other to the female, patients. In the centre of each room is a stove and table, with a few benches and stools, whilst the beds of the patients are ranged along the walls. These rooms are sufficiently light and well-ventilated, and at the time of my visit were perfectly clean and neat. In the rear of these rooms is a small chapel, so arranged that a window obliquely traversing the wall on each side of the partition, which divides the two rooms, enables the patient of either sex to witness the celebration of Mass without meeting.

Through the same apertures confessions are received, and the Holy Communion administered. I may here remark how curious an illustration is thus afforded to architectural students of the object of those low skew windows often found in the chancels of ancient churches. In a remote corner of North America, in a rude wooden building of modern date, erected by men who never saw a mediæval church, or possess the least acquaintance with Gothic architecture, convenience has suggested an arrangement precisely similar to one which has long puzzled the antiquaries and architects of Europe.

"At the time of my visit there were twenty-three patients in the Lazaretto, thirteen males and ten females, all of whom were French Roman Catholics, belonging to families of the lowest class. These were of all ages, and suffering from every stage of the disease. One old man, whose features were so disfigured as to be barely human, and who appeared in the extremity of dotage, could hardly be roused from his apathy sufficiently to receive the Bishop's blessing, which was eagerly sought on their knees by the others. But there were also young men, whose arms seemed as strong, and their powers of work and of enjoyment as unimpaired, as they ever had been; and—saddest sight of all—there were young children condemned to pass here a life of hopeless misery.

"I was especially touched by the appearance of three poor boys between the ages of fifteen and eleven years. To the ordinary observer they were like other lads—bright-eyed and intelligent enough; but the fatal marks which sufficed to separate them from the outer world were upon them, and they were now shut up for ever within the walls of the Lazaretto.

"An impression similar in kind, though feebler in degree, is produced by the sight of all the younger patients. There is something appalling in the thought that from the time of his arrival until his death, a period of perhaps many long years, a man, though endowed with the capacities, the passions, and the desires of other men, is condemned to pass from youth to

middle life, and from middle life to old age, with no society but that of his fellow-sufferers, with no employment, no amusement, no resource; with nothing to mark his hours but the arrival of some fresh victim; with nothing to do except to watch his companions slowly dying around him. Hardly any of the patients could read, and those who could had no books. No provision seems to be made to furnish them with any occupation, either bodily or mental, and under these circumstances I was not surprised to learn that, in the later stages of the disease, the mind generally became enfeebled.

"The majority of the patients did not appear to me to suffer any great amount of pain, and I was informed that one of the characteristics of the disease was the insensibility of the flesh to injury. One individual was pointed out to me whose hand and arm had been allowed to rest on a nearly red-hot stove, and who had never discovered the fact until attention was arrested by the strong smell of the burning limb, which was terribly injured."

I never think of the haunts of the larger wild quadrupeds of this region without associating them with many scenes deeply impressed on my memory, of the delightful winter days spent in roaming on snow shoes over the forest, or the nights when under the shelter of the little hut made of pine boughs, and covered over with snow, its cheerful log fire in the centre, and our pallets of the softest spruce foliage, we recounted the adventures of the day, or listened to the long yarns of the Indian.

How vivid come back these and like recollections! the solitude and perfect stillness of nature, only broken by the twigs cracking from intense frost, the loud chattering of stray squirrels, or the phantom-like form of a hare springing over the snow, the dreary barren with only here and there a single tree, or clump of stunted pines, the impervious alder swamp, anon the dismal darkness of the forest; now the deep impres-

sions of a moose, then the broader and less hollow prints of the reindeer; the fox's sharply defined dimples, the lynx's broad pads, and shallow track of the sable or mink, whilst from beneath every bush close around the bivouac, are seen innumerable sojournings of the smaller weasels that come forth at night to feed on the refuse of our humble fare, or the little short-tailed wood mouse, attracted by the light and heat, and not yet taught to fear man, is seen running about the humble hearth. I think, moreover, of the Indian, seated on the opposite side of the log fire, pipe in mouth, mending a torn moccasin, as he narrated some hunting or trapping adventure, or what was always most akin to his fancy, a discourse on the supernatural. Indeed, their belief in ghosts and goblins, fairies, water sprites, and monster animals, if in any way inferior to that of their forefathers, must indeed be small.

It used to be my favourite occupation during visits to Indian villages, or in excursions to the wilderness, to provoke discussions on all sorts of traditional stories, or elicit personal narratives in regard to their habits and customs, and, I will say, a more impracticable race does not exist. It was of no use talking to the squaw on any subject save the price of moccasins or snow shoes, for, indeed, little she cared to tell her social life, whilst the man was seldom induced to talk unless when separated from the others. But by the blazing log fire in the depths of the forest, during the winter night, when he and the European attempt to wile away the long hours, there comes over him at times a disposition to be communicative, and nothing will delight him more than narrating his experiences of the supernatural, of which he has generally a few sensational instances handy, and is generally prepared to listen to any fresh example, more especially if at all connected with forest life. My friend Mr. Edward Jack, the most experienced wilderness traveller in the province, informed me that he nearly terrified an old Indian out of his wits by assuring him that "a monster spirit had appeared close

by, and demanded to know where the Indian was, as he desired to eat him," at which the latter became so terrified that nothing subsequently would induce him to leave the camp fire after nightfall. I moreover well recollect another occasion when hunting Virginian deer with my excellent friends Colonels Anderson and Wetmore. We had settled down in a deserted shantie previous to beating a hard-wood forest, when the native, a brother of the Indian just referred to, after cooking our dinners and spreading the pine tops, on which we reclined under rugs, and having piled the logs on the fire for the night, betook himself, as usual, to his corner, whilst we chattered and talked until one after another fell asleep. However, from some cause or other (possibly being my first night in camp) rest would not come to me, so dozing and waking, I tossed about under the blanket. Besides, there were porcupines calling in the forest, and strange sounds like the breaking of dried twigs under feet, whilst mice kept passing over me to feed on the refuse of our dinners. Restless and uncomfortable, I popped my head from under the rug to find Sabates, the Indian, seated, with pipe in mouth, intently gazing into the blazing fire. In a trice I was alongside of him, whilst my two friends snored in concert under their blankets. Talking of the porcupines, he assured me in the first place that their noises always preceded a thaw, and certainly such was our experience on the above occasion.

Then reverting to the cracking of twigs, he would not positively say what was the reason; perhaps a deer or a stray bear might be about; "there were sounds," he said, "sometimes in the forest which no one could explain!" At last, from one thing to another, we got on ghosts, when Sabates warmed rapidly, and at once proceeded with a long narrative, the gist of which ran as follows. One night, when alone in a very unfrequented portion of the forest, where he had been hunting musk-rats, he was on the point of reclining under a little temporary cover made of branches of trees placed on

uprights, when, to his utter astonishment, a female figure appeared in the gloom before the fire.

"Come now, Sabates," said I, "you did not see her closely!"

"I seed her," replied Sabates, "as clear as I see you! And what do you think?" he continued, "when I returned to my people, who live on the banks of the Schoodic Lakes, I found a squaw, one of my near relatives, had died on that very night!"

It is, however, scarcely fair to be hard on the heathen, when at the same time we find the white race indulging in similar if not more extravagant delusions. Thus, when I retorted to his narrative with a smile of incredulity, Sabates asked if "I had heard of the Monster of Utopia," which lake, as the crow flies, was not ten miles distant. We have already seen the archæological interest attached to the district, and in the sequel I will revert to its waters in connection with the brook trout; in the meantime I shall relate briefly a supernatural wonder connected with this beautiful forest loch.

During midsummer, 1867, some lumbermen employed at a saw mill situate at the north end of the lake observed on one occasion that the waters, usually remarkably placid, were suddenly disturbed by the splashing of some object, which certain individuals asserted was fully ten feet in breadth and about thirty in length. The most reliable of the witnesses informed me that, although he saw the water furiously disturbed in a circumscribed area of the above dimensions, he did not observe any object; and this I believe is the most correct statement. The entire phenomenon did not last above a minute, when the surface became smooth like the rest of the lake, which was remarkably tranquil at the time. During the two following days the same appearances were alleged to have been seen by other observers in different parts of the lake; and so positive were the residents that some monstrous animal was the cause, that they set large hooks baited with salt fish and pork, and which I found attached to logs in various situations.

The credulous asserted that the slimy track of some huge animal had been traced from the ocean to the lake some *thirty* years ago! and we were considered adventurers in sailing on the lake so soon after the above occurrence. The question, however, came to be, "What was the real cause of the disturbance," for there could be no doubt that a remarkable appearance as regards the surface of the water did take place. The lake is picturesquely situated in a deep basin, surrounded by wooded hills, which are composed for the most part of red felspathic granite, the only direct communication with the sea being by canal and river, whilst the latter presents a barrier at its mouth over which it is absolutely impossible for sturgeons, or a fish of any sort, to make their way; moreover the lake is only six miles in length by about one in breadth. We might suppose, therefore, sub-lacustrine rock fissures, containing air and water from the water-shed, suddenly opening in places; or shoals of eels or fishes, such as are often observed in the case of the little sardine-like fish in the Mediterranean. Again, I have noticed, in secluded lakes in Thibet and Ladakh, that whirlwinds not unfrequently disturb parts of the surface, especially where cross currents of air from gorges meet; and this is the case on Lake Utopia. At all events, the monster was decidedly *Utopian* in every sense.

Returning to the natives. Any familiar objects or sounds seem to have always made lasting impressions on the Indian's mind, and the more remarkable, the more likely were they to take a place in his wild legends and wilder mythologies. As examples—the night screech of the owl had to them a linguistic significance, and the squirrel's continual chattering on the approach of man is accounted for in the following pretty fable.

The red squirrel chooses the dense, dark forest of hemlock spruce among the moss-covered and rotting prostrate trunks where it sports about and stores up cones for winter; there came a belief among the ancient Indians of New Brunswick,

that the squirrel had been an enormous animal, but that one day an old man of the tribe was asked by the Great Spirit what he should most desire, and he replied, "To reduce the size of this giant squirrel!" Whereupon he received the divine mandate, and going forth from the council chamber, stretched out his hand, when the squirrel shrank to its present proportions: "therefore the result has been that the little creature has ever since been querulous at the sight of man!"

But there were other monster animals, according to their legends, besides this great *miko*, or squirrel. Stories are told of huge moose, beavers, and "the wonderful Great Turtle"!* How the snowy owl still laments the Golden Age when man and all animals lived in perfect amity, until it came to pass they began to quarrel, when the great immortal Glooscap, or Clotescarp, got disgusted, and sailed across the seas, to return when they made up their differences. So every night the owl repeats to this day his "*Koo koo skoos*"—"Oh, I am sorry! oh, I am sorry!" Thus, whatever was strange or uncommon in the habits and appearances of animals, either in the production of fear, or calculated to excite curiosity in the savage's mind, was sure to be utilized in one way or another: for example, the passenger pigeon was their ideal of "rapidity in movements;" the ungainly bear, jet black excepting a white mark on its chest, elicited a story of how the "beauty spot was produced." The amphibious musk-rat was associated with "good actions," as it furnished food and fur for winter. To this day fabulous tales are told of the "Lhoks," or "Indian Devil," and its ferocity, but unless the puma had at one time ranged over the New Brunswick forests, there is no other feline animal formidable enough to attack man.

* The gigantic tortoise of the Hindoo mythology is a strange contrast to this myth of the American Indians, and whether in either case a chimera or not, it is remarkable that the imaginations of the two races were so concordant. For the above and other Indian traditions in connection with New Brunswick, see the interesting "Wilderness Journeys," by the Hon. H. Gordon, "Vacation Tourists" for 1862-63.

According to Dekay,* the PUMA does not probably range further north than New York; but it may just be possible that now and then an individual strays into the forests of this region. I have a record made by the late Dr. Robb, Professor of Natural History in the University of New Brunswick, of a large feline animal having attacked and nearly killed a man near the capital of the province in 1841, and he further states having seen the skin of a puma from the vicinity of Quebec. The ferocity and cunning of the glutton has made it famous in more southern regions, but the animal is unknown within our boundaries.

The LYNX is still plentiful, and the WILD CAT (*L. rufus*) is not uncommon, but under the latter are included numerous domesticated varieties, which, when abandoned on the breaking up of the log camps and such-like, betake themselves to the feral life, and are frequently captured in traps set for sable and mink; and as the fur partakes of the richness of the wild felinæ, jet black sorts especially are valuable. It may be, moreover, that crosses take place between the wild and tame animal.

The AMERICAN SABLE or PINE MARTEN is considered by certain authorities to be only a variety of the Russian sable, whilst others maintain specific distinctions. In dimensions, length of tail, coloration, and quality, or rather quantity of the fur, they assimilate pretty closely, only the density of the pile is most assuredly in favour of the Old World animal, as shown by their marketable values. But this difference is no doubt owing to climate, as the varieties in colouring are common to the denizens of both continents. The two sorts of skins familiarly known to Canadian trappers as the hard and soft wood sables, are so pronounced that dealers make distinctions in their prices.†

* "Natural History of New York."

† The hard wood or light coloured skin usually fetch two dollars, while that of the dark or soft wood sable varies from two and a half to three dollars and upwards.

Natives and hunters state that the former, or the orange and saffron coloured sable, lives more or less in forests composed of deciduous leaved trees, and the latter in the dense pine woods. I can well believe that the exposure to light in the maple woods, as compared with the eternal gloom of the coniferous forest, would be sufficient to bring about these remarkable differences; indeed, looking at the advantages these colorations are to both—take, for example, in the autumn, when the ground is covered with the many yellow and red leaves of the various sorts of trees, then the black sable would be conspicuous when hunting, whereas the other would scarcely be recognized. At all events, we must say that there is a predisposition to variation in the species, and that from whatever cause the same is apt to be continued and propogated by offspring, provided the parents are both similarly shaded. I have repeatedly arranged series of sable skins from one large forest tract composed of long stretches of nothing but coniferous trees, with only hard wood sparingly distributed throughout, when without difficulty I was enabled to form a regular gradation from one extreme to the other. Now, although it frequently takes place that the two sorts are met with in the same situation, this does not militate against the fact that the animals prey chiefly on squirrels, partridges, and the like, which repair to feed on the nuts, etc., that furnish their chief food in summer and autumn, as do the denizens of the coniferous region in winter, therefore we may fairly conclude that, if nature does select the animal best suited to the circumstances, she did wisely towards the sable, inasmuch as its means of subsistence are distributed over two districts very distinct as regards sunshine. With reference to physical features, we might go so far as to believe that supposing the pine forests should disappear, and only the maple, beech, birch, and so forth remain, in process of time the dark-coloured sable would become extinct. From abundant data I was enabled, as far as the New World animal is con-

cerned, to establish the following comparisons between its outward appearance and bony parts, with the denizen of northern Europe and Asia.*

The average length of the American sable, as indicated from the very many specimens examined by me, is nineteen inches, exclusive of the tail, which averages six inches. The tail vertebræ do nearly extend to the end of the hind feet, which is also the case with the old world animal; nevertheless I observe Professor Baird stating † that in the specimens procured in the United States the feet reach only to the middle of the tail. The balls of the toes, as usual with its compeers, are densely covered with woolly hair in winter and are naked in summer. The skulls of the two agree in all particulars. In the orange and saffron varieties of Canada the upper parts are more or less orange, with dark tips to the hairs and shadings of the same extending down the back. The yellow occupies about three inches of the tail, the remainder being black, like the extremities. I observed that several skins procured in the same district showed a few white hairs at the tip, and in one in particular there was a conspicuous orange and white tuft at the distal extremity, thus showing a predisposition to a character common to many carnivorous quadrupeds, both closely and remotely allied to the genus, or according to the doctrines advanced by Mr. Darwin.‡ Are we to say it is a partial reversion to the colour of a common progenitor?

It seems that the lighter the upper parts of the Canadian sable, the more so are the lower; and the darker the pile,

* I am indebted to my friend Lieutenant Sweeny, 22nd Regiment, an experienced and skilled trapper, for many opportunities of examining large collections of skins of the martens of northern New Brunswick, as well as numerous specimens of their skeletons, which he kindly procured for me; also an interesting series of thirty-two sable skins from the hard and soft wood forests of the central part of the province.

† "United States Pacific Railway Report," vol. viii., 152.

‡ See "Origin of Species," "Animals and Plants under Domestication," and "Descent of Man," *passim.*

the more pronounced is the black dorsal stripe. The smallest specimens are generally the darkest, with often a greyish-white front patch, and only a faint tinge of yellow on the hips; in fact, the description of the Russian sable by Brandt * differs in no way as regards coloration from the sable of this region. The hair on the head, neck, and throat is bushy and very light coloured in winter, so that when the animal faces you the darker hind parts become more or less hidden, and thus advantageous towards sneaking on its prey. Moreover the margins and inside of the ears are pure white, giving a very attractive aspect to the handsome creature when on the alert. I fancy a hare would with difficulty discern the sable on snow when in this position. The orange throat patch is always varying both in richness and extent: sometimes it is brilliant saffron, often with dark markings intermixed, and not unfrequently yellowish-white; at all events all the yellow seen on this marten attains the deepest hues on the throat patch, and on the flanks and sides of the belly, the first coming to a point between the fore legs.

It is evident from the descriptions given by Baird of the American sable that the diagnosis he attempts to establish between it and the *M. Zibellina* will not apply to the animal found in this region, which in all particulars, excepting in the fur being less dense, is seemingly in no other respect different from the Asiatic and European animal,—at least, as described by the above eminent Russian zoologist. At most the American can only be called "a yellower or more yellowish brown, and less densely furred variety of the Asiatic sable; it is surely not a distinct species, nor is the dark variety a pine marten (*M. Martes*), seeing that specimens are as black as any described by European authors. Regarding the seasonal changes, as will be pointed out in the sequel, it is a general rule with all the quadrupeds of this region, either in the chang-

* "Beitrage Saugethiere Russland," 1855.

ing of colour or in the additional coat, that they are attained towards the end of October, and shed in March and April.

The BLACK MINK was at one time very plentiful in the forests, but the Indian and trapper have made sad havoc in its numbers; moreover the future bodes badly, considering the increased demand for its fur; however, like others of its congeners, the mink possesses an ardent attachment to localities, and may still be found close to towns and settlements. The first individual I saw was hunting for trout on a brook within a mile of the capital. Not perceiving me, it came within a few feet before discovering its mistake, when with an amount of nimbleness scarcely to be expected from its short legs, the handsome little creature bounded along the bank with the alacrity of the sable. From all accounts this and the Nurek (*P. lutreola*) of Siberia are much alike, only it is said the latter is smaller, with the edges of the upper lip white; but the mink varies a great deal in this respect. I found two out of eight captured on the Miramichi had the edges of the upper lip hoary; moreover it is well known to traders and trappers there are two sizes independent of sex and apparently of age; indeed, so marked is this that many dealers consider them two distinct animals, the larger being obtained near the sea coast. The last statement, however, may not be altogether correct; still I found among hundreds of skins so much discrepancy in dimension, that there need be no hesitation in accepting the statement above given. Thus, after making allowances for the overstretching, I have noted two sets averaging thirteen and sixteen inches in length, exclusive of the tail. Like the sable, it is subject to varieties, but only in respect to the white on the lower parts, which is often entirely wanting; but many have longitudinal white stripes on the belly, and even a cruciform band of the same colour.

The smaller weasels of America have been entirely separated from European allied forms, but no doubt in many cases

on questionable grounds. The COMMON WHITE WEASEL of this continent, named *Putorius Richardsonii*, is most distinctly allied to the Ermine, so closely that several skulls and skins from this region fail in my hands to show any appreciable distinction, with the exception that the fur of the American ermine is not so rich as that of northern Europe. I have not seen specimens of the so-called New York ermine, from the New England States, but as far as the latest and most accurate descriptions extend there is seemingly no well-marked difference between it and the *T. Richardsonii*, perhaps only what would arise from climate. I have examined several fine specimens of the ermine of New Brunswick, one of which in the flesh measured six and three-quarter inches, exclusive of the tail, which was seven inches.*

The most common and widely distributed of Acadian martens is a little brown weasel, which agrees better with the *T. Cicognonii* of authors than any other recorded species, but only in dimensions; for whilst I have seen no full-grown individuals so small as the *T. Pusillus* of Audubon, I have before me specimens apparently in no ways different from the so-called New York Ermine, either as regards size or colouring; but seeing that there is already great confusion engendered by European and American naturalists in regard to the specific characters of the above, I shall enter more into details. The Little Brown Weasel of New Brunswick varies from nine to nine and three-quarters inches in length, inclusive of the tail, which is from two and a half to three inches to the extremity of its vertebræ, and about one-fourth of the entire length of the animal. The hind legs stretched to their fullest extent do not come within half an inch of the last caudal vertebræ. The black of the tail extends for fully

* The sulphur yellow tinge conspicuous in this as in other allied species which turn white in winter, being localized to the hips and lower parts, appears to be owing to emissions from the stench bag, the contents of which are of that colour, just as the red of the hair in the inner sides of the legs of the Red Deer and other mammals is caused by urine.

half an inch beyond the tip. This weasel is brown above in summer, with white upper lips and lower parts, the latter more or less tinged with sulphur-yellow; the hairs on the dorsum of the feet greyish-brown; tail always tipped with black for about two inches. The winter pilage is white, with the yellowish tinge on the hips and belly. The tubercles of the feet are obscured by hair in winter, and to a less extent in summer. As regards its summer pilage and size, it is closely allied to the European weasel (*M. vulgaris*).

The winter coat shows a dense woolly fur, which is rapidly attained—indeed, so soon that I have seen it completed in the course of two weeks after the first fall of snow, when, as in many of the other indigenous quadrupeds and birds, there is also an absolute increase in the weight, caused by additional layers of fat all over the body. It is said to bring forth four to five young at each litter, and breeds two to three times during the year, which accounts for the plentiful distribution of the species.

The PEKAN, or FISHER CAT, so closely allied to the mink in habits, is becoming rare in this region; individuals, however, are met with, but they more often make their presence known to the trapper by carrying off the baits from sable and mink traps. This the pekan readily accomplishes, owing to superior strength and agility; even when caught in fox-traps, it has been known to bite off the captured limb.*

Like others of its family it bounds on the ground, springing (as I have seen often) five feet at one leap on soft snow. Here again, as in the mink, there is often present, and as frequently absent, a little grey patch on the throat, in others on the belly between the fore and hind legs.

In all the specimens I have examined, the footpads were

* I am indebted to Mr. Sills, of Fredericton, a gentleman of great forest experience and much discernment, for several valued data in connection with the habits and haunts of these and other quadrupeds of New Brunswick.

bare at all seasons. Like the sable, it turns hoary on the head; moreover, in case its dark colour, longer legs, and larger frame might render it conspicuous in the snow, the white extends to the tips of the hairs on the neck and head, as in the sable. The length of the body, exclusive of the tail, is not over twenty-five inches, as I ascertained from specimens in the flesh. It preys at all seasons on fish, squirrels, or whatever favourite land or fresh-water animal happens to come in its way, in the capture of which it is said to display remarkable adroitness. Trappers familiar with its habits state it has two litters within the year, and from five to eight on each occasion, which would be remarkable fecundity, even allowing for the numbers captured and its general distribution. Perhaps the biannual breeding may not be regular. During heavy falls of snow, when the carnivorous quadrupeds are hard pressed for subsistence, and also when the temperature is very low, seldom any of the mustelinæ appear, hence it is a current opinion that they sleep for short periods in midwinter; indeed, it has often appeared to me surprising how they manage to obtain subsistence at this season even on ordinary occasions. The smaller weasels that can prowl under the snow after mice do, doubtless, fare well; but such as the mink, pekan, and raccoon, with the rivers closed and the hares under the pine boughs buried in the snow, and the squirrel high up on the tops of the pines, must have often a hard struggle for existence.

There cannot be a doubt that the SKUNK hibernates in this district, very few being seen between October and April. It is the least agile of any of the native polecats, and can be overtaken without difficulty; this defect, however, is made up by its powerful means of defence. The fœtid odours evolved by the mustelinæ in general most assuredly attains the extreme of pungency in the skunk, and it is remarkable to observe its wide diffusion. I remember driving, one dark night, along a highway, when the effluvium of a skunk was perceived for

nearly two miles. So persistent is it that articles of clothing retain the smell for years, and the dried bones of a skeleton I picked up in the forest not only retained, but communicated, the stench to a number of birds' skins in the same cabinet.* When pursued by dogs and its foes, it ejects the fluid, in the form of spray, at its pursuers, as was illustrated on one occasion when a party of officers belonging to the 22nd Regiment came suddenly on what, to them, appeared "a most strange and beautiful black and white cat!" which they pressed and hounded on their dogs to capture, little aware of the nature of the animal and the consequences of such rashness. Indeed no sooner did the leading dog get within a yard or two than the little creature suddenly stopped, and with head down and tail erect, sent a shower of the liquid straight in its face, when the dog howled most piteously, and making for a swamp close by, plunged into the mire, while simultaneously with the occurrence the surrounding forest became suddenly permeated by a most noisome and abominable odour, which adhered to the clothing for days; moreover, one of the gentlemen informed me that the bath sponge he used on the following day smelt of the skunk. The compressor muscle in this species, the Hudson's Bay Weasel (*M. Hudsonicus*), is extremely powerful, seeing that the animal is enabled to propel the contents of the stench bag for ten and, I have been told, even fifteen feet.

The slow mode of progression of the skunk, unlike any of its tribe, is evidently engendered from an inherited confidence in its power of resisting attacks of its enemies by this formidable and strange mode of defence. Its eye is said to have a dull aspect, wanting the sparkling vivacity of many of its congeners; perhaps this may be owing to its hybernating habit, as the eyes of the other non-hybernating skunks of the temperate and sub-torrid regions of the continent, although

* Dr. Gilpin perceived the odour for nine miles. There is no accounting for tastes! he says the Indians "like the odour, willingly eating the tainted meat."—*Trans. Inst. Nat. Science of Nova Scotia*, vol. ii., p. 68.

small, are said to be bright and piercing. In Mexico, California, and Texas there are reported to be eight or nine other species besides the above. The condition of the cornea just described seems more or less common to all animals that spend a portion or the whole of their existence in darkness, and may arise from prolonged disuse of the organ. I have repeatedly observed, in the case of bears and other animals which spend the winter in a dormant state, that their *corneæ* were almost lustreless in spring, and never so bright as subsequently after exposure to light. Moreover it will be, I think, generally found that wherever one of the senses is defective another is unusually acute. The moose, as will be before noted, has a relatively small eye, but very acute senses of smell and hearing; the bear is the same; and hundreds of similar examples are familiar to natural observers. I wonder if the blind rats of the Kentucky caves possess acute hearing and smell, such as the moles and other subterranean mammals. I must confess there is a very regular accordance between the size and brilliancy of the eye and the animal's habits, whether it searches for subsistence in daylight, twilight, or in total darkness; and the modifications of the organ, from use or disuse. All seem to be owing to natural selection, for no careful observer can gainsay Mr. Darwin's words, "that use strengthens and enlarges certain parts, and disuse diminishes them, and that such modifications are inherited." *

The OTTER of Canada is said to differ from the European species † by having a larger muffle, with the pads of the feet separated from the toes by hair; the fur is also richer, and more of a chestnut-brown.

With all the reclamation of the forest tracts of Canada, and the destruction of their wild quadrupeds, it is particularly pleasing to the naturalist to learn that several species which had been on the verge of extinction are again returning to

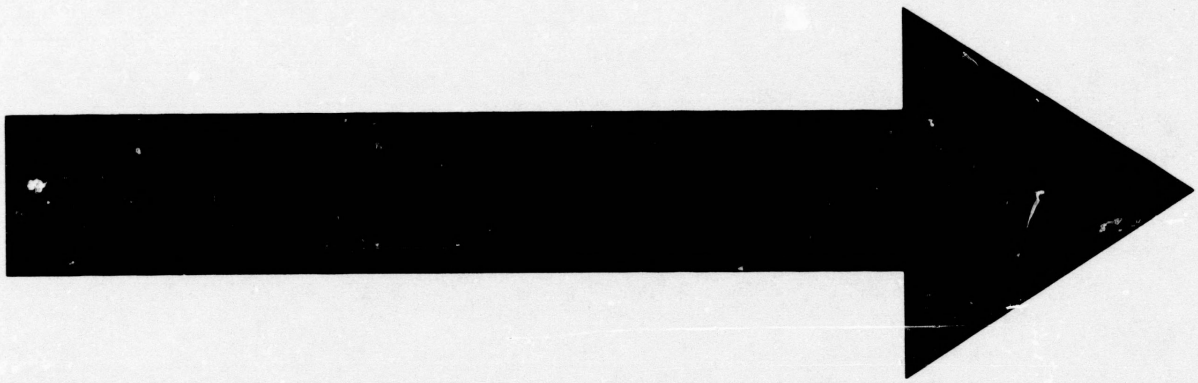
* "Origin of Species," p. 134.

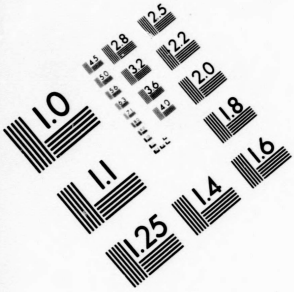
† Baird, "Pacific Railway Report," vol. viii., p. 186.

their ancient haunts. In a series of interesting papers lately published by Dr. Gilpin in the Transactions of the Institute of Natural Science of Nova Scotia,* it would appear that such as the bear, raccoon, and beaver are returning to localities from whence they had been driven in former years. With reference to the raccoon he says, "It has penetrated the whole length of the Annapolis Valley during the last thirty years in such numbers as to damage the crops of the mountain farmers, whilst on the southern side, separated by the river and basin, he is unknown. Les Carbot, who visited Nova Scotia in 1606, speaks of small animals very round and fat, which had black paws like monkeys, as plentiful there at that time. These must have been raccoons. I note this as curious that they should retire before cultivation, and then return 300 years afterwards, under such different circumstances, to cultivated fields instead of primeval forests, to corn and maize instead of wild fruits and berries." These observations suggest considerations with reference to the cause or causes of albinism and nigritism, and to consider how far the changed conditions of life may have brought about these states; indeed, so changeable are the colourings of the fur of the raccoon that, as Baird states, it is rare to meet with two individuals coloured exactly alike. It would be interesting, therefore, if we could find out whether or not the animal has always been subject to this remarkable mutability as regards colouring. Indeed so pronounced are many varieties of the carnivorous quadrupeds just mentioned, that the species-maker might indulge his proclivities to a large extent, were it not that we know sufficient of each animal's habits to show the inutility of any such proceeding.

It has frequently appeared to me, as it must doubtless strike every one whose field of observation has extended beyond one district or region, and not been narrowed to the naming and describing of objects in museums, how much it has become a

* See vol. ii., p. 83, *et seq.*





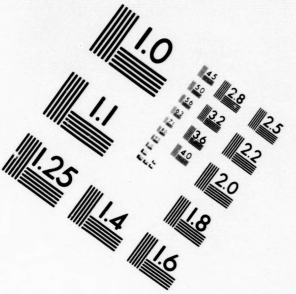
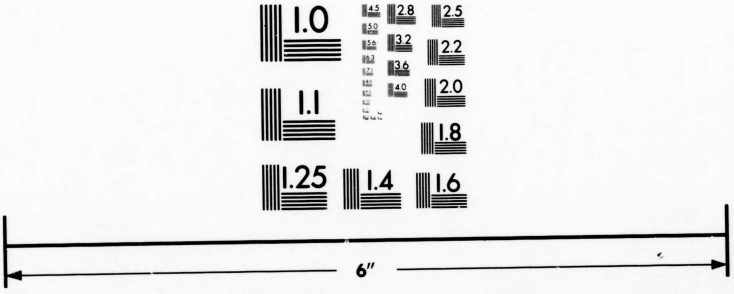
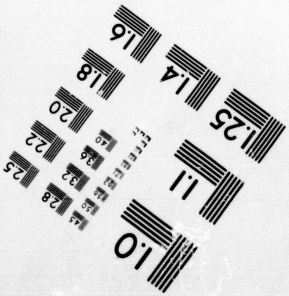
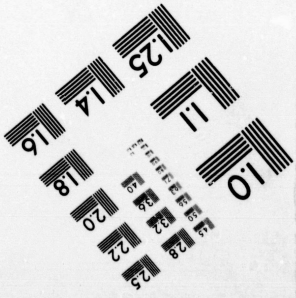


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habit with certain naturalists to isolate closely allied forms, on the score of adding to the fauna and flora of the country in which their own particular fields of study have been directed. This is very apparent with several well-known American zoologists, and seems in some instances to arise from an idea that whatever remarkable objects are furnished by the Old World, there are equally interesting representatives in the New, but *distinct*, and therefore must on no account be allowed to be considered identical. I am far, however, from wishing to apply this solely to the many distinguished observers who adorn the annals of natural science in the United States, nor to assert that it is a general practice anywhere; the merest tyro knows full well that the affinities and analogies of natural objects are not so easily defined as all that; but this much I do believe, that if the study of the Geographical Distributions of animals and plants were prosecuted with the vigour bestowed in the descriptive details of the individual objects, we should have fewer synonyms in our nomenclature. Reverting to the subject of allied natural objects common to the old and new worlds, I have been much interested in an elaborate article on the well-known Big-horn or large Mountain Sheep (*Ovis montana*) of the Rocky Mountains,* more especially as during my wanderings in central Asia I had frequent opportunities of examining specimens of the equally magnificent Mufflon of that region, named the Ovis Ammon, or *Nuang* of the Tibetians. The specific differences, according to the excellent authority named, taken from specimens of the American animal, are referable to slight discrepancies in the curvature, dimensions, direction, markings, and distances between the horns. Now, having examined very many heads and skins of the Ovis Ammon of the Himalayas, I have found the differences in all these respects in individuals even more pronounced than Mr. Baird seeks to establish as specific between it and the Big-horn of western America.

* Baird, "Pacific Railway Report," vol. viii., p. 674.

Again, the Big-horn is said to inhabit the continent as far north as Alaska, opposite which is Siberia, the head-quarters of the Ovis Ammon. I shall, therefore, be in no ways surprised if further researches show the two sheep to be one and the same species.

The connections between the Barren Ground Bear of Richardson and the Brown Bear of Europe and northern Asia on the one hand, and the so-called Isabel-coloured Bear of the Himalayas on the other, are so close that naturalists have agreed on the first being equal to the second; such being the case, I have still smaller doubts, from careful comparisons, that the second is also equal to the third. Thus the Ursus Arctos at one time or other in its history roamed over the most part of Europe, Asia, and the boreal regions of America. As to the specific distinctions between the beaver of Europe and North America and the fossil remains met with in both continents, there is no one who has even read up the literature of this subject but must feel very much disposed to come to the conclusion that in these cases the evidence shows distinctions without differences.

The BLACK BEAR has maintained its position in the forest tracts of the North American continent better than many far less persecuted animals; indeed, although very much diminished in numbers now, and within even a quarter of a century, still in the large tracts of primeval forests towards the sources of the St. John and Miramachi rivers it is not in any way uncommon; indeed, even around the larger towns an occasional individual may be seen in autumn feeding on raspberries and other fruits. Bears are all great wanderers, unless when old age compels them to restrict their movements and select their retreats. I visited a forest tract near the sources of the Miramachi, where the old "dead falls"* and numerous remains of sable traps showed that both animals had abounded

* Heavy logs made to fall on the animal when passing under them.

in the district. For many years the bears that used to come in numbers to feed on the autumn fruits totally disappeared until 1865, when there was a general failure all over the country; then, to the astonishment of the settlers, their old enemies rapidly increased, and the locality became overrun by bears until the grain was reaped, when they dispersed.* Although it prefers vegetable to animal food, nothing comes amiss, from a sheep down to the daintiest fruit the forest can afford.

The decayed trunk of a pine is a favourite position for hybernating; but if such is not procurable, it will make a bed in some clump of trees, selecting the nearest soft substance at hand. The desire to retire to its winter retreat becomes manifest as soon as the cold has destroyed all the fruits and the grain has been gathered; then it sleeps for the greater part of the day, moving from place to place, and on every occasion attempting to make a bed, until at length it settles down for its long siesta, which is seldom broken throughout the winter months; however, during the usual mild weather that sets in suddenly after a continuance of intense cold, it will rouse from its slumbers and walk about the vicinity of its layer, picking a scanty subsistence by devouring the bark of trees;† but its susceptible organism and a recurrence of cold compel it to return to its layer.

The only abnormality in colouring to which the animal is subject is the frequent absence of the white spot on the brisket, which is more or less defined in all bears, even

* Mr. Rowan says it is plentiful on the island of Anticosti, off the Gulf of the St. Lawrence, where it feeds on fish and spawn thrown up on the beach, and makes its den in dense shrubberies where it hibernates. —*Field*, May, 1869.

† The Esquimaux believe the polar bear prevents the passage of evacuations during hybernation by devouring moss and earth, whilst the Indians of this region entertain a belief that the obstruction is caused by eating quantities of pine resin, and precisely the same view is maintained by the natives of the Himalayas with reference to the brown bear. I often observed, immediately after leaving its den, that the spoor of the latter was very mucous, which may have led to this mistake.

in the brown species. In outward appearances there is a close resemblance between it and the black bear of the Himalayas, which, however, always maintains the white crescent on the brisket, and invariably more of it; at the same time, there are pronounced cranial and other distinctions, considered quite sufficient to separate them; whereas the barren ground bear and the old-world brown bear, and its variety the isabelline bear, are, as I have shown elsewhere, most probably identical.* All must, however, disappear with the spread of cultivation, and considering the price set on the snout † is three dollars, it is surprising that so many continue to frequent the region. I was informed, however, that two are the usual number born at one litter, but now and then three are seen.

The nervous centres of certain bears must be extremely sensitive to very low temperatures. I noticed that a tamed individual of the above species, belonging to the 22nd Regiment, during several days of severe frost, when the glass stood steadily below zero of Fahrenheit, although sheltered in a barn among straw, became very drowsy, and scarcely ate its food until the temperature rose; it never, however, absolutely fell into a complete stupor, and the evacuations went on more or less. No doubt the fat with which the body is loaded in autumn maintains the animal heat, but it rapidly disappears in spring, even in a few days after the bear leaves the den, and beforehand with the female when the cubs are suckling. The birth of the latter takes place shortly

* "Wanderings of a Naturalist," p. 238.

† The Auditor-General of New Brunswick, W. J. Beeck, Esq., furnished me with the following data. During the years 1860-62 no less than 569 bears' snouts were produced, when the Act was repealed, but so numerous and destructive did the animal become that the law had to be repassed in 1865; the result was that 1,173 were brought to the magistrates; in 1866, 347; in 1867, 867; thus in six years no less than 2,956 bears were destroyed, not to speak of what had been shot by sportsmen, and not reported.

before the parent leaves the den; indeed, it would seem from various instances brought to my notice that the sleep is not continuous, in any case being made up of successions of prolonged repose with fits of dosing or dreamy indolence.

Civilization has exercised a marked influence on the habits of several forest animals: thus the Hare and Birch Partridge are rapidly drawing close to settlements, and the Lynx and Red Fox are following on their trail. With reference to the advantages of these three mammals in making their ways over snow, we find the lynx and hare have expansive furred feet, which enable them to progress rapidly, whilst the fox's are small in proportion, and sink deeply; so that I scarcely think in a fair run in the open it would be a match for the latter; indeed, of the winter resident carnivora it is the only one so helplessly constituted, although (as will be pointed out in the sequel) both the Moose and Virginian Deer, among the local ruminants, are greatly at a disadvantage with their enemies.

The above, moreover, might be cited in support of Professor Baird's assertion,* that the Red Fox of eastern America is the descendant of individuals of the European animal imported many years ago, and allowed to run wild and overspread the country; and further, that its remains not having been met with in a fossil state in America, whilst exuviæ of the grey species are abundant in the bone caves, is additional evidence. He adds, "The muzzle of the European fox is larger than that of its new world congener, and the eyes are further apart, the feet are more slender and not so densely furred, the texture is not so soft and silky, and, on the whole, it is not so large as the American fox, while the colour is not so golden." How far the regions and necessities of life and climate may have brought about these modifications cannot at present be shown with accuracy, but there is no reason why

* "Pacific Railway Report," vol. viii., p. 121.

the fox of Europe and America, more than the brown bear, should be a distinct species. As to its introduction through man's agency, there does not appear any valid proof, and the geological evidence is very small, seeing that so few discoveries of post-tertiary fossil remains have yet been made. It may be that the red fox has been driven northward from the more temperate climates of the United States, and that the larger body and shorter muzzle and yellow tinge are due to natural selection; perhaps these conditions are now developing with the individuals in the northern regions, so that in process of time the foot will expand like the Arctic species, and enable the animal to progress over the soft snow as easily as the hare and indigenous feline quadrupeds.

At all events there is a decided tendency to variation in the animal as it affects Canada. For example, the Cross Fox, a decided race, is often localized; it breeds with the other, forming intermediate gradations, which the dealers call "mongrels." Sometimes the dark bands along the back and across the shoulders are very pronounced, in others very faint, but more or less observable in all when the skin is hung in certain lights, indicating perhaps that this was the original colouring. As I will again point out with respect to the Rodents, there is a disposition to melanism in this fox, generally observable in a predisposition to sooty shades of colouring of the lower parts, culminating in what are called the silver-grey and black foxes, which however are now rare * in consequence of being always destroyed wherever they are seen. The silver-grey might be called a black fox with grey tips to the hairs, and perhaps a modification in accordance with climate, as a jet black object on the snow would be very conspicuous, unless, as in the sable and others just described, there was a winter change of the fur of the face, which seems to be the case even with the darkest coloured foxes. If, as Professor Baird

* Skins of the last are in great demand: I have known as much as sixty dollars given for a single skin.

surmises, the red fox came from Europe, I opine the original individuals must have been unusually cunning, or else Reynard has been greatly molested since, inasmuch as trappers state that scarcely anything will induce him to enter a trap; accordingly the majority are poisoned by strychnine, which is said to materially injure the skin, causing the hair to fall out during the process of tanning.

The repugnance of one species to breed with another closely allied in form and habits may be the reason why black or white varieties do not continue to propagate, the individual being thus driven to lead a life of celibacy. Looking, for example, at an albino blackbird or a black fox, and bearing in mind what has just been stated, and that even although the voice and habits are the same, and the animal associates with its species; still, the very decided difference as regards outward appearance would be sufficient to forbid intercourse between it and the typical individual. I have for many years noted carefully all information I could obtain from personal observation and reliable sources with reference to albinism and melanism in wild animals, and as far as I have been enabled to make out the occurrence seems to be accidental, and often happens only in single individuals, or to one in a brood of birds; but there are evidently exceptions. I was shown by Colonel Otty, of the New Brunswick Militia, a specimen of an albino Ruffed Grouse from a covey similarly marked, all having red eyes and white plumage, excepting a shade of the original colour on the back and flanks. And Mr. Boardman informed me that he had often seen similar individuals, and states that an albino of the Migratory Thrush and Rusty Grackle is also of common occurrence: both birds, be it observed, are highly gregarious, and very plentiful in the localities they frequent. But in no instance in his long experience did he observe them pairing. The differences, however, between pied and slight varieties and decided black or white sorts are often so gradual, that in the slighter cases we might well suppose that the abnormalities

are maintained by interbreeding. For instance, sparrows and other finches with white wing quills may be seen breeding with normally attired individuals; and no doubt the silver-grey, like the cross fox, freely cohabits with the red fox of North America.

It is therefore probable that with extremes only there is any great repugnance to intercourse. Nevertheless we observe a strong disposition in certain species,—nay, even genera and families of animals—to produce albino and black varieties. Of the latter, both foxes and squirrels furnish good examples, to which further reference will be made in the next chapter.

CHAPTER III.

Aspect of the Forest after a Snow-storm—Tracks of Wild Animals on the Snow—Hare; its changes of Pile—Adaptation of the Feet of Wild Animals for Snow Travelling—Feet of Moose and Caribou compared—Their Habits—Extermination—Moose and Irish Elk compared—On the Interment of Fossil Deer—Enormous Horns of Moose—Modes of Hunting the Native Deer—Origin of Moss Swamps and Caribou Barrens—The Pitcher Plant—Beaver; its Habits and Extermination—Musk Rat—Porcupine, small Muridæ—Bats—Squirrels—Melanism—Flying Squirrels—Effects of the Climate on European Brown Rat and Mouse.

THE perfect stillness of a Canadian forest during or immediately after a heavy fall of snow is something remarkable; solemn silence reigns supreme, for it is no longer broken by the cracking or creaking of branches, or the notes and forms of bird or beast. The scenery is also changed; you wander down some familiar pathway to find it transmuted into what recollections might suggest in a Christmas pantomime. Here, the pines and spruces, with their boughs overburdened with snow, slope downward, whilst masses are piled up round the trunks, and those of the leafless maples and deciduous leaved trees which stand out in spectre-like ugliness. The enormous accumulations of snow on the branches of spruce and pine trees would appear to act mechanically by their dead weight, hence it may be from this cause that the boughs have attained the graceful downward swoop so characteristic of the conifers of high latitudes, inasmuch as the fibres become outstretched, so that even on relieving a branch of its load of snow it will only partially return to the horizontal. We may on like occasions estimate the numbers of quadrupeds in a district by their

tracks visible after a fall of snow. One of the first to stir when the weather clears up is the lynx. I have frequently followed its footprints for miles, now noticing when one had sat on its haunches by a fir stump, watching the outcomings of mice; then where it had made a spring on the creature, the tiny tracings of whose feet look like as if a large beetle had crawled over the soft surface; but they terminate abruptly, not however too soon for the mouse's safety, for just as the mighty paw had been on the point of descending, that instant the mouse dived headlong into the snow. The lynx delights in deserted lumber camps, where it is generally certain of a mouse, which, after all, must be a small morsel to such a large animal, yet seemingly a coveted tit-bit, although the hare furnishes its chief subsistence. Like other furred quadrupeds, the lynx is scarcely to be recognized when dressed in its summer and winter robes,—the thickness of the latter giving it the appearance of being a much larger animal; hence, as I have already remarked, the stories of the Indian Devil (puma) may have thus originated.

The colour of the pile of the AMERICAN HARE and other mammals that turn grey in winter is brought about most distinctly by climate, a sudden setting in of cold hastening the change, just as it is retarded by a continuance of mild weather at the commencement of winter. The summer or brown coat is rapidly attained in June, and that of winter more gradually, the process of change in the latter being accomplished not only by an actual change in the colouring matter of the hair, but by an additional growth; the denizens of the colder parts getting their winter dress sooner than the hares along the Atlantic coasts, where the climate is milder, whilst the tamed individual well sheltered from cold scarcely changes at all.* This hare is very prolific, breeding often twice a year, and

* See an excellent article on this subject by my friend and late brother-officer, Mr. Welch, Assistant-Professor of Pathology in the Army Medical School.—*Proc. of the Zool. Soc. of London*, April 8, 1869.

producing four to five young at a time; moreover, the latter are said to couple before a twelvemonth. Reference will be made elsewhere to the steady increase of hares in this region, consequent on the destruction of their four-footed enemies, much to the advantage of the great Virginian and Snowy owls, which prey extensively on the animal, keeping it in a constant state of dread, especially during winter, when, in common with other rodents, it seeks to evade the stoop of rapacious birds by diving instantly headlong into the snow, thus escaping them, but ensuring destruction by man, and such animals as the fisher-cat and lynx, who can easily dig it out.

The leveret, in common with the young of other members of the family, presents a mark of relationship in having the white spot on the forehead. Like the variable hare of Scotland and Tibet, the above is by no means shy. Its runs are in thick bush, where when pursued it may be heard stamping its feet. The flesh is not savoury, and is highly flavoured with turpentine during winter, when the animal subsists chiefly on conifers. It is also subject to differences in size, the denizens of hilly parts being larger than such as frequent the level forest tracts.

The foot of the American hare, like that of nearly all the furred animals, is admirably adapted for progression on snow, inasmuch as not only are the feet bones lengthened, but they admit of much lateral expansion, so that with the intervening fur there is presented an excellent snow-shoe, which enables it to run with ease on the softest surface. I measured several fore footprints three inches, and hind foot impressions four and a half inches in breadth. The nails are long in winter, for the reason that their tips are not subjected to the same amount of friction as in summer.

Modifications of structure and appearance, either of advantage to the individual or the reverse, are highly instructive. For example, in comparing the feet of the Moose and Reindeer, it appears strange that nature should have been so considerate

towards the latter, and so neglectful of the safety of the elk, and, I may add, the Virginian deer; so evident is this, that it might be fairly questioned if the two latter have always been natives of Canada. Indeed, whether or not they were driven northward by man or by other causes, at all events the defects in regard to their means of progression in winter tell effectually on their powers of escape from man and four-footed foes. Thus considered, we may suppose the reindeer will survive longest, from the fact that its light, hollow, and expansive



HOOF OF REINDEER.



HOOF OF MOOSE.

foot enables it to outstrip its foes over snow, when the other two sink to their haunches. The Virginian deer runs on the hard frozen surface, but is at a great disadvantage in deep soft snow or drifts, where it may be readily captured; indeed, after unusual storms the caribou has been mobbed and killed; but neither are so helpless as the moose, more especially during the spring season, when the frozen surface readily gives way at every step, necessitating great exertion, while

the sharp edge of the ice wounds the fetlock. Hence the latter repairs to situations where food can be procured without much travelling; whilst the light concave and expansive hoof of the reindeer, with its rounded points and sharp edges, enable it to wander about with perfect ease on hard and frozen surfaces; in fact it would be difficult to cite a better example of the adaptation of a member to meet a difficulty than is displayed in the construction of the foot of the caribou, nor of what might be styled a bad design in the solid, heavy, and sharp-pointed hoof of the moose.

These differences account therefore for the opposite habits of the two in winter; inasmuch as the elk seeks situations where there is abundance of its favourite shrubs, to wit, striped maple and moose wood,* where the herd remains until they have cropped every bush, or, skirting the barren, nibbles the young poplars, which also form its chief subsistence at this season. Thus whilst the moose affects dense forests and feeds on bark and underwood, the reindeer delights in the more open parts, wandering from place to place, and browsing on grass, moss, or lichen,† more especially the long trailing moss familiarly known as the "old man's beard," which hangs in graceful tresses from trees. It subsists in summer on various sorts of crow and whortle berries, birch foliage, etc., and is also partial to seaweed, and in former times was wont to repair to the seaboard districts to obtain it, just as the northern form does now in Greenland.

With reference to the dimensions of certain deer common to North America, and of wide distribution, it has been

* *Acer Pennsylvanicum* and *Dirca palustris.*

† The reindeer moss or lichen (*Cladoniæ*), said to be the almost sole subsistence of the Lapland variety, would seem to be scarce nowadays; indeed, we are told there is not even enough to afford occasional food. These differences in the nature of the animal's subsistence, coupled with climate and physical condition, may have influenced the different varieties of reindeer. With reference to the absence of *cladoniæ* in Greenland, see Brown's "Notes on the Mammals of Greenland," *Field*, 1868.

ascertained, as in the case of other animals, that much depends on situation. The Virginian deer decreases in size southwards in latitude, and the individuals of mountain regions are relatively larger than the denizens of the plains ;* and the same rule is applicable more or less to the reindeer. Indeed we might suppose the arctic, barren ground, and caribou or woodland reindeers to be one species, subject to diversities in size and dimensions of horn in each of the forms, the largest specimens being procured in regions favourable as regards food, haunts, climate, etc., while the reverse, amounting to a marked deterioration of race, obtains where these conditions are not so conducive to the animal's well-being.

There is evidently a similar deterioration of race taking place in the eland in various parts of South Africa. I am informed, on the authority of W. Bell, Esq., who has sojourned for several years in that region, that the eland, once plentiful all over Natal and the plains of the Orange Free State, is now exterminated, excepting on the intervening mountains, to which it has been repelled. Here, from having to undergo rigours of climate foreign to its primordial state of existence, a race has gradually been formed not only smaller in size, but, from constant persecution and the requirements of mountain life, are much more active, and their limbs and bodies are more gazelle-like than their progenitors ; whereas the former denizens of the plains, what between good pasturage and other favourable conditions, became so fat and inert that colonists and natives were in the habit of capturing them.

Again, looking at the development of the senses in the moose and caribou as being advantageous or otherwise in their struggles for life, it will be found that the former relies to the greatest extent for safety on smell and hearing, while the latter has also powerful sight. Moreover, much as we must be struck on viewing the massive proportions of the moose, it is, after all, far from what would be called a hand-

* Baird, *Am. Jour. of Science*, vol. xli., 1866, p. 12.

some animal; on the contrary, either when at rest or in motion, its form is most decidedly ungainly, the head being greatly out of keeping with the other parts, and the eye lacking very much the size, brilliancy, or prominence of the stag and caribou. But after all we should not expect this sense to be highly developed in an animal frequenting the dense forest, where smell and hearing would be more likely to discover danger. It is therefore on this account we find symmetry has been sacrificed to utility; inasmuch as the enormous nasal cavity, great expansion of its chambers, and extent of surface covered by the olfactory membrane, together with the large ear-conchs, attest the importance of these organs. But acute hearing is also present in the caribou, as every hunter knows full well when stalking the animal; for although the twigs may be cracking in all directions through intense cold, the animal at once recognizes the sounds produced by the hunter in contradistinction to nature; but should man by dint of craft manage to creep near enough, and the deer happen to be lying down, and consequently not favourably placed for a fatal shot, he has only to break a rotting twig, when the herd will instantly spring to their feet, and he may pick and choose his buck. The caribou, like other deer, when not previously molested is easily approached, and at the first report of the rifle becomes so completely electrified by the unaccustomed sound that it will stand gazing in wonder, while the adroit hunter is dealing deadly bullets in rapid succession. The animal is steadily decreasing in the New Brunswick forests, not so much on account of the numbers slain as from the intrusion of man on its haunts, being extremely sensitive of molestation, and when once fairly frightened will continue on the move for days in succession, nibbling moss from the trees as it goes along.* The

* New England States seem to have been its southern limit on the eastern side of the continent. In an interesting volume entitled "Description de l'Amérique," published in Paris in 1672, it is stated that

moose is often found in winter within hearing of the woodman's axe, but many barrens formerly frequented by the other are now entirely deserted since tree felling commenced in their vicinity.

The gradual extermination of the Moose and Reindeer through human agency, and the disadvantages under which they now compete with enemies, contrast in some way with the disappearance of several congeners during prehistoric periods, more especially that noble representative the Irish Elk. Although we have no well-established data to show that the former preceded man in North America, still no one knows what the future may reveal. But America had also its gigantic stag, the dimensions of which even exceeded those of the Hibernian ruminant,* so that both continents stand in similar relation with reference to these extant and lost species; possibly there may have been a closer relationship between the two extinct deer than is at present shown; as regards the moose and European elk, it was the opinion of Cuvier long ago that they are identical.† When we consider the disadvantages wherewith the moose contends in regard to man and climate, it need create small surprise that

the woodland reindeer was then a native of Prince Edward Island, and hunted by the Indians. The walrus was also said to be exceedingly common on the island. Now both animals are extinct, indeed neither has been known to exist there since the notice referred to. Indian refuse-heaps, containing oysters, clams, and bones of these animals, were common until of late years, and furnished manure and top-dressing to the settlers. Prince Edward Island seems to have been a favourite Indian fishing station, and their rude stone and bone implements are still met with, and have been found in conjunction with human skeletons. A body enveloped in spruce bark, and surrounded by war implements of flint and bone, among others the club-shaped greenstone tool, No. 7, already noticed, was discovered there some years since.

* *C. Americanus fossilis*, much resembling the Wapiti, was found by Leidy in the post-tertiary deposits of Natchez.—*Trans. Amer. Phil. Soc. Philad.*, etc.

† *Ossemens fossiles*, tome vi., p. 132.

a huge ruminant like the Irish stag, standing from ten to eleven feet to the summit of its antlers, with a spread of horn often eight to ten feet, must have at all times been subjected to unfavourable competition with man and four-footed foes. One can scarcely conceive such a spread of horn could be carried through the forest without coming frequently in contact with trunks and branches; hence, possibly, the animal may have only frequented the open country. The moose, when excited by the amorous roaring of the cow, the bellowings of a rival, or the imitative sounds of the Indian, crashes madly through the forest, with snout extended and horns thrown well back on his massive withers, so as to prevent their becoming entangled among the stouter branches. His progress through an alder swamp, which is highly obstructive to other animals, and teasing beyond measure to the two-footed pursuer, is to him of no importance, seeing that his stout limbs and short neck, as compared with the crest and horns of the two extinct stags, are admirably suited to overcome such obstructions. If we should wonder, therefore, how he can make his way through the Canadian swamps and dense forests, what must have been the difficulties incurred by the others under similar circumstances? The frantic excitement of the males of certain deer during the rutting season is wonderful; I have known many instances of the red deer of Cashmere having been killed at this season by the hunter merely breaking decayed branches in the forest, when the infuriated animal, in expectation of meeting a rival or mate, blindly rushed forward until it was too late to find out its mistake.* We may well imagine, therefore, what often resulted at this season on many a swampy valley of Ireland of old, when its great horned hart, maddened by passion, scoured down the slope to the marsh side, beyond which, descrying the object of his desires, he halted for a moment, and erecting his splendid head in defiance of obstacles, dashed frantically through the marly

* "Wanderings of a Naturalist in India," p. 188.

bottom with tremendous strides and desperate exertions, until overwhelmed in the deepening mire he sank shoulder deep and finally disappeared, there to remain until his bones were dug up by the farmer in attempts to reclaim some old bog.

It may possibly be owing to accidents of the above description that more male than female skeletons are recorded; however, on the excellent authority of Professor Harkness, F.R.S., who has inspected many remains of the Irish elk, I am told that the country people fancy all skulls without horns belong to mired cattle or horses, and therefore do not preserve them. Still, when we take into consideration the large quantities of the remains of this elk met with in the shell marl under the peat, and the circumstance that the horns are generally those of adults, and in full growth, such as would obtain at the rutting season, there is some probability that the individuals either met their death in the above way, or were driven into the morasses by their enemies. Moreover, in the case of the moose, it is a favourite habit of the animal to repair to lakes for the purpose of escaping the annoyance of insects in summer, and in autumn to feed on water lilies and other aquatic plants.

Apropos of the moose, and the pugilistic propensities of the bull during the rutting season, I was informed by Colonel Saunders, of the New Brunswick militia, that he had in his possession two pairs of horns of bull mooses, which were found dead in the forest, with their antlers firmly locked in each other. The individuals had been either killed in the encounter, or else the horns becoming firmly entwined, caused death by starvation. Similar accidents have been recorded,* and instances are also extant of antelopes sending their horns

* Two specimens locked in this way, from North Carolina, are preserved in the Hunterian Museum, Royal College of Surgeons. See also Richardson, "Faun. Bor. Americana," p. 252. Darwin, "Descent of Man," vol. ii., p. 240, *et seq.*

into the brains of their antagonists.* Moreover, I have known several examples of ibexes pushing their rivals over precipices.† Reverting to the moose's habit of repairing to lakes and ponds for the purposes above stated, I was informed by persons who had seen it in autumn browsing on the leaves of water-lilies, that it then constantly plunges its head under water. Now the horn begins to separate about this time, and perhaps the submersion might somewhat accelerate the process, so that many may drop in the lake, and be preserved in the mud; indeed it occasionally happens that an individual gets mired, and one example was given me where a woodsman was attracted by the stench of a decomposing moose which he found in a small tarn almost submerged, with only a portion of the back above water; and a similar occurrence was also related of the caribou; thus explaining to some extent why so many Irish elks' remains are met with in bogs. Moreover, there is a further illustration of how the bones of such animals may be preserved for indefinite periods in the case of gypseous marls in Albert county, on the coast of the Bay of Fundy. Here the country is broken up by pot-holes caused by rain; many forming large pitfalls, which, getting covered over by snow in winter, an unwary moose or caribou now and then stumbles into the hollows, where it is soon covered up by soil, so that complete skeletons of these animals have been found in digging for gypsum in the above situations. The Indians assert that deer bury their cast antlers, and this is the reason why few are met with in comparison to the number of any one species frequenting a particular locality, and I have often remarked the same absence of fallen horns, in the case of the deer of the Himalayas; but on the other hand we must bear in mind the dense and interminable forest tracts over which these animals

* A fine specimen illustrative of this may be seen in the Derby Museum, Liverpool.

† Author's "Notes on the Habits of some of the Mammals of India," *Proc. Zool. Soc. London*, 1858.

roam; besides, as I had cause to suspect, they choose secluded spots for the express purpose. However, this important fact is noteworthy with reference to the finding of horns of extinct species in marshes. Moreover it is well known that the moose is in the habit of hastening the shedding of the antler by rubbing it against the stems of alder bushes in swamps, where Indians say more moose horns are found than in the forest. It seems that the time of shedding the horn is somewhat irregular in various regions, being rather earlier in Nova Scotia than in New Brunswick. A good many, however, are cast before the ice has covered the lakes. In the case of the moose, not unfrequently young males carry them until the end of December, whilst the female and young reindeer also frequently retain theirs until March. I have heard almost fabulous descriptions of the size and weight of certain heads of moose,* and the Indians, as we have seen, hold a tradition that the animal was once double its present size. Has this any reference to the great extinct stag just referred to? I was assured, moreover, by a gentleman conversant with forest life, and an experienced hunter, that an Indian informed him of having killed a female moose with small horns, and considering that such anomalies are not rare in other members of the family, the females of which are hornless, it is possible the instance in question may be correctly stated, thus furnishing an example of the male weapon of defence being transmitted to the opposite sex, which in the caribou is a rule, whilst in the female Wapiti there are often bony protuberances in place of the horn.

The development of the reindeer's horns is moreover remark-

* A magnificent specimen was presented to the Prince of Wales during his visit to Canada, the weight of the dried skull and horns being fifty-six pounds; the extreme breadth across the antlers seventy inches. Another large specimen, in the possession of Mr. Boardman, weighs fifty pounds, and has nineteen points, with a span of sixty inches, the palm antler being thirteen inches broad. This gentleman has also a splendid example of the caribou's head, the horns of which have thirty-five snogs. The two latter specimens were procured in New Brunswick forests.

able as being produced at a very early age, which, coupled with their full development in the female, is supposed by Mr. Darwin "to be due to the males having first acquired them as weapons for fighting with other males; and, secondly, to their development for some unknown cause at an unusually early age in the males, and their consequent transmission to both sexes."* At all events, the predisposition in certain female mammals and birds to assume male characters is always interesting and instructive.

The moose is decreasing steadily; indeed, considering the wholesale destruction practised by settlers and Indians, it is remarkable how any survive. But this most unsportsmanlike and savage custom is not altogether confined to them, for I regret to say not a few English gentlemen, who would affect to hold it a disgrace to shoot a partridge in the breeding season, yet in defiance of laws, and regardless of the time-honoured principles which every right-minded hunter—and let us say, every right-feeling man—respects, do also repair to the forest on exactly the same errand, or, in other words, to blow out the brains of this noble elk as it flounders, heavy in calf, through the hard-frozen snow, its fetlocks often streaming with gore, as now sinking shoulder deep, then with all but supernatural exertions it vainly struggles to escape from its pursuers and the dogs, which are tearing the brute to pieces. It is a sickening sight indeed to see an animal which in a few weeks would tax the best energies of the hunter, now from force of circumstances compelled to be shot like a dog, or knocked down with the woodman's axe in its native forests. We might, however, speculate as geologists on a similar method of exterminating the Irish and American fossil elks during post-glacial epochs, provided these animals and man existed under conditions similar to those which obtain in the case of the moose during the spring months.†

* "Descent of Man," vol. ii., p. 245 (1st edition).

† Some idea of the massacres practised in New Brunswick may be con-

In respect to the above method of hunting the moose, I refer the reader to the next chapter, where he will find the facts detailed at greater length, and be enabled to form his own conceptions on the subject.

The natural timidity of the wild animal is said to be strangely absent in the calf moose as compared with the reindeer; indeed, I have been informed by persons who had captured it that the young one seldom displays any fear, unless when irritated by dogs, when it has been known to drop dead through paralysis of the heart. Of the latter, two instances were given me by independent observers,—one where a dog rushed suddenly on a calf moose, which fainted and expired immediately; another, when startled by a loud sound, the animal suddenly sank in the same way.*

The cow moose is always fat and in good condition when carrying the calf, while the bulls are lean during winter and until the green food reappears. Looking therefore at all the advantages and weak points in the bodily construction and habits of the moose, it is apparent that, compared with the reindeer, there are defects which must always be injurious to the animal's well-being, and none more so than the hoof, —contrasting in the latter respect, as before remarked, with that of the caribou, in being solid, unyielding, and pointed, and readily sinking through the hard crust; while the light, hollow, and expansive hoof of the reindeer is admirably adapted to such circumstances. The extinction of both keeps pace with the disappearance of their native forests, which now in this part of the Dominion are rapidly vanishing before the lum-

ceived from the fact that, not many years since, no less than 400 moose were butchered on the banks of the Magaguadavie river by the settlers during one season, mostly on account of their hides; and although there is a penalty of forty dollars imposed in each instance, it is a notorious fact that both Indians and whites continue the work of destruction, and even sell the flesh in the public streets.

* The Hon. Sir A. Gordon says the same of a grey squirrel which died of fright on being captured. ("Wanderings," *op. cit.*, p. 29.)

berer's axe, while their ancient enemy, the Indian, is also steadily yielding and melting away in an unequal contest with the white man, so that in a few centuries both the natives and larger quadrupeds will have vanished, leaving few traces behind them. We need not wonder, therefore, that the larger extinct quadrupeds—to wit, such animals as the Irish elk, mammoth, dodo, and great auk—became exterminated, more especially if man was contemporary with them.

FORMATION OF BARRENS.—THE PITCHER PLANT.—The moss swamps, or "caribou barrens," are met with throughout the region, either in the open or in the forest. They appear to have been originally formed from melted snow accumulating in hollows, where in process of time mosses and other aquatic plants gained the ascendency, transmuting the surface into a soft bog, which gradually dried up until the decomposing weeds formed a soil where the coniferous trees took root; first in small numbers here and there, their dwarfed dimensions and outward surfaces densely covered with trailing moss and lichen, showing a struggle for existence. In the less reclaimed parts we find thickets of alder, willows, etc., while the Labrador tea plant (*L. palustris*) and other shrubs flourish on the bog generally, where the hare and musk-rat make their tracks, the latter towards some reed-covered pond not yet fully overrun by aquatic plants. Thus it would seem that many of the smaller lakes are steadily disappearing; the rate however at which this is going on cannot, as a matter of course, be accurately computed in a comparatively speaking newly settled country; but I have been assured, on the authority of residents, that many barrens now exist where lakes stood not fifty years ago. Some barrens may have both effluent and affluent streams, but many are mere hollows fed by the melting snow on their sides. The barren is moreover a favourite feeding ground of the reindeer, where it ploughs up the snow with its snout and feet in quest of moss and lichen,

divining, in a remarkable manner, the particular spots where these plants grow in luxuriance.

Conspicuous among the flora are various sorts of orchises,* remarkable for elegance and beauty, while the well-known Pitcher Plant (*S. purpurea*) is still more attractive on account of the remarkable construction of its foliage. Each leaf has a rounded arching hood at the apex, the interior of which is clothed with stiff dagger-shaped bristles pointing downwards, while the cavity is more or less filled with water and drowned insects, also live worms and larvæ.

It would be difficult to assign a reason for this unusual construction of the leaf, inasmuch as there is no need of any such contrivance to hold water, seeing that the plant is always well supplied from the wet bog in which it grows, unless, as indicated by Gray,† the drowned insects furnish manure to nourish it.‡

What induces the fly to go into the cavity? Perhaps attracted by the hope of procuring subsistence, after traversing the part covered with bristles, it finds itself unable to return; or, losing its footing, falls into the well, from whence it is unable to extricate itself on account of these obstacles.

* Among others I may mention *Plantanthea obtusiata, rotundifolia, oriculata*, and the very attractive *blephariglottis*, and its gorge ous ally the great purple orchis (*peramœna*) *Arthusa bulbosa*, and many other *orchidaceæ*, which the student will be enabled to determine from the very excellent and clear description of Asa Gray, "First Lessons in Botany," p. 442, *et seq.*

† *Op. cit.*, p. 51.

‡ The Indian's idea is that the liquid is filtered up the leaf stalk, and therefore is purer than any other water; hence he is always wishful to direct the attention of the traveller by quaffing its contents. I well recollect the disgust depicted on the countenance of my companion, who first drew my attention to the plant, when, after he had demonstrated the circumstance by drinking the contents of several pitchers, I pointed out numbers of drowned flies and red worms among the bristles. Moreover the water is insipid, and is, no doubt, the accumulation of rain drippings from the hood, as the pitcher gets nearly filled during wet weather, whilst the contents remain frozen throughout winter.

RODENTS.—INSECTIVORA.—BATS.—There would appear little to be added to the natural history of an animal so well known as the BEAVER, especially since the publication of Mr. Morgan's elaborate work;* however, out of curiosity I visited, in the depths of winter, a beaver dam, near the sources of the S.W. branch of the Miramachi river, where, and among the more secluded forest wilds around the head waters of Restigouche, Tobique, and Nepisiguit, a few still linger; it cannot be, however, long before the noise of the lumberer's axe and the trapper will expel or extirpate every beaver from the country, inasmuch as the creature is very susceptible of molestation, and will not flourish unless left in undisputed possession of its haunts. The great strength of the creature's jaws was well exemplified on several trees near this dam. Selecting a tough alder stump of nine inches in circumference, I counted the chisellings, and found there were from thirty-four to thirty-six distinct marks of the incisors to within a very short distance of the centre, before the tree had toppled over.† Unfortunately, a heavy snow-storm came on and obscured the outline of the dam and its works, but we could see distinct traces of the extensive tree felling that had been going on, and the stumps with their incisions slanting, as if done by an axe. Our guide informed me that he visited the locality during the previous autumn, and demolished a large

* "American Beaver and his Works."

† The persevering industry wherewith the animal labours at its dam is well illustrated in the size of the trees it will often cut down; but I have observed that it seems sometimes to fall into error in selecting, or else taking by chance, trees of too large size, as evinced by the prostrate trunk lying where it was felled, without any further division. On one of the influents of the Restigouche, the Hon. Sir A. Gordon mentions that "heaps of large trees, some of them four or five feet in circumference, were seen lying prostrate; and on examination we found them to be all freshly cut down by beavers. Gabriel (*i.e.*, the Indian) said we might travel for years in the forests and not come upon such a spectacle again. We counted twenty-nine trees cut down, besides multitudes of shrubs and bushes."—*Wilderness Wanderings*, p. 28.

portion of the dam for the purpose of letting off the back water, which had inundated a large flat and the forest where he had been engaged with a party of wood-cutters; but now, to his astonishment, he found not only that the beavers had repaired the breech, as shown by quantities of logs sunk in deep water, but that the meadow was as much flooded as ever. We ranged all over the swamp, now frozen and covered with several feet of snow, yet could not perceive any further traces of the animals, which had, no doubt, been scared away by the lumbermen in the vicinity. On reference to the map it will be observed that the northern portion of the province is completely intersected by networks of streams and rivers, so that a colony of beavers is enabled to retreat from one to the other, just as the wood-cutters happen to intrude on their haunts. Unlike the musk rat, it is extremely sensitive of molestation, and readily abandons a favourite resort when subjected to annoyance. Both Indians and old settlers assert that formerly all the work was done by day, but is now chiefly carried on at night; which statement, if correct, shows the influence of civilization on the habits of the animal. A trapper long practised in beaver hunting told me that after April or May, when the young are born, the males leave the dams and wander about for several weeks, quite away from the females, who also disperse as soon as their offspring are able to provide for themselves; moreover, that they congregate towards the end of summer. These ways, in connection with its slow progress on land, would make the odoriferous glands serviceable in leaving their effluvia on substances, in order to guide them towards each other when they re-assemble in the rutting season. The same, moreover, might be said of the skunk, and even the contents of the infraorbital glands of certain deer, not excepting the bag of the male Musk. No doubt, however, with the Skunk, as before shown, the abominable odour serves also as a means of defence.

The beaver, when he has totally disappeared, will leave

traces behind him such as few, if any, quadrupeds have done. Although now verging towards extinction, it was at one time very common in the United States and Canada, as shown by the numerous meadows teeming with grass that were formed by the creature; indeed, as regards New Brunswick, there are few rivers that have not numerous old beaver dams, which produce excellent crops of hay, and furnish a feature of the landscape. In the remote wilderness districts the beavers are said to be somewhat increasing, but only here and there. Like the Indian and the Deer tribe, all will before long be creatures of the past; and whilst the man will leave no useful trace of his handicraft behind, the beaver—the more intelligent animal in one or two respects, (to wit, diligence and providence)—has thus built a monument of its industry which will last for ages.*

The MUSK RAT, or *Musquash* of the Indians, although very common, and much persecuted, has managed to linger on even in the vicinity of towns. I was frequently struck by the

* The Hon. Sir A. Gordon, in the article referred to, in recording his observations of the beavers on the river Restigouche, gives the following interesting account of one of the animal's store depôts. "But though we did not see a single beaver, we saw signs of their habitation and modes of life, which I confess I almost hesitate to set down, lest I should be thought to tell a traveller's tale. At some little distance from the beaver camp, down the stream, was a regular path, beaten quite hard, and evidently by these animals; for though the path was well defined, it was nowhere cleared for more than a foot or so from the ground. This led to a regular storehouse of wood, where a number of birch-logs, for winter food, about the thickness of a man's arm, were piled side by side and on each other, each about eighteen inches long, and cut with perfect regularity to the same length. That the deposit had been formed by beavers there could be no doubt, but what their object was in making such a store at a distance from their dwellings, or why they should have taken as much trouble to equalize the length of their logs, and pile them neatly, as the best lumberers would their cordwood, I am at a loss to guess." Perhaps this was a reserve store in the vicinity of the regular depôt, and lodges. I was informed of a similar example on the Tobique river, and can only account for them on the supposition that the beavers having filled up their storehouse in the dam, and finding there might not be enough for winter, formed the reserves at any easy distance.

singular methods adopted by this little creature to escape observation, one in particular is the habit of forming itself into a loose ball, which, unless by the practised eye of the trapper, cannot be distinguished from a stone or clod of earth or stump. But this plan of sitting motionless on the approach of danger is also common to squirrels and many birds, also to certain partridges and pheasants, and the porcupine, which, however, is well protected. There is a vulgar opinion, both among settlers and Indians, that the latter has the faculty of shooting its spines like so many arrows, from the circumstance, unknown to them, that when the animal is bearded it defends itself by means of its tail, which is whisked across the dog's face with great dexterity and force, leaving the spines sticking; or as often happens, the adversary, unconscious of danger, rushes madly on the porcupine; indeed dogs are sometimes destroyed in this way. The porcupine delights in deserted lumber camps, where it gnaws old sugar barrels. It is also partial to the bark of the maple on the same account; indeed the bark of trees is its favourite food, and many saplings are entirely destroyed by the creature. Although generally distributed over the region, it is most plentiful in rocky situations, and lives in societies, its presence being usually indicated by heaps of spoor on the rock ledges.* The cast and weathered antlers of deer being usually found with the tips gnawed, are supposed to have been mutilated by their owners; but after examining several specimens of moose horns so bitten, I could clearly define traces of the incisors of porcupines, who, doubtless, eat them from choice, considering the number usually found in this condition.

Of the smaller insectivora and rodents, both the little

* The spoor of the porcupine (*i.e.*, the pellets) is very much larger than might be supposed from the size of the creature, consequently the inexperienced hunter is apt to mistake its droppings for those of deer, as occurred to me on a certain occasion, when I spent an hour in carefully tracking a porcupine, under the belief that I was on the trail of a Virginian deer.

SHREWS, named after Richardson and Cooper, are plentiful in the wilderness districts.

On comparing them carefully with descriptions, it seems that both S. Richardsonii and S. Fosteri of Richardson are so closely allied that I could not perceive any distinction, further than the density of the fur, which after all is most probably an effect of climate. But these shrews are also common in backwood settlements, where they take the place of the European Mouse, which has not yet found its way into the wilderness. The two MOLES, including the Mole Shrew (*B. talpoides*) and Star-Nose, are plentiful; the only Bats being the common New York and Hoary Bats. The last (*V. pruniosus*) is the most plentiful. The long period they are forced to continue in states of hibernation, extending sometimes to nearly seven months, is suggestive in many respects. One captured in May, soon after its appearance, showed how easily the nervous system is influenced by cold. I directed the contents of Richardson's ether spray producer on the skull and spinal column, when the bat closed its eyes instantaneously, and seemed to all appearance dead, remaining in this condition for several minutes, when the effects wore off, and it gradually returned to life; but doubtless there is a disposition in the brain and nervous system of all animals that hibernate to be more easily affected by cold than others.

The COMMON RED SQUIRREL (*S. Hudsonii*) is probably more plentiful now than formerly, for, like the hare, it has fewer enemies since the smaller carnivora have been extirpated. It is also, however, getting familiar, and increasing in numbers about dwellings; thus displaying a marked change in its habits, inasmuch as its favourite haunts are in the deepest solitudes of the forest.

The generality of the members of this genus seem disposed, more or less, to take on dark shades of colouring, as is the case with the foxes, and occasional instances of melanism are not unfrequent. For instance, on the reliable authority of Mr.

Boardman, I learn that there is a district on the south coast of the province where all the squirrels belonging to this species are black, and trappers have told me that black varieties of the grey squirrel are not rare. The latter, however, is not so generally distributed as the other, being confined to districts. The intensity of the black colouring in the specimens I have seen varies from a shining sooty black to an intense black; and perhaps, as before observed, the reason why these, and so many albino races of birds and beasts are met with in this region, is the little molestation to which they are subjected as compared with Europe, where every strange animal is destroyed. It would be useless even to speculate on the cause or causes of the black fur of the squirrels. We may suppose it would certainly be of service to the little animal during summer in the sombre darkness of the forest, as much as the contrary would obtain in winter; but the distinctions between this and the normal colouring in both species are so characteristic that, unless attracted by voice or some peculiarity, I do not suppose that the black sort would breed with the other; but should two or more of the former come together, we might imagine the propagation of the black race, which would naturally associate and expel, or, on the other hand, be expelled by, the normally coloured, according to their physical capabilities.

The FLYING SQUIRRELS are of two species. I have carefully compared skins with descriptions, and make out one species which may stand as the *Pteromys Volucella* of Cuvier, and another and much larger one agreeing with the *P. Sabrinus* of Richardson. The differences between the two are these: The former is seldom over five inches in length, exclusive of the tail, which is four inches; the upper parts are light fawn, the lower white with the roots of the hairs of the same colour, the tail is lighter coloured than the back. The other is seven inches in length, and the tail is five and a quarter; the upper parts are mouse-brown, the lower white with the

roots of the hairs plumbeous.* Both are found on the banks of the St. John River, and in the interior. I have heard of black varieties having been captured in the district. The well-known Ground Squirrel (*T. striatus*) is very common, and comes much about gardens. I have also seen several instances of melanism in this species. The MARYLAND MARMOT or "Ground-hog" has also of late years become more sociable and more abundant, and is abandoning the forest for cultivated tracts. Besides the JUMPING MOUSE, there is the SHORT-EARED HAMSTER and the WHITE-FOOTED species, which take the place more or less of the European mouse and rat in the backwood settlements and localities not yet invaded by the latter, the distribution of which is more or less confined to the seaport towns and also the banks of navigable rivers. Neither, as might be expected, stand the cold like the native *Muridæ*, indeed there appears to be a mortality among the European rats and mice during very cold weather, although like other imported animals they get a thick fur in winter; still by exposing live mice to a temperature of 15° Fahrenheit in the open, they survive only for an hour or two, and seemingly from the posture in which I have found them, death must have been rapid, inasmuch as two individuals exposed during a cold north wind, when the glass registered about 16° Fahrenheit, were quite lively when placed in the cage, and in the course of a few minutes I found them frozen to death and seated on their hind-quarters with their eyes open; whereas the native mice above mentioned may be seen running about, apparently unaffected by much lower temperatures.

* Since the above was written I find *P. Sabrinus* is included in lists of the mammals of Nova Scotia, and has therefore most probably been hitherto overlooked in Maine and New Brunswick.– See Gilpin, *Trans. Inst. Nat. Hist. Nova Scotia*, vol. ii., p. 14.

CHAPTER IV.

The Lumberer's Camp Life and Hospitality—Forest Fires—Barbarous Mode of Hunting the Moose—Moose Yard—Moose Hunt—Difficulties of Forest Travelling—Natural Decay of Forest Trees—Lost in the Wilderness.

DURING March, when alternate thaws and frosty nights prevail, I started for the wilderness with a woodman well versed in his craft. Although not a hunter in the proper sense of the term, he was known far and wide as a famous moose slayer,—that is, instead of gun or rifle he preferred his axe, with which he had felled many a helpless moose when struggling through the hard frozen snow. Having placed our necessaries on a small hand sleigh, we pushed through the forest by devious pathways, and arrived at a wood camp, after a fatiguing march of upwards of twelve miles on snow shoes. It is a common remark that the climate of the forest in winter is far healthier than the open country, and no doubt such is the case, for the reason that the extremes of cold are not intensified by wind. Thus often when sleighing over a bleak country, with a north-wester blowing fiercely, when the horses look as if dusted over with chalk, and our furs and whiskers are thickly powdered, we experience a delightful change the moment the woods come between us and the piercing blasts. The log or lumber camps are all constructed on much the same model, being composed of pine trunks placed lengthwise, one above the other, with a sloping roof covered over with pine boughs and a thick layer of snow. The fire is in the centre, whilst around it

the inmates lie on pallets made of the soft twigs of the spruce with their feet inwards, whilst all are well wrapped up in rugs and blankets. Excepting weekly changes of under-clothing, no doffing of outer garments takes places at bedtime, and the modes and means of ablution are neither effective nor ample, but, on the contrary, primitive in the extreme, as are many other domestic and household arrangements of these hardy and hospitable foresters. Nevertheless the comfort of the log hut is much beyond what we might expect to find in the depths of the primeval forest; and although every available space is occupied at night, there is no impurity of the atmosphere, as an enormous log fire is kept burning constantly, the apartment being thus freely ventilated through the large smoke flue of the roof.

The diet of the lumberman during the five or six months he is occupied in felling trees in the wilderness consists of occasional fresh animal food, conveyed through the forest, frozen, and on sleighs; or now and then a moose that may have unfortunately yarded in the vicinity; but the chief fare is salted pork, bread, potatoes, beans, with tea and sugar, to the total exclusion of spirituous liquors of every description. The result is, what with temperate habits, and exhilarating, healthy outdoor occupations, there are created as fine specimens of humanity as ever wielded axe or poll. Being away from the temptations of the towns, their simple fare and life have taught them, with the rigours of the climate, to make kindly welcome whatever forest wanderer happens to enter the wicket of the log hut; and I must say, who have more than once been indebted to their kindness, that nowhere is hospitality more genuine than around the log fire of the Canadian lumberman.

After building the camp, the next course pursued is the clearing of lanes in the direction of the banks of streams, where the logs are piled up to await the great thaws of spring, when they are floated to the main rivers. The vast

accumulations of snow in the woods turn many of these insignificant brooks into torrents, which are further swollen by means of dams so constructed as to be rapidly opened out when the lumber tumbled into the bed of the watercourse is borne down in a furious rush to the river of which it is an influent. This, called "stream driving," is the *finale* of the winter's work, the financial success of which is dependent altogether on the continuance and extent of the thaws. Sometimes when the latter are gradual, more than half of the timber is left in the forest until the following year, and of course the market is influenced accordingly. I do not know a more exciting scene of its kind than to stand and watch a party of these stalwart woodmen, with their long iron-shod poles, jumping from log to log with amazing agility, now balanced on the readily yielding timber, now, with acrobatic dexterity, leaping from one log to another among the noise and clamour of exulting voices, and the fouling and jamming of one log on the other as they crash along the devious windings of the surging torrent.

We had not long settled down into the ways of our good friends in the camp before a hard frost set in at night, and enabled us to run with ease on snow shoes. One afternoon after a toilsome day's wandering over the forest in quest of whatever natural objects might turn up, I returned to the hut to find my moose-slaying friend expatiating to the numerous inmates on his hunting exploits in the district some years before, and how, between axe and gun, he and several companions slew no less than twenty elks in the course of a few weeks. I had scarcely finished expostulating with him on the cruelty and illegality of destroying the hinds then, when they are heavy with calf, when suddenly the little wicket opened, and there crawled into the hut two stalwart settlers, accompanied by several dogs. "Halloo!" exclaimed my companion, "here come the moose wardens!" "Why," addressing one of them, "you, surely, of all men, are not bound on moose hunting

now?" It was the case, however, for although appointed conservators of the moose by the magistrate of the district, they had travelled upwards of fourteen miles in order to secure three mooses, which had been seen for some time within a short distance of our camp, and having observed us pass their settlement they imagined we had heard of the deer, and were hurrying to the spot. My guide, already disposed to consider me absurdly scrupulous as regards the two points on which I utterly dissented from him, with reference to the mode and time he selected for hunting, became, now that the poachers arrived, more encouraged than before, so, after some hesitation, I promised to accompany the party, but only as a spectator. Accordingly on the following morning all sallied forth on snow shoes, and dispersed over the forest in quest of footprints, which were soon discovered, when men and dogs followed them up as fast as the nature of the ground would permit. On looking closely at the tracks I found that three mooses had passed only a few days previously, and, as usual, in "single file," treading as near as possible in each others footsteps. "Our start" was, assuredly, a strange one; the uncouth, bearded backwoodsmen in fur caps, and dressed in grey homespun, looked perfectly equal to the occasion, whilst ten or a dozen dogs, picked up at various farms on the way, presented a heterogeneous collection of mongrels, which barked and yelped around us in perfect ignorance of the work they were about to engage in, save a large-boned bull-mastiff, which, we were informed, seldom missed his hold of the muzzle of the animal. Each of the so-called wardens carried a gun and axe, whilst my henchman stuck to his faithful weapon, and laughingly remarked to a brawny blacksmith that however much the latter might trust to a musket, it was his belief that if he did not in the excitement of the moment either shoot himself or a neighbour he would most assuredly miss his mark, and we shall see anon that this surmise was not far from proving correct. Having

witnessed the hounds "turned off," and all speeding along the moose tracks, I struck across to an alder swamp for the purpose of examining the nature of the food on which the animal browses at this season, nor had I gone far before footprints and large hollows where the herd had lain showed I was in one of their yards, on the confines of a large barren, overgrown with moosewood, aspen, poplars, and alder bushes, which they had cropped and barked, many of the saplings having become stunted in growth by depredations of former years. Looking northwards, the eye ranged over a vast tract where once a stately pine forest grew, now overspread by deciduous leaved trees, with only here and there a solitary spruce or pine which had not yet attained the height of the old charred and black mast-like forms of its predecessors, towering many feet above it, although nearly half a century had passed since they were destroyed in the frightful conflagration known as the "great Miramachi fire," that desolated the major half of the central and northern portions of the province.*

On surveying the enormous tract demolished by the fiery hurricane, I was reminded of the remarks made by an old man on the previous night;—how, at the time referred to, he and his wife, having an infant at her breast only a week old, were driven from their little clearing in the forest, with nothing beyond the clothes on their backs;—how they wandered about for hours, not knowing whither they were going, half stifled by smoke, when night came on, and hearing a disturbance in the wood close by, stumbled against their only horse, and before knowing it found them-

* Another memorable fire occurred during the summer of 1870. It began in the upper provinces, and extended to New Brunswick, where serious damage was occasioned. These periodical conflagrations seem dependent on continued droughts and prevalence of high winds during midsummer and early autumn. Like all such occurrences, they commence with unimportant beginnings, and are sometimes made intentionally, but are oftener the result of clearing tracts for settlements. In olden times the Indians frequently set fire to the forests to annoy hostile tribes and the early colonists.

selves within a stone's throw of the home they had abandoned in the morning, whilst the crackling of the fire and red-hot ashes raged on every side;—how on the following morning, as they sought to escape by forest paths, the frightened moose, caribou, bears, lynxes, etc., and partridges, were constantly hurrying past, and how on their arrival at the banks of the Miramachi, two of the former nearly ran over them on their way towards the river, into which they dashed and swam to the opposite bank. The desolation worked by the fire on the above occasion was marvellous; so changed were the physical features of the country that the narrator, when he returned to his farm soon afterwards, was at first unable to identify his property, until absolutely at the door of the dwelling, which owing to a swamp on one side and a large tract of clearing on the other, had been saved from the general destruction which overtook everything in any way combustible.

While contemplating the scene of this terrible fire, suddenly, on my right, there came forth from the forest loud shouts of men and bellowings of dogs. At once divining the cause, I made for the wood with all speed, and had just gained the moose-yard when a female elk came crashing through the cover, and passed within a few yards of me, pursued by the dogs, who, running nimbly on the frozen crust, hung about her flanks, yelping and barking, whilst she was making laborious efforts to escape. Now and then she suddenly sank to the shoulders; again her hind-quarters would almost disappear; sometimes I lost sight of the pursued and pursuers, as the former doubled backwards and forwards in the denser parts of the woods, where the snow was not so heavy as in the barren and along its skirts. Twice or oftener I came within easy shooting distance, and was reproached by my henchman for not firing, and perhaps had I known the sufferings in store for the poor brute I might have been induced then and there to put an end to the chase; but having that morning

made a secret vow not to shoot at a hind, I was obdurate. Nor did his request to borrow my gun meet with consent; so shouldering his axe with redoubled energy, Brown pushed forward, and once I saw him raise it, and as suddenly lower the weapon as the animal twisted and turned in a clump of pine saplings. He had, in fact, lost a good chance of braining the moose or breaking its spine, and now, over-excited by the chase and dead-beat by extra exertion, he had no alternative but to give in, whilst the elk and its canine foes pursued their ways through the forest. Being myself fairly out of breath, I hung back also; and as we were both moving leisurely along, there appeared the two wardens, who had lost the tracks in attempting to cut off the animal's retreat. But now that the hounds were in full cry and the moose well-nigh worn out, it seemed only a matter of time to get up with our quarry; we accordingly followed the footprints, which were painfully distinct from the blood of the wounds inflicted by the dogs, or made by the frozen crust. Here I noticed large gouts where she had halted for a moment, or a gory pit caused by her nose, when in her struggles she had suddenly sunk to the brisket and buried the muzzle, or where mouthfuls of snow had been seized to slake thirst and cool the parched tongue. I must, however, allow that the chase was exciting, and had it been a male moose I should have enjoyed the fun immensely; but considering the circumstances, I could not enter heart and soul into the hunt in the same way as my companions, who, now worked up to the very extreme of venatical frenzy, were madly rushing on regardless of all obstacles.

It is a most perplexing moment to the Canadian hunter when, in hot pursuit of his quarry, he happens to strike the tip of the unwieldy snow shoe against a snag, and is sent "a cropper, spread eagle-fashion," on his face, the long snow shoes standing on end. If inexpert at recovering himself, he may have to roll about for some time before gaining the erect position. Indeed it so happened, for as we sped along in

single-file, the two wardens leading, an accident of this nature occurred to the blacksmith, whose gun went off at the same time, lodging its contents close at his companion's heel!

The number of pursuers was now reduced to Brown and the other moose warden, whilst the son of Vulcan and myself were left breathless in the rear. However, not to be altogether outstripped, we redoubled our efforts once more, and after a series of "trips" arrived at the brink of a stream, when my bailiff companion, without a moment's hesitation, leaped on the snow-covered ice, and as quickly disappeared up to the armpits—gun and all. Thus reduced to his axe, he struggled on, whilst I cautiously made my way to the opposite side, and in a trice was standing by a thicket of pine trees, where lay the poor moose breathless and exhausted, with the dogs crowding around so closely that the warden was afraid to fire. However the victim was finally despatched, and the reeking body of a full-grown calf extracted from its carcase, which on being quartered was hidden in the snow, to be conveyed to the settlements as opportunity occurred. So ended this inglorious day's sport, the first and last of my moose hunting adventures in the spring season. It may be confidently stated, however, as far as this region is concerned, that nine out of twelve elks are killed in the above way.

The instance just narrated is however rather an exception to the rule, in so far that the sport lasted for upwards of an hour and a half; whereas in general, from the deepness of the snow and thickness of the crust, it is seldom that the animal can progress any distance before the bullet or axe are brought to bear on it.

Of course my companions were overjoyed at their success; moreover, not content with the final issue, the hardier of the two backwoodsmen struck off on a fresh trail, having only a crust of bread and a piece of cheese in his pocket. Sleeping out that night, he only returned to the lumber camp on the following evening, when he brought tidings of having slain another

hind, which contained two calves! All this he accomplished on the simple fare above mentioned, passing the night on the snow, whilst throughout the day he was constantly on the move, traversing at least some thirty miles of forest. This man furnishes an illustration of the extraordinary powers of endurance of these hardy settlers: having some years previously fallen into the St. John River when crossing on the ice, he swam into open water and finally ashore, where he was picked up, encrusted in ice, and so benumbed that no one expected he would recover.

Of course the legitimate time to hunt the moose is toward the end of summer and in autumn, before the horn drops, when, however, few of the industrious settlers can spare time for such occupations, setting aside the woodcraft necessary in stalking the animal at this season. Although the legislature attempts to put a stop to a wholesale destruction which must sooner or later exterminate the animal, residents in the out-of-the-way places, irrespective of the sport, find, what between the value of the skin and the flesh, that a moose at all times is worth killing, and therefore evade the law whenever opportunities occur.

It is surprising to observe the accuracy wherewith woodmen will hit off a lumber camp without any footmarks to guide them. This, they informed me, is accomplished by noticing the appearances of trees and the effects thereon of the prevailing winds; however, many allowed that they very often get out of their reckonings, and wander about for hours, until some brook or stream carries them to a familiar watershed or drainage valley. The American larch, better known as the *Tamarack*, when growing in the barren and exposed to the prevailing winds, becomes bent usually in a S. and S.E. direction; accordingly it is by this circumstance, and by marking the position of the moss on trees, windfalls, and direction of streams, together with whatever acquaintance the

individual may happen to possess with reference to the stars, that the Indian is enabled to find his way in the primitive forests, where few white men could shape their course except by the compass. A few natives are still apt in these respects, and no doubt with their forefathers the faculty amounted to an instinct; but now, excepting experienced hunters, it is rare to find them displaying remarkable excellences in this branch of forest craft, which, like many other traits of their primordial lives, has been obliterated by civilization. But even in the immediate vicinity of settlements there is no difficulty in losing one's way; indeed, I have known many experienced forest rangers get beyond their reckonings, and wander about for hours.

I started on a beautiful October morning for the purpose of beating the forest in quest of partridges, with the chance of a stray shot at a hare, woodcock, or snipe. Selecting a part of the country only sparsely settled, I drove some ten miles along a forest road to a burned tract, now covered with a second growth of soft and hard wood trees, interspersed with charred and blackened trunks of many noble pines that had passed through the great conflagration of 1825 (just referred to), and the wasting influence of the frosts and thaws of subsequent years. The autumn tints had already appeared on the leaves, and in their exceeding beauty and variety of colouring dappled the forest with brilliant patches of red, yellow, and purple. I was soon beating along alder swamps or scrambling over the fallen trunks, now pushing through thickets, then sinking knee-deep in bog or the soft moss or the rotting lumber around the roots of the noble old hemlock spruces, which spread their gnarled branches and feathery foliage on every side, and nodding towards their mother earth with the weight of centuries, seemed doomed before long to totter and fall prostrate by the side of their forefathers. The natural decay and death of these patriarchs of the forest seem to be brought about by a disposition to

overstep, as it were, the centre of gravity, the tree getting top-heavy, when by a slight disturbance it fairly topples over, the roots standing up erect, with masses of rock and soil between them; often, however, the trunk breaks across near the ground. There is, moreover, canker and dry-rot, which gradually destroy the soft interior, in some cases to a surprising extent, when the tree is to all external appearances in full vigour. Many fall from the effects of frost and thaws loosening the soil around their roots; but the most fatal catastrophes follow hurricanes, which send one on another, producing what is known as windfalls, which, as just stated, serve to indicate the direction of the prevailing wind. The perfect stillness of the woods at this season is remarkable, for nearly all the birds of passage have flown southwards, and, save a solitary squirrel, or a few migratory thrushes among the berries in damp places, one wanders over miles of forest and seldom meets with a living creature. Thus, after several hours' search, I determined to penetrate further into the interior, and selecting as my landmark one gigantic pine trunk, that rose like a huge mast far above the underwood around, I proceeded on through the gloomy solitude, and had not gone far when the increased activity of the dog quickened my pace, and away we went as fast as the nature of the ground and obstacles would allow. The scent was strong, and for more than half an hour our course lay entirely in an opposite direction to that which we had just been following. At length, as the spaniel drew up at a rocky ledge, and barked furiously, I discovered the characteristic spoor of a porcupine, which in all probability had taken to earth under the rock.

It being now sunset, and not having a compass or any means of directing our course, I began to feel that the sooner we got to the old pine trunk the better, so with unpleasant forebodings of what was coming, we made towards the skirts of the thick wood, but no landmark was visible among the seemingly interminable

growth of larch, birch, poplar, etc., stretching far and wide over the vast level country. Moreover, on climbing a tree, and straining my eyes over the expanse, I found, instead of one gigantic trunk, more than a dozen of equal magnitude, here and there, as far as the eye could reach. An enormous old pine, in the far distance, bearing a resemblance to my landmark, determined me to make for the spot; but on returning to "*terra firma*," the thick bush around obscured all distant objects, and each charred pine looked so like its neighbour, that we had not proceeded far through the decaying bracken, and over rotting trunks and soft ground covered with rich red bunch-berries, before, halting in bewilderment, I sat down, and now, for the second time in my forest wanderings, began to realize the horrors of being lost in the woods.* It was five p.m., and the sun was disappearing behind the tall trees; so shaping our course eastward, we made for what seemed more open country, and pushing rapidly down the side of a ravine, in hopes of coming on some pathway, we struck a goodly-sized brook, which again added to our perplexity, as we had not crossed the stream before. At length, bewildered how to proceed by tree or watershed, we finally commenced searching for the footprints of cattle, which sometimes roam for long distances from the settlements; stopping now and then to listen for the sound of their bells; but nought was heard beyond the last chirps of grasshoppers in the damp places. Once there came a hollow sound like that of a lumberer's axe, from the direction of the forest; but it was not sharp enough, and more resembled the woodpecker's tap on some skeleton trunk. Wandering from place to place until it was getting so dark that we could scarcely recognize objects at any great distance, there at length appeared footprints of cattle in a swamp, and before another half hour, we came unexpectedly on a snake fence, enclosing a little clearing and cottage, the inmate of which informed us

* A similar but more trying incident I have described in my "Wanderings in the Western Himalays," etc., p. 233.

that we had overshot the spot where we had entered in the morning by some six miles, and that had we continued in a north-westerly direction, we might have wandered about for days before arriving at a settlement. With an empty game-bag, and only a crust of bread since eight a.m., I turned my face homewards, wondering how many more experiences of a similar nature would be required before I could be taught the requisite precaution of taking bearings beforehand; yet, strange to say, I repeatedly afterwards lost my way in wilderness districts where one might imagine there should have been little difficulty in finding the proper course. One of the common mistakes made by persons unskilled in forest travelling, is a disposition to incline constantly in one direction, until at length you return to some spot traversed before. This is owing sometimes to the devious directions of the "logging or lumber paths," which constantly intersect each other, forming in many forest tracts complete labyrinths, which puzzle the wanderer until he is compelled to trust to chance in making his escape.

PART II.

BIRDS AND REPTILES.

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CHAPTER V.

Rapacious Birds—Bald-headed Eagles stooping on Fish—Similitude between Birds of boreal America, Asia, and Europe—Hawks, Owls—Effects of Climate and Civilization on certain Rapacious Birds—Numerical Estimate of the Migratory and Resident Birds—Effects of Cold and Climate on the inward and outward Economies of Animals and Plants—Results of Climate on certain Indigenous and Foreign Animals and Trees—Pines split by Frost—A Silver Frost—Climate affecting Fruits—Ox-eye Daisy—Crows and Jays—Canada Jay assuming the Habits of the Kingfisher—The Thrushes—Robin and his Habits—Young Birds Feeding their Companions—Songs of American Thrushes—Catbird, or Carolina Mocking-bird; its modes of Mimicking Sounds—Woodpeckers prospecting rotting Pine Trunks—The Log-cock—Differences in dimension of Species from different Latitudes and Longitudes—Birds laying indefinite numbers of Eggs.

THE rapacious birds observed within our boundaries amount to about thirty species, of which only a few reside throughout the winter, as may be readily surmised considering the climate, and the fact that by far the greater number of the smaller birds are migratory; but doubtless the former is less a barrier to their appearance in winter than the absence of the latter, and as the extinction of forest and reclamation of land extends, so will the numbers of birds, great and small, increase. Moreover, the hare, as I have shown elsewhere, is now fast attaining the characteristics of the European rabbit, and is as

rapidly multiplying as its four-footed foes are being destroyed, so that we may expect such hawks and owls as prey on it will in time become plentiful and resident, just as are the peregrine and goshawk, which must fare now far better during the winter months than formerly, when the feline quadrupeds were plentiful.

A solitary instance of the TURKEY BUZZARD and two specimens of the GOLDEN EAGLE are recorded by Boardman, who thinks the latter may remain throughout the year. The WHITE-HEADED or BALD SEA EAGLE is seen at all seasons on the coasts, and on the lakes and rivers in summer, where it preys extensively on salmonoids. Few recommend themselves to notice more forcibly than this noble-looking bird, more especially when engaged in hunting for food; the pure white head, neck, and tail contrasting with the black of the other parts, as with break-neck impetuosity he plunges headlong on his quarry, remind us of the glowing descriptions and vivid delineations of the American ornithologists, Smith and Audubon, who have certainly spared neither pen nor pencil in attempts to render imperishable and impressionable all the ennobling qualities of this the heraldic emblem of their country. Nevertheless, allowing for the heightened enthusiasm of these patriotic naturalists, the main facts they describe are still rehearsed daily on many of the great rivers and along the shores of the United States and Canada. On one occasion, during an examination of the geology and Indian refuse heaps before mentioned, in the vicinity of the pretty little town of St. Andrews, in the Bay of Fundy, I found myself on the dome-shaped or rather glacial rounded summit of Shamcook Mountain, some 700 to 800 feet above the level of the lovely Passamaquoddy Bay, with its little islands and outline recalling recollections of the Gulf of Naples as seen from the summit of Vesuvius, whilst the scenery towards the north was hilly with deep intervening troughs containing natural tarns where the

togue or grey-spotted trout (*S. confinis*) is plentiful. When contemplating the enchanting panorama, I observed four of these eagles circling gracefully over the placid waters, their dark bodies and white extremities showing boldly forth against the deep blue of the heavens. At last one, parting company from the rest, descended to lower levels, and after a gyration or two suddenly turned and sank perpendicularly on the surface, but only for an instant, when it rose again and made shorewards with a fish in its talons, before the others had time to observe its movements. At length one perceiving the successful capture, hesitated for an instant, when with closed wings it stooped grandly some 300 yards in one fell swoop, followed by the remainder, and, although the distance was far, I could hear their wild cries as each contended for the fish, which after all fell into the lake during the *mêlée*, and must have escaped, as none of them followed, but, on the contrary, returned to their former outlook, to use Longfellow's words, by "invisible stairs ascending and scaling the heavens."

The position from whence this scene was witnessed displays in a remarkable manner the so-called "muttoning" and *striæ* caused by ice friction, just as if a glacier from the highlands northwards had passed down the lakes and over the Shamcook hill down into the bay; indeed, along all the river valleys opening into the Bay of Fundy precisely the same phenomena are visible, showing, as I shall notice elsewhere, that in all probability a vast sheet of land-ice once covered the area, and moved steadily, or pretty much so, from north to south.*

The birds of boreal Europe and America are, perhaps, more closely allied than many naturalists suppose. If we eliminate the absolutely identical, and those which differ from each other to a very small extent, there remain but only a few peculiar to

* See Hind, Dawson, and Bailey: especially the Report of Mr. Hind, p. 190.

the northern portions of both continents. I think there is also a disposition in the present day to keep closely-allied birds apart, rather than link them together—too much of what might be called the cabinet diagnosis, founded on the bare aspect of skins in museums, without any consideration of the influence of habits, climate, and other causes, in bringing about alterations in form and external appearances of such objects as closely resemble each other, but differ in a few minute points of distinction. Again, the naturalists of particular countries often hold fast by the names originally given to species since shown to be identical with others previously known; thus the Canadian eagle, duck, hawk, and American osprey still retain separate specific appellations, although it is well known that they are identical with the golden eagle, peregrine, falcon, and osprey of the Old World.

The PEREGRINE remains here throughout the year, and breeds on the rocky shores of the Bay of Fundy.

The OSPREY is plentiful along the rivers and their fiords in summer, where it may be seen constantly stooping on fish. It arrives early, when the ice is breaking up on the lakes and rivers, and just as the migratory fishes are pushing up from the sea.

The PIGEON HAWK (*F. columbarius*) spends the year in the region, and feeds in winter on the Canadian grouse and ruffed partridge, as does its ally the goshawk, one of the most destructive and daring enemies of the poultry-yard. I am inclined to believe it kills hares also; at all events the young suffer in common with smaller rodents. A straggler of the Greenland gyr falcon has been seen now and then in winter, but, according to Baird, it has been killed as far south as New York and Providence. When all the alder swamps are bare, and the forest more opened out, no doubt buzzards, now uncommon, will increase in numbers in summer, when there is abundance of frogs and the like. At present the marsh, broad-winged,

and red-tailed buzzards are common in suitable places, and also breed.*

The LITTLE KESTREL (*F. sparverius*) lays its eggs in hollows in rotting trees; and I am assured, on the authority of Mr. Boardman, that when such is the case, it may, as with the woodpeckers, noticed elsewhere, be made to lay an indefinite number of eggs by leaving one in the nest.

The OWLS, like nearly all the resident animals, get fattest in winter; however, as might be expected, this would be almost if not altogether without a single exception, still as regards woodpeckers, I did not observe any difference between their summer and winter conditions; for the reason, I suppose, that they return in winter to the far less rigorous temperatures of the depths of the forests. It is a noticeable circumstance, moreover, that in the case of the brown Virginian owl, its plumage is paler at this season, which I suspect is the Atlantic variety mentioned by Baird.† Some individuals procured by me in mid-winter had no less than a quarter of an inch of fat all over the surface of the skin. Both this species and the snowy owl, which however departs in May, are deadly enemies to the hare, and I was assured that the barred species, although smaller, does capture the latter by inserting its very acute and curved talons into the eyes. The civilization of the backwoods has already allured many owls to the settler's barn. For instance, the pretty little *saw whet* often takes up a permanent residence in the hay-shed, to the extent, in some instances, of breeding there. I saw a great Virginian horned species taken out of an otter trap baited with a duck; but both this and the large snowy owl prefer hares, inasmuch as when snow is deep, and the rodents lie hidden under it, one or other may be seen intently scanning the openings formed when the lower branches of coniferous trees get borne to the ground by the weight of

* I noticed a white or albino specimen of the last in Mr. Boardman's collection. † Pacific Railway Report.

the mass; the hare, however, is often master of the situation; and when desirous of crossing the surface, sallies forth suddenly, and expanding its broadly padded feet, flies across the snow pursued by the owl, which stooping with all haste, is just on the point of capturing its prize, when head-foremost it buries itself in the soft snow, which closes in rapidly behind it. Indeed, so accustomed has the hare become to pursue the above practice, either through personal experience, or inherited dread, that the woodsman, taking advantage of it, throws up his cap or axe as one is passing, when the terrified bunny dives headlong into the snow and is easily captured.

Looking at the owls which frequent this region, it will be observed that no less than seven out of ten species are also natives of Northern Europe.

EFFECTS OF CLIMATE ON ANIMALS AND PLANTS.—The migratory birds arrive *en masse*, and set about their nidifications without delay; hasty marriages take place in the ornithological world here as compared with the prolonged love-making of the birds of less rigorous climates, for scarcely has the most assidious reared a second brood before the chilly nights towards the end of August warn them that the time is come for a rapid retrograde movement. By the middle of the month nearly all the swallow tribe are off, and the warblers after them, while the finches and thick-billed birds assemble in flocks, and, reinforced by arrivals from more northern parts, tarry for a week or two longer, and until the first frosty night in October, when the last of the host disappear, and we are reduced to our residenters and the new winter arrivals. According to the carefully compiled list of Mr. Boardman, and further information he has kindly furnished me,* there

* Mr. Boardman has for many years devoted a very close attention to the local ornithology not only of New Brunswick but adjoining State of Maine and Bay of Fundy,—his museum of the birds of the district representing an amount of industry and skill seldom noticeable excepting in public collections. For his list of the birds of this region, see *Proc. Boston Soc. of Nat. Hist.*, vol. ix., 1862.

appear to be only about forty resident birds, including thirty land and ten water birds, while there are no less than 296 migratory species, including also of course such as only tarry for a short time on their way to and from more boreal regions.

Seeing that winter lags to May, and sharp frosts set in before the middle of October, it is evident many birds must be expeditious in their movements, especially such as breed in the country. I think with the exception of such hardy wanderers as the migratory thrush, snow bird, chipping sparrow, and a few more early arrivals, very few of the other migrants remain long enough to enable them to rear two broods; indeed several have barely time to bring up the first before the approaching cold warns them to be off to more genial regions. The flights of many birds from this and other northern lands are often very rapid. One cold night may make a difference, as I have often noticed, especially in the case of the swallow tribes, more especially if accompanied by a north wind, when the flock retreats before it. Then many a rural scene is suddenly robbed of some its most attractive objects.

Now when we think of generations on generations of birds being subjected constantly to the influences of this climate, and the expeditious movements it engenders in comparison with others, or even members of the same species that sojourn in regions where they have not to endure such vicissitudes, and the bird is put to no unusual exertion in procuring food, we may well believe that the strongest and most vigorous individuals are likely to be found among members who have had their constitutions tried, and that these will, through natural selection, attain advantages over the others; hence may be the origin of the differences in the outward appearance, etc., of animals from different regions, as I shall point out in the case of the woodpeckers, etc.

It will be observed that in animals which change to white in winter, especially the hare, weazel, etc., that the whiskers

and long stiff bristles about the mouth become grey from their tips, and not from the roots, as if cold was the cause of the change, or some agency acting from without; and this is most probably the case; moreover, there can be no question as to the influence of low temperature in stimulating the new growth. There is, moreover, a seemingly strong disposition for the lower parts of animals to become white in winter, *i.e.*, the parts in closest contact with the snow; thus, the under surfaces of the deer tribe are always whitest. And as if from its habit of constantly digging among the snow with its snout in quest of food, we find the cariboo with a white patch on its lips and around the hoof; indeed the same may be observed in domesticated animals, especially on their bellies and snouts. This has been frequently pointed out to me on the bellies and elsewhere in horses, who did not show any appearance of grey on their lower parts in summer.*

I was frequently much struck in observing how rapidly imported animals, such as short-haired hounds, attain a long thick fur; indeed the brown rat, European mouse, sheep, cattle, pigs, etc., become changed in their outward appearance in winter from this very cause; so much so that the two first-named look then much bulkier than their old-world compeers.†

* It is supposed that Europeans become grey more rapidly in these cold regions than in England, and that the beauty of the Canadian ladies soon fades. As to the former, it seems that the extremes of cold and heat do exert some influence; at all events, I have observed that the venerable tint proceeds more rapidly, *i.e.* men get sooner grey than they would in central or southern Europe. But I acknowledge this may be more apparent than real,—just as it is said the fair sex lose their teeth early from eating too many sweets. No doubt the very cold winters and gushing summers are trying to the fair complexion of the Anglo-Saxon female, more especially should there be much direct exposure to alternations of high and low temperatures, which may influence the colouring of the hair quicker than a continuous residence in a torrid or temperate climate.

† I don't think the European brown rat and mouse flourish in the interior of Canada, although abundant enough in the seaport towns. The intense cold of many inland cities tries them; and, as I have shown elsewhere, the mouse cannot long withstand a very low temperature, such as the native hare, squirrel, and the like would endure with impunity.

The rapidity wherewith both wild and domesticated animals become fat in accordance with the severity or otherwise of the approaching winter, is another provision of nature in order to enable them to withstand the cold. We have seen this to be the case with birds. Indeed the law seems universal as regards the denizens of such regions as that now under consideration. Both Europeans and natives assert that they can prognosticate a very cold winter by inordinate quantities of fat on the intestines and epiploon of wild and domesticated quadrupeds; moreover even man (white or red) is no exception to the rule, the differences in weight in summer and winter being very evident. I well remember a butcher informing me at the beginning of the very cold winter of 1867, that he knew the weather would be severe, as he had not seen so much fat on the omenta and about the kidneys of pigs, sheep, and cattle for many years.

Being desirous of finding out how indigenous animals withstood the winter climate, I solicited Mr. Boardman's great experience with reference to the birds. He says: "I remember during the cold season of 1858-9 that crossbills and pine finches were very numerous, and I procured a large number in February, to see how far the eggs had advanced, and found them nearly as large as buck-shot. Two days afterwards we had *a warm shower, then a sudden change to extreme cold*, which killed every small native bird in the woods, where we found their bodies in abundance. The result was far from being common; not one bird was seen again during the season, and the ruffed grouse were exceedingly scarce from the circumstance that the entrances of their burrows in the snow were frozen over and the birds were starved to death, and in spring their bodies were found here and there all over the forest."*

* The same we shall see presently obtains even in Britain, although not so pronounced; but now and then seasons do occur when numbers of our native birds perish from cold.

The fowl is preserved in New Brunswick with difficulty; not so the Guinea-fowl, seemingly a hardier bird, which is rather a curious circumstance when we consider the native haunts of the two. But what is still more surprising is the fact that the turkey chooses to roost on the bare branches of trees in place of the cover of the hen-house, even when the thermometer is at its lowest, just as we observe it braving equatorial climates and that of India; where, however, according to Mr. Blyth, it is said to deteriorate.* Moreover Baird,† an excellent authority on this subject, states that the domesticated bird is descended from the so-called Mexican species, and not the wild turkey of the United States. This assertion is further strengthened by Leconte,‡ who states that the latter species has never been known to breed in confinement, and that the coloration of the plumage of the domesticated bird and Mexican species are in many respects alike, and distinct from that of the former. Be that as it may, I have seen broods of turkeys like as many herons perched on the topmost branches of tall trees during exceedingly cold weather when they might have roosted in barns. Indeed, farmers stated to me that when left to themselves they infinitely prefer out of doors at all seasons, and usually select prominent and exposed situations.

With reference to the effects of low temperatures on plants as well as animals, I well remember during my first excursion into the forest in winter, there had been a heavy fall of snow, and the roads were scarcely formed; indeed, the horse in several of the back settlements had to drag the sleigh at a walk for miles, so that the lumber camp we were seeking was not gained until sunset, when, just as we were partaking of the tea and fried bacon of our hospitable entertainers, I

* See Darwin, "Animals and Plants under Domestication," vol. ii., pp. 197 and 335.

† "Pacific Railway Report," lx., p. 617.

‡ "Proc. Acad. Nat. Sciences, Phil.," 1857, p. 179.

started to my feet on hearing the loud whooping of an owl, and before they could well remark on the cause of my departure I had disappeared, and was wading in the deep snow towards the object of my solicitations, which turned out to be a fine specimen of the snowy owl. In a trice I had its skin off, when the condition of the body became apparent. Layers of fat covered the entire carcase, thicker in the armpits and along the flanks, but universally distributed over the frame, whilst the internal organs were loaded with it. But I was too tired to think over the owl's obesity, and soon fell asleep, coiled up in blankets on the spruce tops, where I lay not "on a bed of roses," being awoke several times by the cracking of the branches and trunks of the forest trees, consequent on the lowness of the temperature, sounds to which my companions had been accustomed, but they were novel to me, and towards midnight became so frequent and loud that one might have imagined pistols were being fired all around the camp.

In certain forest tracts it will be noticed that spruces, especially the black sort, also birch and other hard and soft wood trees, are furrowed by deep longitudinal seams, extending often throughout the entire length of the trunk, and even penetrating to the pith. This splitting of the wood is owing to extreme cold acting on the vegetable fibre, and no doubt produces the reports above-mentioned, which are also occasioned by the snapping across of the decayed branches. I did not observe the longitudinal rents in saplings; it may be for the reason that their fibres admit of more elasticity than the old tree. Moreover, although the rent does often extend to the centre, there is seemingly no evil effect on the health of the tree, and in the course of a few years it gets filled up by new bark, when the outline has much the appearance of the seam produced by lightning. The explosion consequent on such a rent is often startling; and although the fissure may not be evident

immediately afterwards, it opens out after the thaws of spring. My always obliging friend Mr. Edward Jack,* to whom I am much indebted for valuable information on forest lore, informed me that the trees for the most part affected grow in exposed places, such as ridges where the north wind plays. Indeed, in felling maple and other hard-wood trees for firewood, I have been astonished to observe how deeply the cold will penetrate into the substance of the stem without disorganizing or seemingly impairing the vitality, even to the freezing of the central fibres. The authority above named moreover assured me that trees covered with moss were not subject to these rents, being, no doubt, protected thereby. The effects of cold are, moreover, exemplified by the quantities of last year growths to be seen strewing the snow around the trunks of both the evergreen and deciduous-leaved trees; hence there is a cropping of the tips of the branches in these latitudes not observable in the trees of milder climates. And no doubt from this cause it is that not only the leaf falls sooner and assumes a brighter tint than in central Europe, and that the former have fewer branchlets as compared with corresponding species in milder climates.

The effects of cold on animals and plants are further illustrated in many ways. Reverting to the cause of the white colourings, whether the direct result of low temperature or not, there is also an undoubted predisposition or idiosyncrasy in the animals so affected to be acted on by the climate, just as the denizens of desert countries take on the grey-brown hues which, in respect to permanence of colouring, are comparable with the artic fox and hare. If the climate, therefore, of Eastern Canada were to become more or less rigorous, we

* Gratitude, says a lawgiver, comes more nearly than any social virtue to justice. I cannot, therefore, allude to Mr. Jack without recalling recollections of happy hours spent in the agreeable society of his relations, to a fair member of whom I am indebted for the original delineations of more than one illustration in this volume.

might expect that the changes in the outward appearances of many of its mammals and birds would go hand in hand. As to plants, no doubt the thicker bark of the birch trees, and also their more stunted forms as met with on high elevations and in high latitudes, are provisions of nature in order to protect them from cold and exposure. I think, moreover (although my observations were not completed to my satisfaction when I left), that the hard and soft wood trees of New Brunswick, growing in places much exposed to the cold north-west winds of winter, have relatively thicker outer coverings than the same species growing in sheltered situations; whilst the conifers especially show under these circumstances a remarkable tendency to gather moss, which, although no doubt a protection to the tree, is seemingly injurious to its growth. During the very severe winter of 1867 I noticed that many foreign trees, such as acacias, growing in the open, and even rose bushes which had been in a flourishing state, were killed outright through the cold, whilst other trees had only the branches on their tops damaged. During early spring the following is not a rare occurrence: a shower of rain is rapidly succeeded by severe frost, called "silver frost," when the bare boughs of the deciduous-leaved trees and evergreens become encrusted with ice, presenting a very striking and beautiful appearance in sunlight, just as if they were composed of as many twigs of crystal, sparkling most splendidly. But the effect is often fatal to the garden fruit trees, and such as are not natives of the region. I was assured by a gentleman of much experience in horticulture, that the plum trees introduced into the province from Europe rarely produce fruit, and seem to deteriorate rapidly into stunted forms, gnarled and covered with excrescences. The effects of the cold winters and hot summers of Canada are, however, notorious with respect to such as, for instance, the apple tree, which has at length got so acclimatized that individuals imported to England, although seemingly not affected by the change in any way, cannot be got to produce

ripe fruit, for the reason that the summers are not hot enough. This, however, is not seemingly a permanent condition, and is probably easily overcome after one or two generations. Precisely the same thing takes place in Canada with the seeds of maize imported from Florida, which, moreover, do not produce the same returns as such as have grown for many generations in the country,* and probably a like consequence would result from the transference of apples from England to Canada, and of Indian corn from the latter to the Southern States. Most unquestionably, however, the effects of climate, as shown in these cases, have considerably modified the organization of the plant.

One of the most pernicious weeds in New Brunswick pastures is the well-known ox-eye daisy, introduced by the first settlers, who are said to have respected it in consequence of its resemblance to the modest denizen of the glades and fields of the old country. At all events, it has prospered and taken advantage of their consideration, so much so that in many farms it chokes up and exterminates the grasses and native plants. Whether it is that the plant enjoys greater advantages in the climate, or that the soil is better suited to it, or is hardy, and therefore more calculated to struggle and compete with the other herbs of the field, or that its fecundity is the result of neglect on the part of the husbandman, there can be no doubt that it prospers where the daisy (*B. perennis*) is starved to death, as neither it nor ivy will grow in the open.

In connection with the crows and thrushes of the region, it may be remarked that the RAVEN (*C. carnivorus*) of the New World differs from its congener of Europe and Asia in having a more slender bill. I do not know how far this is a universal characteristic throughout the continent; but as there are no other distinctions, it may be a question how far such a slight

* This grain is put in the ground at the end of June, and reaped about the middle of September.

peculiarity entitles it to be considered a distinct species. The CARRION CROW (*C. Americanus*) * is somewhat larger than the Old World corby, with the neck feathers less pointed; however there is no mistaking the "caw" of the former, which resembles the bark of a dog. Indeed, we might, on the principles of natural selection, fairly ask how far these modifications may have been brought about by circumstances which a closer acquaintance with the habits and haunts of these four birds could explain. The raven affects the shores of this region, whereas the crow is universally distributed, repairing more or less to the coast districts in winter. It is much persecuted by the settlers on account of its pilfering habits, and, in common with the BLUE JAY (*C. cristata*), is wild and wary. The contrast in this respect between the latter and its far less gaudy congener the CANADIAN JAY, is easily explained, for whilst the former is in request on account of its beautiful wings, the latter is allowed to pass unchallenged, and accordingly retains all its pristine indifference to man's presence, being his constant companion in the wilderness, and alighting even on the carcase of the slain moose, whence its familiar name of moose bird. I have moreover seen it picking this animal's flesh from a carcase carried on the back of an Indian. Why it breeds in midwinter I cannot discover,

* Mr. Rowan, whose observations in the island of Anticosti I have freely quoted, observes in connection with the habits of the black duck (*Anas obscura*) and this species in midsummer: "I never had any trouble in keeping our larder supplied with black duck. In the spring they seem to live entirely on herring spawn and small shellfish, and feed amicably on the beach along with the gulls and crows. The latter birds are in clover here at this season. I could not at first account for the number of urchin and other shells which lay scattered about the plains, but I soon found out that they had been carried there by the crows. I saw a crow one day fly up in the air with an urchin and drop it on the rocks, and repeat the operation two or three times before he managed to get at the interior."—*Field*, May 1, 1869. And Prof. Verril says the crow is one of the most "unsuspicious of birds" in Anticosti. *Proc. Boston Soc. Nat. Hist.*, vol. ix., p. 138.

inasmuch as it has a second brood in spring. I have here referred to the Canada lynx capturing trout like the mink and fisher cat, and elsewhere of rooks and jackdaws taking to aquatic habits, and fishing like gulls.*

I am informed by the gentleman just quoted that he has repeatedly seen the Canada jay capturing trout in brooks after the manner of kingfishers; and, knowing its crafty and familiar ways, I can well suppose such an occurrence; nevertheless, it is difficult to imagine that a bird not constructed for such a mode of obtaining subsistence should take to the not easily acquired habits of divers.

The true thrushes of this portion of the continent comprehend four species, of which the well-known ROBIN or MIGRATORY THRUSH is by far the most common. None can be said to be resident; but even during the very severe winter of 1867-68 many robins managed to brave the cold, and survive until spring, by feeding on native berries and whatever subsistence they could obtain in and around the settlements and towns. It is a common assertion that an unusual show of fruits presages a severe winter; and certainly, as far as the one in question was concerned, I observed remarkable returns of autumn berries and garden fruits, such as the choke cherry, mountain ash, elder, and the like. At best, however, any of the thrush family must have a hard struggle for existence during a New Brunswick winter; and most probably a large proportion of the loiterers perish before spring, just as I shall show is not unfrequently the case with resident and winter animals, besides such as arrive too soon, or delay their autumn migrations.

The same sometimes obtains in our own country with reference to fieldfares and redwings. I well recollect during the memorable winter of 1837 seeing in the north of Scotland numbers of the dead bodies of these birds under hedges

* "Wanderings," p. 45; "Natural History and Archæology of Egypt and the Maltese Islands," p. 33.

and in sheltered places. This I further observed at the latter end of December, 1870, during unusually frosty weather, at Kinsale, where the song-thrushes, blackbirds, fieldfares, redwings, missel-thrushes, titlarks, grey and pied wagtails are extremely plentiful during winter. Then after a few days' continuous frost many became so enfeebled that the village boys captured them with the hand or knocked them over with stones. It was then interesting to observe the relative powers of resistance of the different species, inasmuch as the missel-thrush and blackbird seemed far less affected by the temperature than the fieldfare, redwing, and song-thrush. The pied wagtail, however, suffered most, being often very feeble, and scarcely able to fly beyond a few yards; whilst the titlark and grey wagtail, although materially affected, were least so. What a contrast all these birds presented to robin-redbreast, which, owing to its habit of drawing near houses, always manages to brave the coldest seasons with impunity; and not only that, but when the others were crouching, ruffed and starving, under shelter, its lively little form may be seen piping on any bare twig. I suspect the missel, being the largest, is also the hardiest of British thrushes. Moreover on that account it holds its own against all its compeers, driving them away from the feeding-grounds. Much, however, depends on facilities in procuring food; for the grey wagtail during winter repairs to springs seldom frozen, where it picks up subsistence with the snipe, when the latter is obliged to abandon bogs and swamps. The old saying that "a hungry man is an angry man," is also referable to birds under the above conditions, as shown by the fretful tempers which they display towards one another. No doubt the migratory thrush is hardy enough; but as the ground berries and fruits are covered over, and the vibernums and mountain ash become more or less overwhelmed in snow, a fruit-eating bird must make great efforts to support itself and struggle against the cold. Perhaps in process of

time, as cultivation increases, it may so happen that there will be ample supplies of winter berries, and this hardy bird may be induced to spend the winter in these latitudes, seeing that it does not go very far south in winter.* The boldness it displays during the breeding season, when its haunts are invaded by the squirrel, crow, and grackle, its familiar habits, late departure, and early arrival,—all testify to its innate strength and stamina, which will always be advantageous in any struggle for existence. After feeding on the fruits and berries, it assembles in flocks towards the middle of September, at which season it is very fat and plump. A few then disappear; but the majority still linger on until sharp frosts in October compel them to beat a retreat to the central and southern States of the Union. It is a pretty sight to watch a flock start on their pilgrimage; they then fly high and keep close together, with that characteristic mode of flight peculiar more or less to the thrush family.

I know no better prophet of the coming warm showers of April and May than the robin as he sits on the snake fence uttering his familiar *chuckee chuckee*, repeated in quick succession, just as the English blackbird often presages a change of weather.†

The song of the robin, like that of many more members of its family (the famous mavis excepted), is not varied, and shows a sort of incompleteness, as if the bird had lost notes and was trying its utmost to recollect them—a sort of laborious effort to catch up lost ones to which he now and

* It is said to have braved the Atlantic, and been found in Central Europe; and knowing its powers of endurance and pluck, I well believe it would survive where many larger birds would perish.

† I dare say some of my readers may be familiar with the blackbird's well-known chatterings on such occasions; it is not, however, always easy to obtain a view of the little sable foreteller when thus engaged, as it chooses a dense shrubbery, where, frisking from branch to branch with upright tail and wings slightly raised, it keeps uttering a metallic tinkling call somewhat similar to the words "Klink, klink," frequently repeated.

then attains, but in repeating them gradually falls back on less melodious sounds, terminating in harsh trills, as if he were doing his very best to discourse sweet music, but in doing so was invariably breaking down. Moreover, like his compeers, he has a soft, low-toned love song when in company with his mate, and sings at night, especially during the full moon—rather a troublesome trait with the domesticated individual. When pairing, or during the time the female is sitting, he seeks the topmost branches of some maple or pine close by, where he pours forth his blackbird-like chant with surprising earnestness and vigour, more perhaps for the purpose of competing with a rival than with any intention of amusing his partner. The nest is built after the fashion of the blackbird's, and placed in a tree generally close to houses; however, when that is not feasible he betakes himself to forests and plantations.

Whether the same birds repair to their haunts of the previous year or not may be doubted; but on the authority of Mr. Wilmot, Governor of New Brunswick, I was informed that a lame robin built its nest for five successive years in his orchard; in this instance, however, it is just probable that this maimed individual never left the district. I have, moreover, been frequently told by residents of robins repairing old nests which they continued to occupy year after year. The migratory thrush is easily reared, and makes a very attractive cage-bird. The backwoodsmen, however, rather prefer to enjoy its presence around the settlement, where it hops about with raised hood, jerking its tail and emitting the thrush-like notes that recall to remembrance the woodlands of the old country. To the newly-arrived emigrant, the robin takes the place of the well-known denizen of home, and thus, from Newfoundland to Mexico, it is known by no other name. Moreover, ever faithful to its times of incoming and departure, it makes forced marches, often arriving before the last snow has fallen, and as frequently

tarrying until every berry is devoured, and the soil is so hard and crisp that no grub or insect of any sort can be obtained; indeed, I feel assured if subsistence were procurable it would frequently tarry all the winter.

In rearing the young, I frequently observed that individuals, when able to feed themselves, assume the duties of their parents and nurse their younger brethren, picking up worms as fast as I supplied them, and cramming the others so assiduously that on removing the latter they would appear quite disconsolate, chirping and moving about the perches with worms in their bills. Although the adult robin has none of the spots and markings of other members of its family, still, like the young of the blackbird, they are spotted on the breast and belly until the first moult; which is an important point when we come to study the affinities common to thrushes in general.*

The song of the HERMIT THRUSH (*T. Pallasii*), like that of the last-mentioned bird, is incomplete, just as if it had learned certain bars composed of highly clear and sweet mellow notes, which suddenly terminate, and you listen to hear what will follow, when there is a rapid repetition, just as if he had got up his part so far, but for the life of him could not vary it further.† The hermit thrush well deserves its name, delighting in thickets and dense woods, and ascending now and then to the topmost branches of stately trees, from whence its loud notes fall on your ear with an agreeable welcome, rendered doubly so after the long dreary winter; for it shows by its presence that the summer is not far off, although the bud has not yet opened. It takes its departure towards the end of September. The nest is made

* See Darwin, "Descent of Man," vol. ii., p. 183.

† Mr. Boardman, to whom I am so much indebted for very valued information on the zoology of this region, likens the song of the hermit thrush to the words, "*O spherel, spherel; O holly, holly; O, clear away, clear away; O, clear up, clear up!*" as if the little creature was praying for the bright sunny days of midsummer.

of twigs, lined with mud and fine dried grass, and is usually placed either in a bank or bush close to the ground; the eggs are greenish-blue. In point of hardihood it is not nearly so able to stand cold as the robin. I reared several, which died suddenly during a cold night in the latter end of October. Another diminutive throstle is the OLIVE-BACKED THRUSH (*T. Swainsonii*); its migrations, as compared with the last, differ in thus far, that it goes further north in summer, and does not go so far south. As usual, all sing at night: its close ally, WILSON'S THRUSH (*T. fulvescens*), is also a summer visitor within our boundaries; both partake of the same seeming imperfections in their songs as the preceding bird.

While on this subject, I may refer to the case of the CAT BIRD (*M. Carolinensis*), the sole representative in our region of the mocking-bird, and brown thrush (*M. rufus*). Neither of the two last have been hitherto observed so far north, but the mocking-bird rarely visits Massachusetts, where the latter is common.

It is strange that the cat-bird, the natural cry of which clearly resembles the mew of the cat, should show such a remarkable dislike for any feline animal. This peculiarity we know is more or less present in all the smaller birds, but I doubt if it is displayed in them to the same extent as as we find in the case of the above. I reared an individual, which became very docile and familiar, coming out of its cage and perching on my hand, or following me about the house. Although never evincing any dread of a dog, even of hairy terriers, no sooner was a cat, or the skin of a hare, placed near the cage, or anywhere within view, than it became intensely excited. I have often wondered if this inherited distrust of the cat could be explained in any way with reference to the imitative peculiarities of the bird. In other words, is it possible that some ancestor began to mew like a cat whenever he saw the wild cats in his haunts, and that in process of time it came to be

an established habit? Even Mr. Darwin might smile with something approaching contempt at this explanation; but he, in common with all who are competent to discuss the subject, knows how ignorant we are of many of the laws of inheritance. The broken imitations of noises, and fragments of songs, uttered by the mocking-birds, are scraps copied from familiar sounds. The individual just mentioned imitated, in a rough way, the rasping of a saw, from constantly hearing the sound in the woodyard, and two or three notes of a white-winged crossbill in a neighbouring cage; but every imitation was unfinished, as if the bird's memory could not retain more than a few of the pointed notes.*

Now with reference to the part played by animals in the propagation of plants, thrushes no doubt convey seeds of plants and fruits for long distances, perhaps more extensively in this region, where, in common with the other migrants, they fly long distances on a stretch when migrating. There is a current assertion that passenger pigeons have been killed in New Brunswick with rice in their crops. About the last food it obtains here is buckwheat,† which is found growing about wild in the forests far away from settlements.

Again, looking at what are called "blue berry plains"—large tracts of forest country that have been at one time burned, and are now overgrown with shrubs and whortle berries—forming insulated patches in the very centre of the forest, are sometimes so effectually locked in thereby, that the winds have little chance of conveying seeds. Here, besides the *vaccinæ*, are found other ground fruits, and the choke cherry, mountain ash, or elder, on which bears, pigeons, cedar birds, thrushes, etc., feed at the end of the season when migratory movements

* According to Boardman, both the BALTIMORE and ORCHARD ORIOLES rarely appear in our forests; perhaps in the no very distant future, when the country is more opened out, they will become plentiful, seeing that both are very common in the neighbouring New England States.

† *P. Tartaricum* is extensively cultivated on the banks of the St. John.

commence. The bear is a great wanderer, and very partial to wild fruits;* whilst cherries and haws are often swallowed entire by thrushes, which subsequently eject the stones of the former. Under these circumstances, therefore, it is highly probable that birds contribute largely towards the geographical distribution of plants.

It seems a law in nature, that after a Canadian pine forest has been burned down, the larch, aspen, alder, poplar, and birch take the place of the cone-bearing trees; just as around the deserted log camps, we find the great willow herb (*E. angustifolium*).

No doubt, however, many seeds are conveyed by the winds, some dying from falling in the shaded forest, or in situations inimical to germination, while the pine and spruce seeds that would have replaced the parent tree were destroyed by the fire. Moreover, such birds as the crossbills, redpolls, and pine finches, who feed on seeds of birch, alder, mountain ash, etc., probably convey them to the burned lands, where they readily take root. I have often remarked in the first growth on such tracts that the young birches and maples were growing in clusters, the former being the most numerous, as we should expect when we compare the numerical arrangement of their seeds in the catkin of the birch and the capsule of the maple.

As may be easily supposed, the boundless forest tracts of this region present tempting retreats for woodpeckers, of which four species are resident and about as many migratory.

Conspicuous alike from his dark mantle, white head, and scarlet crest, as his large size, is the BLACK WOODCOCK, or LOG COCK of the settlers (*P. Pileatus*). This, the king of our scansorial birds, is fully eighteen inches in length, and inhabits the dense forest; although nowhere common, it is generally diffused over all suitable localities, where its loud

* I have frequently observed its dung, and also that of the black bear of the Himalayas, made up almost entirely of the seeds of wild fruits. —See "Wanderings in India."

tappings proclaim its presence at long distances. I was puzzled for a time how to account for only a tree here and there, among hundreds exactly similar, having been selected by the woodpeckers for their diggings, and why in many instances the perforations covered only one side of the trunk; when one sultry forenoon, whilst seated near a rotting pine, I heard several distinct scratchings in the interior as if as many mice were nibbling the wood. On splitting the trunk open, I found many large woodworms busily employed in making their tunnellings; and thus it appeared to me that probably the woodpeckers discovered the whereabouts of this their favourite food by listening to the sound made by these worms when excavating passages in the interior of the tree. Indeed it is extremely likely that by hearing they are enabled to find out the particular site of the worm, as it is not every tree that contains this insect. I have often seen woodpeckers halt for a few minutes now and then on their way up a trunk, as if listening for the welcome sound of these large white worms, one of which ought to be a dainty dish to the majority of the species, although perhaps only a bite to this the most portly of all. The strong wedge-shaped bill of the woodpecker perforates the tough CEDAR (*T. occidentalis*) to the rotting centre in quest of these insects, perhaps only when the bird has been assured beforehand by a process of auscultation that it is sure to find its prey by digging through several inches of fresh wood. Some idea of the extreme durability of this, the American *arbor vitæ*, may be conceived from the fact that snake fences have been pointed out to me no less than fifty years old, which with the exception of some surface weathering looked as durable as on the day they were put up. The woodpecker delights to hunt on soft-wood trees growing on light sandy soils, as these pines do not attain huge dimensions, and show an early tendency to death of the centre, when the worm attacks that part, and often turns the trunk into a perfect shell, which the first hurricane blows down.

Whether woodpeckers return to the hollows of decaying trees and become semi-torpid or not, it is a fact which every forest warder who has had his attention directed to the circumstance must have noticed, that no sooner does the severe frost of midwinter set in than the above and other resident woodpeckers suddenly disappear; whereas, should a sudden thaw take place, they come out again in numbers.

The two most common woodpeckers are the HAIRY and DOWNY species, which bear a resemblance to the GREATER and LESSER WOODPECKERS of Europe, but differ in some important characteristics. Individuals from various regions present remarkable discrepancies in size. Thus the hairy woodpecker of Canada is much larger than the same bird of Mexico, which is again smaller than that of the southern and middle States—the extremes being from eight to eleven inches in length. Professor Baird has noticed that birds of wide distribution in latitude,* whether migrant or resident, will be found to be larger the higher the latitude of the place of birth, and that there is a certain variation in size dependent on the extreme northern and southern limits of distribution during the breeding season, the more northern individual being the larger, the more southern the smaller. This is precisely what I have noticed with reference to the birds of Europe and Asia. I found the redbreasts, thrushes, blackbirds, etc., of Southern Europe smaller than those of England, and the black partridges and jackals, etc., of the plains of India relatively much smaller than the same animals met with on the temperate regions of the Himalayas. Again, the authority just referred to states that the black and hairy woodpeckers, although neither are migratory, both have a wide distribution in latitude, and that there is a very great difference in size—for example, between specimens from Florida and Canada; and these laws he found

* This authority records the same in connection with the belted kingfisher, a species common to the entire continent, there being a remarkable difference in the size of specimens from the Atlantic and Pacific shores, the eastern being the smaller.—*Am. Journal of Science*, vol. xli.

held good with many of the mammals of the continent, especially the deer and certain squirrels, which are much larger in the north than the south, and in the mountains than in the lowlands. Then as to colouring: Baird also found that birds living in forest countries and on the coast are darker in colouring than those of the interior, owing perhaps to climate, shade, and protection in the one case, and greater exposure to the elements on the other. As far as my experience extends, I have noted in the three continents of the Old World, and in America, that what we call the prismatic colours are far brighter and clearer in birds constantly shaded by foliage than in species which hunt in the open, and that white and bleached colourings attain their intensities in desert living birds. At all events, nothing can exceed the purity and richness of the plumage of many of the migratory and resident birds of the Canadian forest.

We have two examples of the three-toed woodpeckers: one is resident, the BLACK-BANDED arctic species; the other, much less common, and apparently migratory, is the BANDED, THREE-TOED WOODPECKER. The first is distinguished from all its other three-toed allies by having the back entirely black, whilst the latter is readily known by having the back banded transversely with white; both have yellow instead of red patches on the head in the male, but these are wanting in the female. The above are all the resident woodpeckers yet recorded in our forests. Of the migratory species, the well-known "yellow-hammer, or golden wing," (*Colaptes*) is common; it arrives in June, has its young fledged by the middle of August, and is off south again in October. Perhaps one of the most common of all our summer scansorial birds is the pretty YELLOW-BELLIED WOODPECKER (*P. varius, Lin.*), readily recognized by its red crown and throat; the latter is white in the female. The only noticeable difference observed in the specimens I have procured here, as compared with Audubon's descriptions, was in the relative smallness of the scarlet patch

on the crown. I have frequently seen this woodpecker capture insects on wing. The RED-HEADED WOODPECKER (*P. erythrocephalus*) I have seen on wing; it is rare, and perhaps non-resident. Mr. Boardman states to me that any of the above will lay an indefinite number of eggs provided one nest egg is left; and the same we have seen occur with the sparrow-hawk of America, which likewise builds in holes in trees. I have fancied that the darkness prevents their seeing their eggs, and by trusting to touch they keep laying as long as only one egg is felt. Should this be the case, it is probable that the same may happen with other species which lay their eggs in dark places.

CHAPTER VI.

Habits and Haunts of the Ruby-throated Humming-bird—Migratory Movements of Warblers—Swallows and their Migrations—Influence of Forest Clearing on the Habits of Birds—Birds abandoning their Young at the Migratory Season—Waxwings: their Love Gambols—Departure and Arrival of the Crow Blackbird—Loves and Courtships of Birds.

OF all the strangers of the grove, of all the sweet messengers of a Canadian spring, no one species recommends itself to the notice of the student of nature more than the ruby-throated humming-bird. This exquisite little creature, undismayed by the still ungenial weather, and propelled by some secret yearning to seek a temporary home in these wild woods, arrives pretty regularly by the end of May, when the bud is just opening out. Then, like a large moth, it announces its presence at the drawing-room window by the sharp hum of its wings as it flutters around the exotics, placed there to catch the first warm sunshine. I well remember one forenoon, shortly after my arrival in the country, when seated in the garden enjoying the delightful prospect of early spring, that a small green object shot past me, and before I could well direct attention to its movements, another and another, refulgent in glossy hues, were seen fluttering around the currant flowers, now suspended over them—in one instant off—now perched on a twig—then shooting away across the fence into my neighbour's garden: hovering anon around the peach blossom, their red sapphire breasts flashing in the bright sunlight with every movement of their beauteous little forms. Such are my first garden remembrances of the humming-bird. Were I to

dwell on the subject of its wilderness haunts, I might attempt to picture a scene in early June, when the balmy south winds and sweet sylvan landscape tempted me forth with my rod to the alder-fringed brook in search of trout, through the rapidly rising vegetation of the old beaver meadow, among the gorgeously attired orchises, the purple trilliums, the wild yellow lily, and the welcome remembrancer of home the chaste anemone; when the forest resounds with the notes of many a joyous songster, and the twin flower is perfuming the atmosphere;* there, with the busy bee, it may be seen flitting from one favourite flower to another. The constant activity of its movements is surprising, as is also its dogged indifference to man's presence. I have often stood within an arm's length of flowers over which individuals were humming; indeed, in attempts to get at favourite plants it will enter houses and conservatories, and if captured feign death by shutting its eyes and lying motionless, when the inert body will suddenly make a desperate effort to escape.† The clustering flowers of the currant are especially preferred by them, perhaps on account of their being the first garden plant that blooms. At all events, it is around them that we see humming-birds in the greatest abundance; sometimes six or eight may be observed hovering about, the males chasing each other in rival emulation for choice of the females, and greatly to the discomfort of the humble bees that frequent the same plants. On one occasion

* The two-flowered Linæa (*Linæa borealis*), although familiarly known to the Scottish botanist, being met with on the banks of the Dee and elsewhere, is a northern plant, and abounds in Norway and Sweden, where, as in New Brunswick, the sweet fragrant odour of its modest-looking flowers permeates the woods and forests for miles. In thus blooming early it has been likened to the career of the immortal Swedish naturalist whose name it bears, and who first pointed out its characteristics, and "with whom this humble but charming plant was an especial favourite."—See *Gray's Lessons in North American Botany*, p. 163.

† This mode of feigning death reminds one of certain beetles, not to speak of such animals as the jackal of India, which often simulates the stillness of death when captured by hounds.

I witnessed two almost collide; when at first the bee, seemingly unaware who his antagonist might be, was on the point of making off, but hesitated for a moment, when all at once, as if each had discovered its mistake, they shot away in opposite directions.

The geographical distribution and affinities of the ruby-throated humming-bird are interesting, extending as it does from Brazil to the confines of the Arctic region, along the eastern portion of the continent, whilst its very close ally (*T. Alexandri*) occupies the western half: indeed, so closely related are the two birds as regards colouring, that it may be doubtful whether they should be separated. The former is seen in the most secluded forest tracts early in May, and suddenly vanishes by the end of September, thus lagging longer than the swallows and hardier birds. I never found its nest, although I have frequently watched a pair for hours. It builds in gardens and orchards, affecting the same fruit-tree for years, but whether the same birds return to the haunt of the previous year does not appear. However, it undoubtedly has its favourite localities, which are never without individuals, whilst apparently more tempting retreats are passed over,—thus leading to the belief that either the same birds come annually to the spot, or that the locality has some peculiar attractions not observable by us. I do not know that the male and female sit alternately on the eggs; but whether or no, as their upper parts are much of the same dull shade of colouring, they would be inconspicuous when on the nest. An observer says: "The nest is usually placed on the horizontal branch of an apple tree, and covered with moss so as to resemble the place where a limb has been taken off, and a circle of bark has risen round the spot. As the female is green, birds of prey might easily pass over it without discovering the nest below." *

Every one familiar with the climate of Canada, and the haunts of humming-birds, will think in vain why and where-

* Peabody, *Zool. of Mass., Boston*, 1838, p. 341.

fore this species in particular should annually roam so far beyond the region frequented by its compeers. Why does it not content itself with the eternal summer of the south, instead of forming the exception, and hurrying north as soon as the weather will allow, to enjoy a short-lived warm season in Labrador or Newfoundland, where it has scarcely time to rear its young before the time comes for the retrograde movement?

All we can say is that some inherited instinct is at work, perhaps to them as precious as is the longing for the holidays to the schoolboy, full of pleasant reminiscences, which of course would grow by experience; and judging from the mute and inert lives many migratory birds, to my knowledge, do pass in their winter quarters, it may be birds, like human beings, love change.

The sexual instinct has sometimes appeared to me to be either a direct cause or a direct effect of the migratory bird's movements; perhaps in such as lag long in winter quarters it may hasten departure; but, as elsewhere observed, I have found that few birds on the way to their summer retreats show that enlargement of the sexual organs observed during courtship and nidification. On this account I have been disposed to think that the aphrodisiacal tendency is not always the exciting cause, although it may occasionally influence the movements of certain species.*

The WARBLERS which frequent these woods in summer are numerous; and as regards habits, there is little to add that is not common to the majority. I must therefore refer the reader to the list of birds of the region at the termination of this volume. There are a few, however, which I may briefly allude to, more especially with reference to their numbers and geographical distributions. No doubt when the country is more opened out and the forests cleared, and extensive cultivated tracts are formed, many species will increase in numbers. Moreover (as we have seen) many birds formerly confined to the

* "Natural History and Archæology of Lower Nile Valley and Malta," pp. 12, 102, and 106.

forests have taken to the neighbourhood of towns, and perhaps in the not far distant future, when the climate becomes modified by the destruction of forest tracts, certain birds now uncommon will become plentiful, whilst on the other hand indigenous species, dependent on evergreen trees for subsistence, will decrease or go elsewhere. The Nashville warbler, *Sylvia ruficapilla* (Wilson), presents a strange geographical distribution, being seemingly rare everywhere; but, according to Reinhardt, the little creature is met with as far north as Greenland in summer. On the authority of Mr. Boardman, I include in the list the warbler *Sylvia protonotarius*, by no means common north of the Ohio River, and partial, more or less, to the sub-tropical portions of the continent and West Indies. The following, moreover, are common with us, and breed and migrate to the West Indies, viz., the black and white Creeper, the blue Yellow Back, the Maryland Yellow Throat, the Black-throated and Yellow-rumped Warblers, the Chestnut-sided, the Blackburn's, the Blackpoll, the Black and Yellow Cape May, and the Yellow Redpoll Warbler. According to Mr. Baird,* all our thrushes frequent the West Indies in winter. Indeed Cuba seems to furnish no less than sixty species of its winter visitors which breed here, including ten rapacious birds. He accounts for the comparative superiority of numbers in Cuba by the probability that it lies in the route by which most species of the Eastern provinces reach middle America in winter. This high authority on the ornithology of North America has further stated in his admirable and highly suggestive paper, to which I am often referring, that whilst many of the birds of the eastern regions content themselves with the Gulf of Florida and its land latitudes in winter, and pass in small numbers even further southwards, few, perhaps

* "On the Distribution and Migrations of North American Birds," *Am. Journ. of Science*, vol. xli. (1866), p. 18.

none, of the characteristic birds of the middle regions of the continent go as far as the Isthmus of Panama or beyond; moreover, that the migratory birds of the Rocky Mountain region go only a comparatively short distance southward into Mexico, few of them even reaching Guatemala, but preponderating on the west coast." Thus there is a general north and south migration, with little intermixture of the birds of the Pacific and Atlantic coast regions; moreover, Baird, as observed in the last chapter, has noted remarkable disproportions in size between specimens of the same species of both mammals and birds from high and low latitudes, and even from high and low altitudes. This very interesting subject of inquiry he further elucidates in this way: he found among the extensive material in the Smithsonian Institution that specimens of birds from further north than 40° Latitude (taken as an average line of demarcation) were larger than those born in the more southern localities; and this even was the case with indigenous species; moreover, there appeared in the birds of Florida a strange tendency to "absolute increase of the size of the bill, even with diminution in general bulk." This would almost indicate a deterioration of race, such as I have remarked in certain wild animals occupying the torrid plains of India and the same species on the Himalayas. Again, whilst "the Florida birds were found to have larger bills than their more northern brethren, several of the birds of the middle and western regions of North America show an increase in the length of the tail, as compared with the same or allied species in the east." With such illustrations, on the authority of one so competent to observe as the learned Secretary of the Smithsonian Institution, we cannot fail to regard these and like variations in size and proportion of the organisms referred to, as valuable exponents in determining species. Such important inquiries, extending over entire continents, and pursued in a true philosophical spirit, will

most assuredly terminate in the complete overthrow of the doctrines which aim at restricting many closely allied animals and plants to certain regions.

In connection with the probable future extension of the geographical distribution of many birds to New Brunswick, at present either not met with there or only casual stragglers, there can be no doubt that the remarkable changes in the physical aspect of North America since the advent of Europeans have very materially influenced the habits and distribution of many animals and plants. Among other remarkable examples may be noticed the present mode of nesting of the PURPLE MARTIN, CLIFF, BARN, and WHITE-BELLIED SWALLOWS;* also the little CHIMNEY SWIFT (*C. pelasgia*); indeed, in prehistoric times, the same might be said of their European congeners, but the differences in their cases are not so apparent. All the above, in the northern parts of the United States and the Canadian Dominion, generally build their nests about houses in preference to their ancient haunts among rocky cliffs and in holes of trees. The Purple Swallow has now such a predilection for man's society on account of the preponderance of insect life which invariably surrounds him wherever he goes, that he has only to construct a small cot with several chambers, and place it on a pole at the door of any solitary shanty in the wild wilderness, when year after year, with the certainty of the seasons, it will be tenanted by these birds in preference to any other situation. This fine, powerful, and I might say warlike swallow—for indeed it is extremely combative, and well able to hold its own in the struggle for life, being quite a prodigy of valour—makes daring sallies; I have seen the inmates of numerous cots, with extraordinary alacrity, rise from their various residences in a body, and

* I have seen several cream-coloured or albino individuals of the barn swallow, and Mr. Boardman informed me of other specimens, so that the abnormality may not be uncommon.

with that rapidity of flight for which they are famous, fly straight at some unsuspecting sparrow-hawk which happened to pass overhead. The latter, apparently aware of the particular birds that were tormenting him, would increase his flight, as with loud screams they pounced down on him, until he was fairly driven beyond the precincts of the town, when all wheeled about and trooped back to their different stations. It is the same with every bird that comes near the cot; they even attack cats, and hunt away robins and the crow-blackbird, which sometimes establishes itself in the cots before their advent in spring.

The cliff swallow and the last species are said to have been unknown in Eastern America until shortly before the Revolutionary War.* If this assertion be correct, we have a good illustration of the influence of civilization on the geographical distribution of birds. At all events, the above species is common on the seaboard of the province where it breeds, arriving early in May; I did not observe it in central New Brunswick, but Mr. Boardman states that it is a regular summer visitor along the shores of the Bay of Fundy,† but does not remark on its breeding retreats. The former swallow, usurping the towns and settlements, probably drives off the others from its haunts; hence the barn and white-bellied swallows are seldom seen in situations where the former has taken up its abode, whilst the sand martin, as elsewhere, affects the sides of rivers and sandy banks. But the

* With reference to the cliff swallow, Mr. Peabody states: "The first account of its habits was derived from Long's expedition to the Rocky Mountains. Since that time the whole body have commenced a great system of emigration, moving gradually on towards the Atlantic, till now it is become quite common in many parts of New England; its wild practice was to build against the sides of cliffs, but when it comes into civilized life it builds under eaves and cornices where its nest is partially sheltered from the rain."—*Birds of Massachusetts, Reports of the Zoological Survey of the State*, p. 345. Boston, 1838. I think Audubon makes a statement to the same effect.

† See Catalogue, *Proc. Boston Nat. Hist. Soc.*, 1862, p. 125.

little chimney swift (*C. pelasgia*), which in former times was wont to breed in hollow trees, now prefers the flues of chimneys, where colonies frequently collect, selecting of course such as are not in use. This extremely active creature arrives in central New Brunswick about the beginning of May, whilst its hardier relative, the purple swallow, is one of the earliest visitors, and a sure harbinger of spring, even when frosty nights still retard vegetable growth, and the migrations of less adventurous wanderers. The numbers and powerful whirring motions of the wings of the chimney swift when circling over the housetops during the breeding season are very attractive; the males, in chasing each other in their love jealousies, sometimes knock together. I watched a flock one afternoon, when one rash bird dashed furiously against another, which fell to the ground dead, as if it had been shot.

None of the swallow tribe lag much beyond the end of August in the more inland districts, thus barely remaining three months in the country; but as if conscious that their time is precious, they set to work to nidificate immediately on their arrival, whilst such as rear two broods, or find they are late in accomplishing the object of their sojourn, may be seen drilling their offspring in the morning or afternoon in short flights around the church spires and chimney-tops. Then suddenly the thermometer falls to near freezing at night, and on the following morning all have vanished. It is asserted* that the migratory instinct is so powerful that late in the autumn swallows and house martins frequently desert their tender young, leaving them to perish miserably in their nests. Although I have no experience of such instances, yet I can well believe that this is frequently the case with the above species when rearing the second brood; indeed, in the case of the Carolina waxwing, which does not arrive in New Brunswick until well on in June, and leaves early in the fall, I found several nests containing dead young birds after the parents

* See Darwin, "Descent of Man," vol. i., p. 84.

had left. No doubt, therefore, such occurrences are frequent when the cold sets in unusually early. Thus, looking at such migratory birds as the robin and chipping sparrow, which come in early, and are the very last to depart, we may readily suppose that they will increase and multiply quicker, and extend their geographical limits further than such as the waxwing. It is a matter, in fine, of constitution and food; so that provided both are equal to the maintenance of the creature, so is it likely to flourish and rear a healthy and numerous progeny. But these are naturally hardy birds, and feed on fruits and seeds; therefore their braving the climate is not so surprising as the case of such pretty little warblers as *S. æstiva* and *maculosa*, which, of all the insectivorous migrants, arrive the earliest and are the last to depart. These hardy songsters are therefore not only the most numerous, but have extended their range further than their less adventurous allies.

The two WAXWINGS—to wit, the Carolina and Bohemian chatterers—exactly reverse their visits to this region; the former comes in vast flocks in June, whilst the other appears only occasionally in midwinter; it is, in fact, an accidental visitor;* moreover, the latter is a native of boreal regions, whilst the Carolina waxwings belong to more genial climates. According to Swainson,† the chatterers derive their nourishment almost exclusively from vegetable food; and doubtless this is true to a great extent; but I have repeatedly observed the Carolina waxwing, or cedar bird, in June, employed for hours in pursuing insects like flycatchers, more especially in the waste country, where flocks may be seen among the decayed pines, for the reason that the soft berries were not then ripe. The ornaments, like red sealingwax, in both species, are shown off to great advantage by the male cedar bird during the breeding season; then it is a pretty sight to witness him making love,

* Individuals have been obtained as far south as Fort Riley, on the Mississippi. Baird, *Pacific Railway Report*, vol. ix., p. 317.

† Swainson's Birds, *Cabinet Cyclopædia*, vol. ii., p. 71.

with his wings outstretched, as he coquets in a fantastic way round his mate, who may be admiring his gambols, and little red bells, as they tremble with the vibration of the quills. How the Bohemian waxwing received the name of Chatterer I cannot say, for beyond a soft "cheep" I have not heard the cedar bird utter another sound.* As has been noticed in connection with the distribution of plants through birds, dejections the cedar bird no doubt also contributes, as it swallows the choke cherries and other fruits entire; moreover its migrations are rapid, coming in suddenly and departing with rapidity—even, as I have observed in some cases, before its young have left the nest.

The CROW BLACKBIRD (*Q. versicolor*), like the RUSTY BLACKBIRD (*S. ferrugineus*), arrives very regularly as to time; the former, like the swallows, is partial to certain breeding-places, preferring tall pine groves, to which possibly the same birds return year after year. Whether from the effects of climate or the failure of food (I believe the former), it leaves suddenly as soon as the broods are ready for the journey; but as its wings are not well adapted for rapid and continuous flights, it takes its time in going south; hence, as I have often observed, large flocks are seen journeying across the tops of the forest trees in September, flying only short distances, but steadily moving southwards at a slow rate as compared with the sharp-pointed winged birds—to wit, swallows and hawks, which seldom loiter on the way.

* In the Report on the Zoology of Massachusetts for 1838, p. 291, the Rev. W. O. B Peabody describes a rather strange parrot-like habit of thi bird; he says: "They may not unfrequently be seen sitting in a row, when one who has found a favourite morsel of fruit hands it to his next neighbour; he, instead of eating it, passes it on, and thus it goes round, each one declining it with a Parisian nod of his tall cap that is perfectly irresistible." I apprehend most observers have failed to notice this piece of eccentricity; and allowing something like what is stated in the first part to be near the truth, I must doubt the "Parisian nod." Who knows into how many educational works this story, evidently more fanciful than real has been copied?

The well-known YELLOW BIRD, or American Goldfinch (*Chrysomitris tristis*), spends the winter in the New England States; but although it lingers in New Brunswick until all the autumnal seeds, especially the thistles, have fallen, none pluck up courage to brave the cold; but as soon as the snow commences to depart, numbers suddenly appear, even at the beginning of April. This bird illustrates the rapid change in colouring of plumage, inasmuch as the dusky hues of winter disappear before the little creature makes its appearance in New Brunswick; indeed all the males, no matter how soon they arrive, are decked in the beautiful yellow and black garb characteristic of the breeding season. Its ally the pine finch (*C. pinus*), referred to before, being coniferous as regards food, is indigenous to the region.

We have, besides, among our summer arrivals from the south, several species of finches, strong and hardy birds, which, if at all inclined to accept the fare of the pine finch, might, as far as the climate is concerned, stop here during winter. One of these, the PURPLE FINCH (*Fringilla purpurea*), belongs to a genus the majority of the species of which are partial to boreal latitudes, and also the BLUE and ROSE-BREASTED GROSBEAKS might well, as far as constitutional powers are concerned, remain with us throughout the year; but it is clear that the failure of food is the chief and perhaps the sole cause of their departure. The first-named passes the winter in the central regions of the northern continent, pushing far north in spring to breed; its bright red plumage and sweet and varied song recommend it to every intelligent observer. I have often been delighted to witness its gambols during the wooing season, when the gay-coloured male may be seen displaying his attractions before the sombre-clad females on some paling, now fluttering from bough to bough, then hopping along the fence with the feathers of the head and back erected, whilst his bride pursues him, and seems either displeased or is urging him on to parade his beauties for her especial benefit.

Another very common and attractive finch is the BOBOLINK (*Dolichonyx orynivorus*), known in more southern latitudes by the names of reed and rice bird; it seldom makes its appearance with us until the fine weather in June, when its attractive form and numbers bring it to public notice generally. The changes in the plumage of this finch are also peculiar and abrupt. The black breeding attire of the male, with more or less of a buff tinge on the tips of feathers, suddenly changes to the less distinctive garb of the female immediately after the duties of incubation are completed.* It is a pretty sight to observe the bobolink (so called from the call, which, however, is not well expressed by the word) during the breeding time fluttering from branch to branch along the sides of hay-fields, where it makes its nest on the ground.

Another prominent object in similar situations, and one famous for its boldness and familiarity, is the KING-BIRD, or tyrant fly-catcher (*Tyrranus carolinensis*); the peculiar fluttering mode of flying (during which it utters a chattering call) and pertinacity wherewith the tyrant sets to bully almost every animal that approaches its haunts, render it a conspicuous object in our summer landscape. I have seen a red squirrel almost frightened out of its wits by the sallies of this bird, and even cats get perturbated by its rapid and constant stoops and the harsh screams uttered as it sweeps past close to them.

The cries and notes of male mammals, birds, and some insects during the breeding season are evidently more or less intended to make known their presence to the females. The roaring of the stag in the dense forest, and more especially the aggravation of his bellowings when the sounds of a hind fall on his ear, the boisterous chirpings and screams of bachelor birds, are all produced by strong passions directed towards the desire for the possession of the female. The hermit moose, who has spent the winter and summer alone in the wilderness, without perhaps ever coming across a companion

* I have seen an albino of this species.

of his own species, seems to be influenced just as much as the female by the changes in his constitution at the rutting season. The law is general, at all events as regards the vertebrata, and obviously more or less present in lowlier forms. Again, although the vocal and instrumental music of birds is most likely a production of the noises and cries, from long habit, and the excellence of some species over others, it has become hereditary and inherent, so that the bird has recourse to its song whenever it feels happy and comfortable. But there is no accounting for musical taste in animals, and, if it comes to this, even in man, when we think that the harshest and most unmelodious noises may be the very reverse in the estimation of those they are meant to please.

Now with reference to the state of the generative organs at the breeding season, I have found that, as a general rule, the males of any one species show a regular and proportionate enlargement; but exceptions are not unfrequent, which explains instances of unpaired birds, and what often occurs, viz., that when a female or male of a mated pair is killed, the survivor soon obtains another partner. In the case of the chaffinch, bullfinch, and goldfinch, it is not uncommon to see males and females unpaired at the breeding-time. I can therefore well believe, with Mr. Darwin,* that "certain males and females do not succeed during the proper season in exciting each other's love, and consequently do not pair." This, I could imagine, is very common with old birds, just as I noticed with aged bears on the Himalayas,† and is the case also with the tiger, lion, etc., that when the animal gets on in years it generally leads a life of celibacy, and retires from the society of its species.

Mr. Jenner Weir,‡ quoted by Darwin, says "he never sees or hears the note of the wild bullfinch; yet when one

* "Descent of Man," vol. ii., p. 107.

† "Wanderings in India," p. 241; and Mr. Rohan, as we shall see in the sequel, observed the same with water birds in the island of Anticosti.

‡ "Descent of Man," vol ii., p. 105.

of his caged males has died, a wild one, in the course of a few days, has generally come and perched near the widowed female, whose call-note is far from loud."

I don't suppose many amateur bird-catchers have had a more extensive experience in capturing this bird than myself. During my boyish days I was constantly so occupied; and the bullfinch being an especial favourite, I soon became familiar with its habits. As is well known, it seems not unfrequently to pair for life; and not rarely, indeed, a male and female, or two or more of one sex, may be observed continually together.

I have captured them at all seasons, and often taken a male close to his nest by means of a female decoy. The call note is not often heard in the wild state, for the reason that the pair usually keep close together; but when either get separated or a stray bird happens to be calling close by, I have seen a male and female desert their nest to look at the new comer. I do not agree with Mr. Weir that the call-note of the female is "far from loud;" on the contrary, when she chooses to exert her lungs, although not quite so clear as that of the male, her whistle is equally strong. I have, moreover, captured the male siskin by means of another, when the former had its nest and eggs in the neighbouring tree. As regards starlings, sparrows, and the like, which breed in societies, there are, no doubt, numbers of bachelors and old maids who do not pair, or who are late in becoming excited by the sexual passion, and therefore ready to fill up a casualty.

Finally, with reference to the long courtship of the birds of mid-Europe. As we have seen, it contrasts with the short love-making of the migratory species in North-eastern America, and in consequence there might likely be more instances of unmated individuals among the former, for the reason that the passions are gradually developed, whereas in the latter they suddenly spring into full vigour.

CHAPTER VII.

Discomforts of Sleighing during Thaws—Effects of unusually Cold Seasons on Winter Migratory Birds—Winter Breeding Birds—Crossbills and their Varieties of Plumage—Possible Causes of the Crossing of the Mandibles and Bending of the Beaks of certain Birds—Deformed Beaks of Birds—Habits and Modes of Nesting of the White-winged Crossbill—The Pine Bullfinch—Redpoll—Snow Bunting—Snow Bird—Familiarity of Forest-loving Birds—Partridges and their unsuspicious Ways—Partridge Shooting—Dogs trained to Point at Partridges in Trees.

I WAS in the habit of making regular excursions to the wilderness in early spring, for the purpose of studying the habits and modes of nesting of the earliest breeding birds, such as the crossbills and others. The difficulties, however, of sleighing at this season, especially in the bye-roads and more unfrequented thoroughfares, are occasionally so great that few residents attempt long journeys until the greater portion of the snow has melted. A heavy fall at the beginning of March, 1868, added to what remained, gave an average of five feet, so that a sudden thaw would, as a matter of course, render the roads all but impassable for horses. Unfortunately, when I then started, on the 16th of the month, a south-east wind gave indication of a thaw; hoping, however, that the thermometer would fall at night, I loaded the sleigh, and with a guide set off for the village of Stanley, distant some twenty-five miles. My companion, although experienced in travelling, was as little aware as myself of the difficulties before us. For the first few miles things went on smoothly enough; the pathway had been well beaten by teams, so that horse and sleigh swept along without hindrance. However, the soft

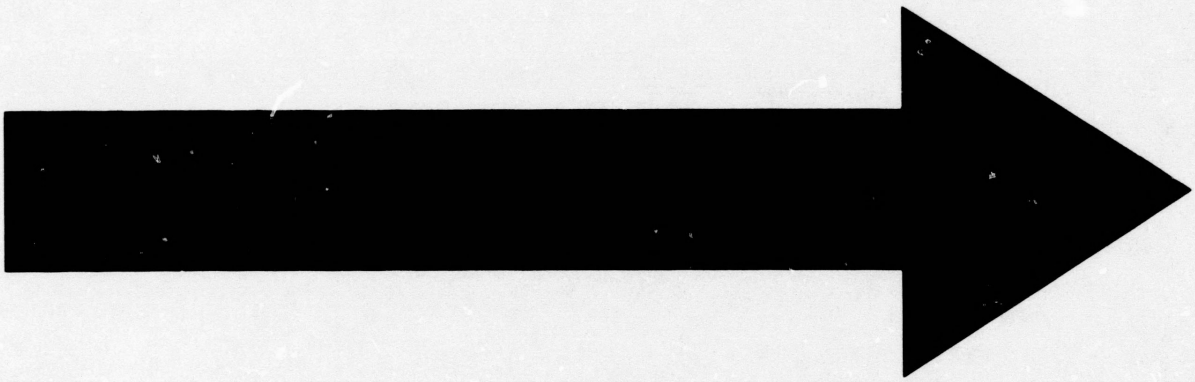
south-easter in our faces getting stronger every hour proclaimed an unusual thaw, and when we got into the less frequented districts, there were indications of impending trouble given by the horse now and then sinking to her knees, and an occasional plunge threatening the safety of the trams; but my companion not showing any symptoms of disquietude, I continued goading on the animal. Indeed, the dogged indifference of friend "Malcolm" was amusing. Like his countrymen, he had imbibed the usual slang expressions of the Yankee, and freely interlarded his conversation with the true nasal "I guess," or the decided negative of "Nū Sūr." His exclamations were invariably "O my!" with which he interrupted every stage of conversational narrative, no matter what might be the nature of the subject. Indeed, by eliminating these repetitions from his sentences, there was little left, and when by dint of hard pressure I could start him on some episode of his forest life, what between these and the countless "says he," "says she," or "says I" interlarding the story, I often thought we should never get to the finale. Then the imperturbable stoicism of the narrator, not a muscle of whose face betrayed the slightest emotion in spite of all these superfluous utterances, not even when rehearsing the history of his amputated finger, which was as follows. "I guess you think this here finger of mine was chopped off by an axe; but no, it was a horse that done it. I was giving him a drink, when he caught my middle finger and carried it right away, and giving it a chew dropped it in the manger. I thought that bad enouf," added Malcolm, "but not content with nipping off my finger, he gave me a kick behind and sent me flying out of the stable door." Just as the worthy woodsman was about to end his tale, the horse, who had been sinking now and then, gave a sudden stagger, and before she could recover herself went down on all fours up to the belly, and every few minutes subsequently showed that further progress would be tedious, to say the least, on account of the rapidly increasing thaw.

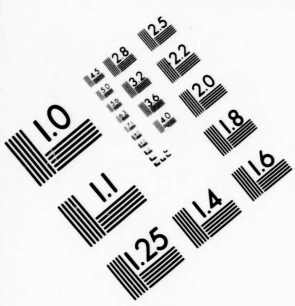
By midday we reached a small wayside inn, within about six miles of Stanley village. Here, whilst the horse was being fed and our dinners prepared, I amused myself watching flocks of white-winged crossbills, pine siskins, and redpolls crowding on the dung-heaps and around the door, the male birds all in perfect plume, and singing sweetly on the trees around,—the brilliancy of the red of the males of the former contrasting with the white landscape as they coquetted around the females, showing off the white beauty-spots on their wings, which they half expanded as they strutted from side to side, while the pretty little redpolls, with their hoods erect, gamboled in the bright sunshine around their mates, who, like the others, did not seem in any way moved by their love-makings. No doubt, however, the love season was commencing, as here and there, among the hundreds assembled around the house, I could mark pairs which came together and went off again to the forest; the majority, however, had not made their choice of partners, and were evidently only meditating matrimony. The blue and Canada jays were also about: the former as shy and wary as the other is tame and familiar, for reasons elsewhere observed.

The remainder of the day's journey commenced as it ended, under most discouraging circumstances; indeed no sooner did the horse attempt to mount a steep bank behind the inn than she sank shoulder-deep, and we had scarcely gained the top of the ridge, when, meeting a traveller returning from Stanley, we were informed that the road was absolutely impracticable, and judging from the wearied aspect of the man, and bleeding fetlocks of his horse, there could be no doubt we were about to face difficulties of no ordinary description. But resolved to try, I loosened the reins, and dismounting, left the horse to pick her way along the all but trackless forest road, whilst we pushed the sleigh behind, and jogged along as best we could. In vain the traveller, who as I ascertained subsequently was the Methodist clergyman of the district,

advised us to return, and even after we had fairly turned our backs on him, exclaimed, "You will both remember me and my advice should we meet again!" yet Malcolm, *sotto voce*, in his quiet drawling way, "guessed he had been out in worse weather," and, encouraged by his indifference, I allowed the team to proceed; so onward we staggered, horse and man floundering and sinking at every step. At times the horse rolled over on its side, or both fore-legs sinking simultaneously, sent its nose into the snow; now the hind quarters disappeared, when the animal assumed the appearance of a giraffe. Still onward we crawled, making very slow progress, but not yet altogether brought to a standstill, until we got clear of the forest where the road led across an open, over which the snow had drifted to the depth of six or eight feet. Here matters became desperate, as finally, with a tremendous plunge, down went the poor animal, until nothing was seen except its back and head, when there was no alternative but to dig her out. Accustomed, however, to such *contretemps*, instead of struggling, as most horses would do, the poor patient brute resigned itself to fate, and waited patiently until we had cleared away sufficient snow to enable her to regain her legs; no sooner was this done than another step, and a repetition of the immersion, proved that our journey was at an end for that day at all events. Matters had indeed become critical: the sun was on the horizon, we were several miles from the village, and there were no signs of a human habitation, while my horse lay shivering in the snow! But not even these untoward events shook the imperturbable coolness of the guide, for he lighted his pipe, and not till then did he utter a single word, when, after a deep whiff, came a suggestion to the effect that if the horse could be got under cover there would be no difficulty in making up beds for ourselves in the sleigh among the bear-skins. Indeed his conclusion seemed inevitable. All around was a vast mantle of snow, with only the tops of snake fences visible here and there; but just toward the edge of the forest there appeared a small puff

of smoke, to which I hastened, to find a hut almost buried in a bank of snow, containing an old Irishman, with his wife and an idiot girl, huddling round a log fire. Having told my tale of trouble, the good Samaritans tendered a share of their humble cabin to man and beast, so that in the course of two hours' hard work, both horse and sleigh were dragged to the little cabin, where we spent the night on the floor by the fireside, whilst the horse was domiciled with the pig, cow, and poultry in an adjoining outhouse. Dead-beat, we fell asleep directly after supper, but were awakened at midnight by loud sounds. These were found to be caused by the lunatic daughter, who, excited by our appearance, would not settle down, and had kept making uncouth noises within the little bunk in which she was imprisoned. In vain her parents suggested all manner of punishments if she did not at once cease her incoherences, when at length she succumbed, but only when threatened with decapitation at our hands. The result was that she repaired on the following morning to the cow-shed, and nothing would induce the poor girl to come indoors until we had gone. I had a long talk with her parents, both of whom had left Cork forty-five years before, and settled in the centre of this forest, where they had made the little clearing, and managed to rear a family of several sons and the idiot. However, "the boys," as they called them, had gone to the United States, so that the man and his better-half were left in their old age to struggle as best they could, with the additional infliction of a helpless child, and a climate particularly trying to old people. Indeed their story was much like that of many others in this land, more especially such as settle down in districts at a distance from towns and markets. As long as the parents can work, and their sons and daughters condescend to remain under the paternal roof, there will be a sufficiency to keep soul and body together; but when health fails or old age comes, and the boys find out they can do better elsewhere, then comes back the old struggle for exist-





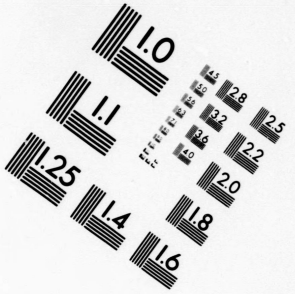
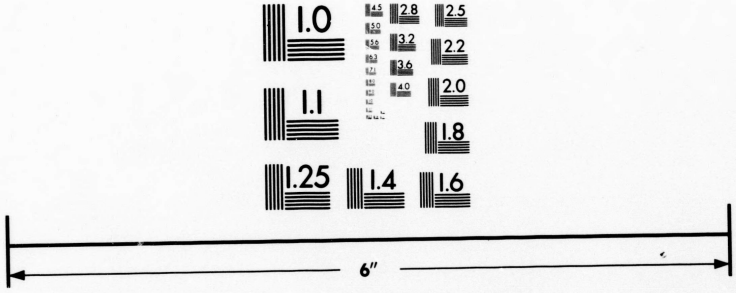
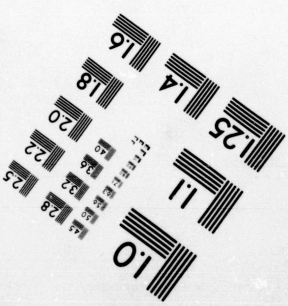
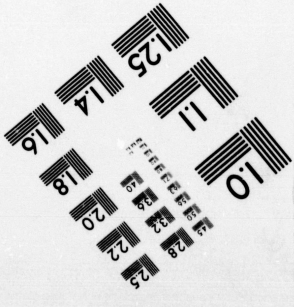


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ence, which had been manfully met in early life, but cannot now be maintained.

Day dawned, and still the thaw continued; moreover, as I gazed across the open there appeared another sleigh and party occupying the place where we had come to grief. We had been the cause of their troubles, inasmuch as having learned at the inn of our departure, they followed our tracks to experience the same disaster and a night's bivouac on the snow. By dint of much hard work we managed to work our way back to the wayside inn, when the wind chopped round to the north, and before the following morning the roads were perfectly passable, and the surface hard and frozen.

In the above valley flows the Nashwauk, a tributary of the St. John, and once famous for its salmon, as will be further noticed in the sequel. Along this river's banks snow had drifted more than on level tracts, thus forming huge loosely packed mounds. On the morning after our return to the inn, as I strolled on snow shoes over the hard glazed crust, and was ascending one of these mounds, I became somewhat startled at first by the sudden cracking of the surface crust in the form of long rents, extending for several hundred feet, followed by hollow rumbling noises like reports of muffled guns, caused by the fracture of the crisp surface sounding along the loose substratum. Sometimes an enormous mass would rend in two, and sink several inches, conveying a feeling that one was likely to be suddenly engulfed in some internal chasm.

During the memorable winter of 1867-8 (one of the coldest experienced in New Brunswick for nearly half a century), there was an inordinate number of crossbills, pine bullfinches, pine siskins, and redpolls, common winter birds, but evidently rendered more so on this occasion by additional arrivals from more northern regions, and a general collecting of each species into large flocks. Being very desirous of

obtaining the nest and eggs of the WHITE-WINGED CROSSBILL and PINE FINCH, which breed in midwinter, I paid a visit to a forest much frequented by these birds, in January, 1868, during very cold weather.* Here were large flocks of the former, either about the lumber camps or the settlements; but although I bestowed much time, I could not make out that there was a general nidification going on. However, about the middle of the month, I was fortunate enough to obtain a nest and three eggs, and another was brought to me some weeks previously. As the nest and eggs of this crossbill are rare in collections, I may state that it is made of the black moss called the "old man's beard," which hangs in long and graceful tresses from the branches of many trees, furnishing, as we have seen, a staple article of food of the reindeer. This is interwoven with birch bark and twigs, and the interior is lined with wool or soft moss. It is usually placed in the fork, although sometimes in the hole of a tree. The egg is bluish-white, with red streaks on the larger end. At one lumber camp in the wilderness I took no less than thirty crossbills in the course of an hour with hair nooses, and a snow shoe placed after the schoolboy's method of capturing birds with a sieve. There appeared a large preponderance of immature plumaged and adult males over the females, which, however, were numerous, and one of which laid an egg in the cage soon after capture The immature plumaged or former year's bird showed the same enlarged genital organ as the adult; thus demonstrating the fact that, like other species, it breeds before the full costume is gained. No pairing was noticed, possibly from the circumstance that the flock represented birds off duty, their partners being on the nests; for when we think of the lowness of the temperature at the time, it would surely be certain death to

* The mean daily temperature for the month was 12° Faht. On two days only did the glass rise to 34°—the lowest being 14°, and for twelve days the readings were below zero; but this was not the coldest month, December, 1867, being very much more severe.

the young, and destruction of the vitality of the egg, to leave them exposed for any length of time.

The various shades of plumage in this and other crossbills are demonstrably the result of age; the red of the adult male not being attained until the third year. The great diversities in colouring, from the olive-green of the young male—like that of the female—to the various red and yellow combinations of the adolescent bird, are perhaps connected in some way with imperfect and gradual moultings. Now, when the rigorous climates it frequents are considered, we might expect that a complete moulting would be attended, in autumn, with some risks to the bird, and probably it is on this account that the above and other species do not obey the general law; and as to breeding in winter, if it be the case that the majority is then composed of birds from higher latitudes, the well-known fact that many other migratory birds breed in their winter retreats makes the case of the crossbills and pine bullfinches not a singular one. This, however, leaves the cause of the intermediate coloured plumage totally unexplained, unless it be the case that accidental varieties are more likely to take place in birds that are slowly and constantly dropping their feathers and obtaining fresh ones; but why at length an uniform robe should be attained does not appear, unless the former variations are relics of long-lost colourings of some bird member of the genus *Curvirostra*. The white-winged crossbill of Europe differs, it is said, from this only in respect of the bill, which is said to be rather stouter than that of the other, which is remarkably slender and compressed, more especially as compared with its compeer the American crossbill. The latter is also a resident, but whether a winter breeder or not I cannot discover; at all events it has one brood in the spring, as I have frequently seen fledglings in July, long after the second brood of the other had dispersed. Both are very hardy birds, and usually assemble in flocks; but I have not seen the two together, and the last-named rarely in

winter. It is apparently also less carnivorous than the white-winged crossbill; whose sharp, narrow, and falcated bill is better adapted for slipping between the imbricated scales of the red spruce and other cones. I have repeatedly noticed that they extract the seed by a twist, like a dentist extracting a molar, just in such a way as to cause the forceps to cross its blades. Now as the young have the mandibles even, and as the direction of the tips in the old birds is sometimes to the right and sometimes to the left, one might speculate on a far-back time when some progenitor discovered, in its struggle for existence in the pine forest in winter, that the seeds of the cones were to be got at, and when in its attempts to get at them the bill, which is not so strong and conical as that of the pine bullfinch, became curved, until at length the condition became hereditary and transmissible. Indeed, this hypothetical mode of reasoning does not stop at the crossbills; for, looking to the digging habits of, for example, the curlew and ibis, and the dredging way of feeding of the flamingo, the poking under stones of the avoset, godwit, and numerous other birds with bent and distorted bills of slender make, we might with as much plausibility attribute the present outline of the bill in them to habits long practised.

Looking at a few pointed instances in connection with the birds of this province, I might cite the long-billed curlew, common to the entire temperate region of the Continent, but here only an *en passant* visitor on its way north and south at the usual times. This bird, and, I might add, its European congener the slender-billed curlew, are subject to much diversity in regard to the bill. As regards the former species, Mr. Baird found* that scarcely two specimens shared the same length and dimensions of the bill. Another widely distributed water bird, the sanderling, the habits and haunts of which are well known, shows also much diversity in size of body and length of bill. The ring plover (*E. semi-*

* *Op. cit.*, p. 728.

palmatus), besides the webbing of the feet, by which it is alone distinguished from *E. hiaticula*, and thus interesting from being an adjunct to the bird in the way of swimming as well as wading, has also been probably acquired through natural selection. Now this species has likewise a very wide distribution, and is very abundant, and, according to the excellent authority just quoted * there is much discrepancy in the length of bills in individuals, even to the extent that the student, meeting only with the two extremes, would deem it impossible that they should be specifically identical. I might cite numerous other pertinent examples—to wit, the LITTLE WILLET (*T. Wilsonii*), the RED-BACKED SANDPIPER, etc., etc. But to return to the crossbills. We frequently meet with analogous deformities in other birds—for example, the rook and the carrion crow seem especially subject to such states. In one instance I found the mandibles more slender than is natural; and probably this defect was the cause of the distortion, which was evidently a serious incumbrance to the bird when feeding, for whereas the usual length of the bill is two inches and a half, in the above the upper mandible was three inches and a half along the curve, and the lower four inches. It is clear, therefore, that this conformation entirely precluded the possibility of the individual obtaining subsistence in the usual manner; it must have, therefore, used the upper blade like a pickaxe; but the bristles on the nostrils and base of the bill were extensively denuded, like that of old rooks, as has been alleged by inserting the bill deep in soil, which must have been next to an impossibility in this case. Therefore, unless the denudation took place prior to the deformity, it is utterly impossible that it could have occurred afterwards.

The point, however, we are most concerned about at present is the attempt to interpret the probable cause of the deformity, having seen the disadvantage it would be to the bird in its struggle for existence. Among quadrupeds the well-known

* *Op. cit.*, p. 725.

case of the incisor teeth of rodents might be quoted, where the plane of contact between the upper and lower is deflected, so that the teeth, growing, as they do, by additions from behind, often protrude, and grow upwards or downwards, as the case may be, to an indefinite extent, and often cause the death of the animal by starvation. In the case of a bird, we may suppose a similar accident occurring in a young individual, the bill of which happens not to be so stout as usual, and from some twist in digging has been displaced, so that the tips are not in apposition, and would accordingly go on growing in the same way until the deformity, as above, resulted. Now, although to a granivorous animal such a condition would be decidedly injurious, in the case of the conical-shaped bill of the cone-feeding crossbill, the sharp cutting and falcated edges would be just the opposite, for they would scoop out the seed of a cone more effectually than a slender straight beak, from which we might conclude, on the principle of natural selection, that no better accident could have occurred to the finch, and scarcely a worse one to the crow, who subsists more or less by picking up substances on the surface.

The crossbill makes use of the hooks to assist it in moving along the sides of the cage, where it crawls like a parrot; it has also another similar habit, that of picking up cones with its feet and carrying them to a branch, where, hawk-like, it holds them in its talons and dissects them from top to bottom. Nevertheless, in winter, all the pine-feeding birds seem willingly to abandon their fir-cones for the refuse of the lumber camp or the dunghill, and the buds of early spring.

At the end of March, when the sunny days invite us forth, flocks of crossbills, redpolls, and pine siskins may be seen on the firs, spruces, and larch trees, singing sweetly, whilst the females and young of the year are feeding on the cones. Shortly afterwards the males disappear, and throughout the summer we only meet with small flocks, which would lead to the belief that the majority go to more northern regions.

The tameness of forest birds is not confined to winter, and times when there is a difficulty of procuring food, for in the crossbills I found them equally fearless in midsummer; indeed, in the solitudes of the primeval forest, and where animals have been little disturbed, we find its denizens, like the wild fowl on Enoch Arden's island, "so wild that they are tame."

The loud canary-like note of the white-winged crossbill is seldom uttered in captivity, and is replaced more or less by a low, sweet, warbling measure, evidently a love song, like that of the thrushes referred to in the last chapter. Of the many cage-birds I have kept, none seemed to take to confinement more readily than this finch, the creature being quite as indifferent a few minutes after capture as if had been born in confinement; indeed, fear of man seemed quite unknown to them. It must be stated, however, that the individuals referred to were captured in a forest remote from human habitations, and probably had never been molested. It is remarkable, moreover, to observe how fear is developed among wilderness animals; not, however, by man's presence alone, so much as by the noise of fire-arms; hence, in the savage times of stone and bronze, many of the larger mammals are likely to have long retained their primordial indifference of him.

The Pine Bullfinch (*L. enucleator*) is said to differ from the European bird of the same name only in being larger, the wing of the former, according to Baird,* being 4·76 inches, but that of several adult males and females procured by me in the New Brunswick forests did not exceed 4·40 inches, thus conforming to the size of the Old World specimens. Although many are resident, like the last, the majority arrive in September from the northern regions, returning in spring. I noticed a great preponderance of females in winter; and although the young of the year resemble the latter, and do not attain the beautiful red plumage of the male until the second year, among very

* "Pacific Railway Report," p. 410.

many specimens procured at all seasons, I have never been enabled to meet with a young bird. It is said to breed in the region, but I am not aware of its nest having been found. Another winter resident met with in very small numbers in summer is the PINE SISKIN (*C. pinus*); it breeds early, and has its young flying before the first summer migrants arrive in April, when large flocks may be observed feeding on the buds of the hawthorn preparatory to their departure northwards. It is very closely allied in habits to the well-known siskin of Europe, with a song more melodious, thus becoming a very choice cage-bird, and is easily tamed. I set several at liberty after a confinement of a few months, when, to my astonishment, all returned to their cages after an absence of several days in the neighbouring woods.

Another European winter visitor, the REDPOLL (*A. linaria*), arrives in New Brunswick, in large numbers, at the commencement of winter, and suddenly vanishes with the snow in spring. I could not find out its nest. Soon after its appearance the male puts on the breeding plumage, the crimson first appearing on the cheeks, then extending downwards. I doubt, however, if it is a condition in connexion with the pairing, being in this instance present in the males of large flocks of both sexes, throughout the winter. There is much variety in the extent and brilliancy of the crimson and the size and thickness of the bill, just as I found with the linnet affecting Tibet and Tartary,* some males rivalling all the others in the amount of gaudiness of their attire. Thus it would appear that there are favoured individuals; and no doubt, as I have noticed in regard to other birds, such as the trumpeter bullfinch,† the finest plumaged males are most assiduous in their attentions to the females, and are most likely to be preferred by them. Many of the most brilliantly coloured individuals captured in February from flocks, after

* "Wanderings," p. 284.

† "Natural History of Nile Valley and Malta," p. 17.

being caged for a few weeks, and fed on hemp and canary seed, rapidly lost the crimson shadings; indeed, such is the case generally, and especially with linnets, who seldom regain their markings in captivity.

The SNOW BUNTING (*P. nivalis*) puts in an appearance in September, sometimes in larger numbers than at others, and with the Lapland larkspur (only a few of which, however, sojourn in the region during winter) disappears early in spring. The common BLUE or SNOW BIRD (*F. hyemalis*) comes in early in spring, the majority departing to regions south of the States of New England in autumn. A few, however, spend the winter in the more genial climate of the interior of the forest, about logging camps, in company with the above finches. Here again, as I have had frequently to point out, is another example of a bird very numerous and gregarious, subject to albinism and piebald varieties, of which I have seen several examples. Moreover, this is one of many birds, including the migratory thrush, that would doubtless brave the winter climate were food more easily procured.

These winter songsters hold precedence as to numbers, as follows: the crossbill, pine bullfinch, pine siskin, and redpoll. Their sweet voices and beautiful forms recall to my recollection many characteristic winter scenes of blessed memory. To the solitary hunter or trapper in his hastily built shanty, they are often the only objects that break the stillness of his dreary solitude. Crowding around the lumberer's camp, they relieve the monotony by their enlivening chants and cheerful ways; indeed, to the cook they are his only companions all the dismal winter day, when his comrades have gone forth to fell trees; now crowding on the refuse heaps, or around the slop-pails, and on the door-sill, picking up particles of bread, pork, or sugar, and, as before stated, preferring the salted substances to all others. Again, the forest ranger in quest of these little outposts of civilization, with no object to guide him over the wilderness, rests

his aching limbs after the heavy tramp on snow shoes now and then for a few minutes to listen for the sound of the axe or the notes of these birds, knowing full well that one or other will bring him to the camp; and the Indian, when he has slain his moose and cut it up into convenient portions capable of being easily transported on a hand-sleigh, has scarcely well begun to flay his quarry before the cheuckish-mink (the crossbill) and the umkenewee-cis (moose bird) gather round him. Whether it be that feeding on such dainty food as the hunter and woodsman afford them, they grow to eschew the dry cones in winter altogether, it is a fact that after a heavy fall of snow, when their usual feeding spots around the camp are covered over, they repair to the door in flocks, and become so tame that I have then actually fed them from my hand. Pine cones and the dried seeds of such trees as the alder are all the forest affords in midwinter, so that it is not improbable that this decided change of feeding has produced or is producing changes in the organism of the species; at all events, we must allow that the camp feeding life is a very decided change from that enjoyed by these birds when these boundless forests were all their own. The desire for animal food so conspicuous in the Canada jay or moose bird, may in the absence of lumber camps in summer have led to its king-fisher habit before noticed. It is strange how such herbivorous birds as thrushes, etc., reared on flesh, get so fond of it that they prefer animal to their natural food, and how salt, usually fatal to such birds as hawks, should be especially liked by the finches of the wilderness.*

No doubt many animals have become extinct from being unable to struggle against their foes. This I believe will be the

* The caged individuals of the white-winged crossbills, although always preferring hemp-seed to fir-cones, were fond of taking them up to their perches; and I have seen individuals in spring, after feeding on the tender buds of the larch, betake to the withered catkins, perhaps as much for variety as anything else.

case sooner or later with the partridges of this region, and that at no very distant period, for more stupid birds than the RUFFED or BIRCH PARTRIDGE and the CANADA GROUSE in their native wilds do not exist. The early settlers knocked them down with sticks; indeed I have seen a whole brood exterminated in this way, and remember traversing a swamp in a wood close to Fredericton, when four of the latter flew into the pine trees and I shot one, to find the rest gazing on perfectly indifferent, waiting their turn until I re-loaded and despatched them in succession. Numbers of the ruffed grouse perish during rigorous winters. Its general habit of diving head-foremost into the snow and forming a burrow, where it passes the night, is well known; but it may so happen that a sudden thaw taking place overnight, is followed by a rapid frost, when the surface gets hardened, and the bird is unable to force its way out; the result is that nearly all the partridges are smothered, and in spring their bodies may be seen strewing the forest in every direction. The Canada grouse, which is feathered to the toes, and altogether a hardier bird, does not seemingly resort to this practice in winter. As if desirous of putting off the spruce and pine-top diet as long as possible, both species may be seen scraping the snow up to the last moment in quest of anything green in the shape of grass, or devouring berries of whatever tree they come across, mountain laurel included; and as many persons have fallen sick immediately after partaking of their flesh at this season, it is probable the poisonous qualities of the plant may have been transmitted. Again, like the hare, when they have fed on the pine tops for a week or two, their flesh becomes so highly tainted by turpentine as to be scarcely palatable.

With all the defects in intelligence displayed by the Canadian partridges, the Birch has advantages in its colour assimilating to that of surrounding objects. I have often flushed covies into trees, and searched for a length of time, and after all failed to discern their presence, until the rustle of their

wings on departure showed that I must have been looking at them. These birds evidently, like many Himalayan pheasants, feel that by flying to a tree they escape immediate danger, and can look down on their pursuers with indifference; indeed until the use of fire-arms they had little to fear in the dense woods and forests except from their four-footed foes; moreover their statue-like posture, with neck outstretched, and their motionless position on the moss-clad spruce bough, render it extremely difficult to recognize them.

Although partridge-shooting in Canada is ignoble sport, the gastronomic quality of the flesh of the birch partridge in particular is of high character, and coupled with the exhilarating exercise, tempts many an orthodox sportsman to deviate from the established canon of his craft and take to "*potting*," even at such close quarters that he is obliged to blow the bird's head off in order to save the carcase from utter destruction. In September and October, as soon as the broods of the year are able to fly, they repair to the dank parts of the forest, alder swamps, or lumber paths, where they delight to scrape and sun themselves at midday. At this season the sportsman may make a large bag, but he must possess a well trained dog, which, as far as outward appearance goes, may be the greatest cur in existence provided it has been taught to put up the birds and stand barking at the foot of the tree until its owner can manage to push through the thicket and mark the partridge, standing usually on one of the lower branches with outstretched neck gazing down in astonishment—just such a mark as Mr. Briggs would never have missed! Some of these mongrel dogs display, however, remarkably good training. Their tuition is accomplished in this way: a cord attached to the leg of a dead partridge is passed over the branch of a tree, and as the dog draws on the bird it is gradually pulled along the ground and then suddenly swung up to the branch. I am told that an intelligent mongrel will become a proficient after a few lessons. On one occasion at

which I was present, a very degenerate and diminutive representative of the genus raised a covey of birch partridges in thick cover, but when we came to inspect the trees not a bird was to be seen, and we were on the point of departure when the dog became much excited and set to barking furiously under a large maple. In vain we looked, for no partridge was to be seen; still the dog barked, and began to bite and tear off the bark, when at length three birds were discovered standing motionless on the moss-covered boughs, and within a few yards of us. The owner informed me that whenever the creature lost patience, and took to biting objects around a tree, it was a sure sign that there were birds on the branches, and that he seldom left the lumber and logging paths in search of them until he heard the bark.

CHAPTER VIII.

Directions and Causes of the Migrations of the Birds of Boreal America, and Laws bearing on Variation of Species—Ducks Building in Trees—Abnormal Habits of Animals—Celibacy among Birds—Strange Habits of the Great Northern Diver—Attachment to its Young—A Loon Hunt—Reptiles—Turtles—Snakes—Frogs—Tritons.

ALTHOUGH for the last half century naturalists have directed their attention to the study of the birds of the New World, it is only of late years that zoological geography in general has been prosecuted with the amount of care and research its importance deserves. In America, Wilson and Audubon paved the way towards an accurate knowledge of the species, and subsequent observers added to the rich stores accumulated by them. When Prince Charles Lucien Bonaparte published his geographical list of the birds of Europe and Northern America, in 1838, he computed the number of species of North American birds at 471, whilst the latest census, made by Professor Baird,* raises the number to about 680, exclusive of species common to the Old and New Worlds. Since the latter list was published, many new species have been added; for whilst the birds of the United States, and the eastern portion of the Canadian dominion, are now well known, those of the Pacific side of the continent, Mexico, and the Arctic Regions have not been fully determined.

Turning to our chief subjects of inquiry, it must be apparent that an accurate knowledge of the ornithology of the neighbouring countries is requisite in determining the distribution and migrations of the birds of New Brunswick; accordingly,

* "Report on the Birds of the United States," *Pacific Railway Report.*

we shall have to refer to that of Greenland on the north-east, and to the imperfect data in connection with the birds of north-eastern Asia on the one side, and South America on the other. Thus it is apparent that, as regards North America, we are at present only enabled to determine with approximate precision the laws which, in the case of the birds of Europe, have long been clearly defined. It is a fact generally accepted by naturalists that about 60 species of birds are common to the northern continents of the New and Old Worlds; thus, by eliminating these we find there are about 444 species peculiar to Europe, and no less than 680 strictly North American birds. As regards the other continents above-mentioned, it is unnecessary, for the illustration of our subject, to draw comparisons. It is apparent, therefore, as far as North America and Europe are concerned, that their birds differ considerably; and indeed the same may be said of their natural objects generally.

With reference to the geographical distribution and migrations of the birds of North America, it was found by Professor Baird* that the general principles in regard to these points were demonstrable from a consideration of the climate and physical characters of the continent; accordingly, he divides North America into two grand ornithological (nay, zoological as regards the class vertebrata) regions,—viz., the eastern, or Atlantic; and the western, or Pacific. Referring to the accompanying sketch map, the eastern division extends from the Atlantic seaboard, westward across the Alleghanies and over the valley of the Mississippi and its fertile prairies, to about the 100° of longitude, or to the beginning of the sterile plains.

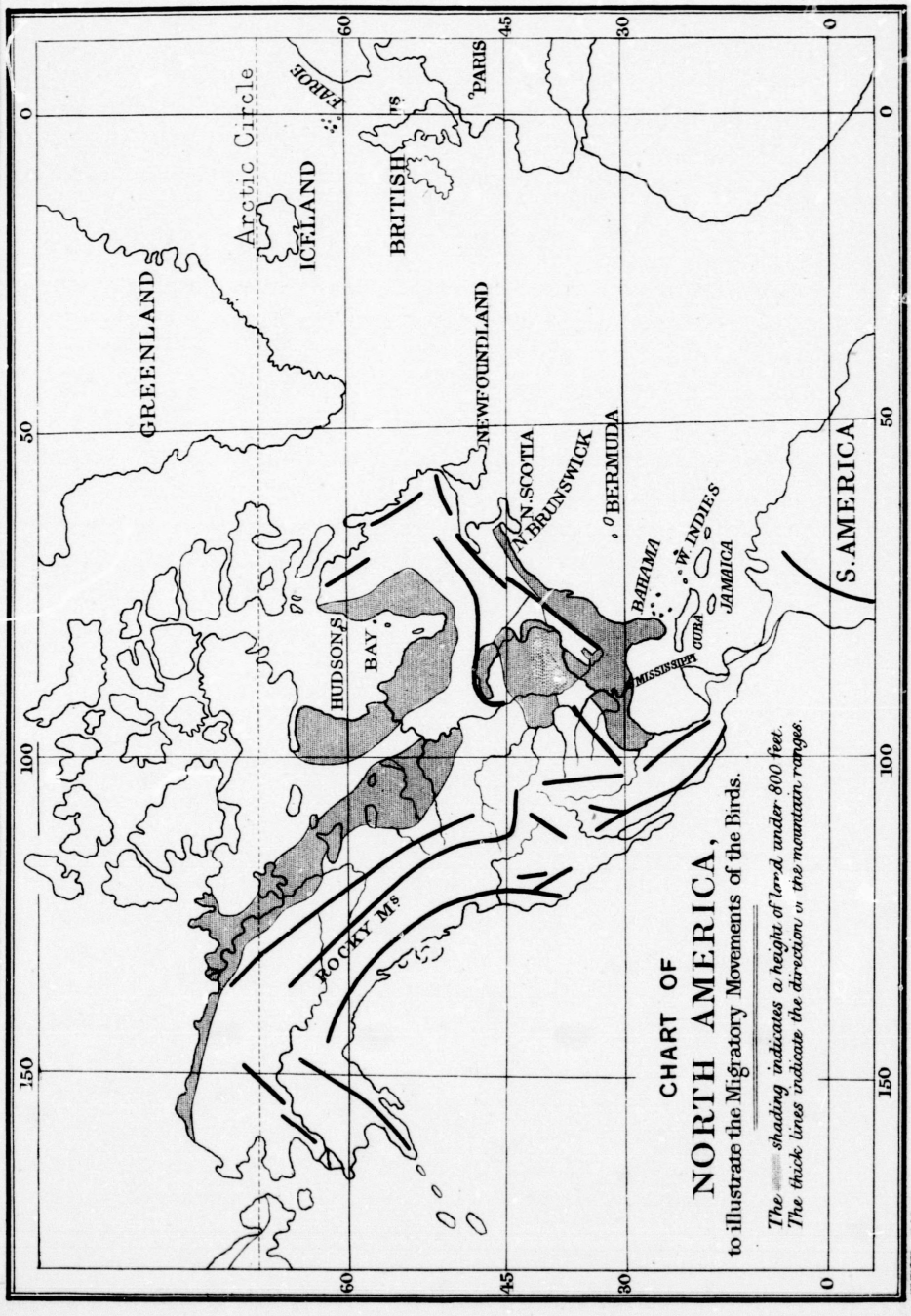
The western division begins at the western border of the eastern, or along the sterile plains of the trans-Mississippi country, and extends across to the Pacific Ocean. These are better defined, on the chart where the part shaded repre-

* "American Journal of Science," vol. xli.

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sents regions not exceeding 800 feet above the level of the sea, and its western margin the limits of the eastern region. Thus it will be observed that the northern boundary of the western division turns westward at the mouth of the Mackenzie River along the shores of the Arctic Sea. Now as to the general directions of bird migrations, they are in all continents, from north to south, along shore lines, valleys, and mountain chains. A glance, however, at the maps of Europe and America will suffice to show the advantages possessed by the New World in these respects, chiefly in its rivers, mountain ranges, and depressed lands trending in the direction of the routes of the bird wanderers, whereas the Alps and Mediterranean Sea appear to present obstacles to the birds of passage on their way to and from Africa and Northern Europe; but whilst not very much influencing their movements, there can be no question that they stand in the way of the distribution of mammals and other animals, which in North America are free to roam over vast tracts of country from north to south.

With reference to the especial direction pursued by the birds during their migrations, it has been found that the birds of the eastern region go to and return from their summer and winter quarters by the Atlantic coast and the great valley of the Mississippi, whilst the western species hug the shores of the Pacific and the western slopes of the Rocky Mountains; and while the majority of the birds of the former division take up their winter quarters in and around the Gulf of Mexico, Florida, and the West Indies, a small portion only going into South America, it has been observed on the other side that very few go further south than the Pacific shores of Mexico. Thus the winter visitors to the West Indies are, with very few exceptions, summer residents in the north-eastern portion of the United States, Canada, and the Arctic Regions. It will be observed that the peculiar tongue-shaped promontory of Florida protrudes on the coast, having Cuba and the Bahamas at its apex. We would therefore expect, from what has just

been stated, that as the waves of winter visitors are proceeding southward, they would, in all likelihood, tarry on their way. Such, in fact, is the case. Accordingly, we find something like eighty species of American migratory birds affecting Cuba in winter, against a far less proportion in Jamaica, which is further eastward, and positively an almost total absence of any but South American birds in the island of Trinidad. Thus Cuba and the Bahamas stand in relation to the birds of North America in much the same way as Malta and Sicily afford resting-places to the migratory birds of Europe; indeed, it has been very clearly pointed out that few North American species winter in South America, that do not also winter in Cuba, or, at all events, make a temporary stay in the island during their spring and autumn migrations. Although the above directions embrace the chief routes or highroads pursued by the migratory birds, there are other inland highways and byways by which they travel, irrespective of the valleys of the Mississippi and Mackenzie rivers. The sketch map indicates the chief mountain ranges and high lands, more especially the Rocky Mountains, Appalachians, and elevated lands of Labrador, running north and south, all of which present excellent routes; but doubtless from the headlands of Newfoundland and Nova Scotia many a bird wanderer starts, and makes straight for Florida without one stoppage on its way. Of the vast hosts of eastern migrants that repair annually to feed around Hudson Bay, not a few gain their summer quarters by the Mississippi valley (as is demonstrated by their numbers along that route in spring), whilst they return by the Atlantic coast, or *vice versâ*. But on the western side, the great mountain chains and the coast line pretty accurately determine birds' movements, and make them more regular than along the Atlantic division. As to the extent of the migrations, we find almost every possible degree, from birds whose migrations extend over a few hundred miles of latitude to such as breed in the Arctic Regions and

winter in Patagonia. From what has been stated, it will be observed that, as a general rule, the migratory birds of eastern and western America pursue a northern and southern course in their respective provinces. In accordance with these facts, we find the two great regions characterized by distinct forms or types; even in cases of species common to both, there are characters which distinguish them from one another. As an example, the well-known yellow woodpecker (*Colapates auratus*) extends from the Atlantic across the continent to the upper Missouri, where it is replaced by a very closely allied species, differing from it in having the shafts of the quills *red* instead of yellow. Now, whether these two birds are distinct species or only permanent varieties of one species, we have it on the excellent authority of Professor Baird that at the line of junction of the two grand ornithic provinces, individuals are met with showing a combination of the characters of both, which, in conjunction with the following examples, would seem to indicate that the eastern and western forms interbreed. The well-known snow bird (*F. hyemalis*), also the long-crested, and Steller's jays, present characters common to both on these boundary lines between the eastern and western provinces, whilst the seaboard specimens are at once characterized by very permanent and distinct colourings.* Let us see what indications are presented of similar crossing of allied species among the Old World *avifauna*. In Egypt the common chimney swallow is distinguished from the European bird by the intense rufous on the belly, with spots of the same colouring on the tail. These, as is well known, are pale rufous or dirty white in the true *Hirundo rustica*. Now the latter passes through Egypt in spring and autumn during its annual migrations; the result is that now and then individuals of the two are to be met with, showing intermediate grades, which may be owing to interbreeding. Again, in Malta, we find specimens of the Spanish sparrow (*par excellence* the domestic

* "Birds of United States," *Pacific Railway Report*.

sparrow of the island), so closely allied to the Italian sparrow, which is found in Sicily and Calabria, as to lead to the belief that there is here again a communication between these very distinct forms.* Would space allow, we might multiply examples similar to the above. Suffice it to say that, considering the close and intimate connection between many species, and the influence of migrations in bringing about an intercourse between closely allied forms, it may be readily believed that there is no branch of natural history more likely to aid our knowledge of the causes of variations in animals than that which aims at establishing their geographical limits and movements.

Having briefly indicated the chief points in connection with the migrations of the North American birds, I shall epitomize a few facts regarding their distribution. The most important of which is the effect of certain influences on the size and external appearance of species. It has been found, from vast collections of specimens from remote localities, that there are not only pronounced differences in size, but also in coloration, between animals of the same species from high and low latitudes; morever, that these differences are apparent in individuals of the same species, having a wide distribution in the same latitude, and even as regards elevation above the sea level. In birds these peculiarities are not so apparent as in man and the quadrupeds; however, several remarkable instances might be adduced among migratory and non-migratory birds. With reference to these it has been observed that migratory birds remarkable for their great range show the least variation in size, whereas such as have a wide distribution in latitude without any special migration present very pronounced discrepancies in the development of certain organs, such as the wings, bill, feet, etc.; indeed, so marked are these in individual species of woodpeckers, that it has been the impression of some naturalists that the extremes, from widely remote localities,

* Author, *op. cit.*, p. 85.

might be fairly considered distinct species; moreover, that the higher the latitude of the place of birth of any species, the larger will be its size; for example, as I will show presently, enormous flights of the well-known golden plover, breed in Canada, many pushing up into the Arctic Regions, of these the individuals born in the former are relatively smaller than the specimens reared further northwards. Much evidently depends on the amount of food and the distance gone over in the migrations, which cause a greater development of the muscles, the bill and feet participating in the laws which regulate the development of organs in connection with the animal's requirements. As to coloration, it has been frequently observed that birds frequenting coasts are darker in plumage than those of the interior; hence the bleached appearance of many of the denizens of the desert tracts, as observed in the larks and other birds of Egypt, etc., as compared with the darker hues of the denizens of forests and of the umbrageous vegetation of the tropics.

I have stated that there are only about sixty species of birds common to the northern continents of Europe, Asia, and North America. Now with reference to birds common to the Old and New Worlds. These are chiefly water birds, there being only a very few land species—to wit, the golden eagle, peregrine falcon, osprey, sea eagle, rough-legged buzzard, long-eared, snowy, and hawk owls, sand martin, Bohemian chatterer, pine grosbeak, redpoll, snow and Lapland buntings, raven (?), willow grouse, and ptarmigan. Moreover, eliminating the above, we find that nearly thirty-five land and about as many water birds, strictly American, have turned up accidentally from time to time in Europe, more especially in Great Britain; whereas in the interchange between Europe and America the numbers are restricted to only a very few species, including the white-rump and skylark among the land birds, and these, with the exception of the lark, are met with in Greenland.

The causes of this marked discrepancy have been accounted

for by a study of the laws which regulate the direction of the winds. Thus between latitudes 32° and 50° in North America, the regular direction of the prevailing winds is from the west, the breadth of the atmospheric current being about 20°, its greatest intensity culminating about latitude 45°. But there are variations in the amount of intensity at different seasons of the year in accordance with the rotation of the earth and the sun's declination. Moreover, the great polar and southern winds, at the times of the year when they predominate, are also influenced by the same cosmical forces, which give them likewise a tendency towards the west. Now it is a fact, both as regards the seasons of the year (spring and autumn) and the birds transferred to Europe, that their transportation is in strict accordance with the times of the migrations of the species then on their routes to and from their summer retreats. Thus, as elsewhere, the occasional transfers of American birds to Europe are effected by the prevailing winds; moreover, these data explain why far more American birds find their way to Europe than *vice versâ*.

As regards the European continent, it is the case that the migratory birds lag longer on their way north in spring than they do in autumn, whereas in Canada the very reverse would seem to prevail. This, I think, might be explained by taking into consideration the natures of the climates of the countries where the majority of the birds of passage spend the summer. Thus the Canadian winter extends over nearly half of the year. There is no spring season; summer advances with amazing rapidity, and sharp frosts set in early in September, so that the majority of migratory birds, we will say in latitude 50°, have barely time to rear one brood before the season returns for their retrograde movements, thus imposing on them the necessity of a rapid advance from their winter to their summer quarters, in order to accomplish the duties of incubation.

Again, the young birds of the year not having attained

sufficient strength to enable them to accomplish long flights, the autumn American migrant proceeds leisurely southward; whereas in Europe it lags on for several weeks longer, until autumn is nearly spent, when it has to push on quickly to its winter quarters. Of the vast flocks of migratory thrushes, and, as we shall see presently, golden plovers, that annually start in autumn from Newfoundland for Florida and the south, it may so happen that stragglers are now and then caught in the "south-westers" that then prevail, and are carried towards the British Islands; or, in the case of birds belonging to the latter country, an occasional individual or even a flock may be conveyed to Iceland or Greenland, where, with the regular migratory species, they might eventually find their way to North America.

But as regards the Arctic route, by which a transference of the birds of Europe, Asia, and America might be accomplished, it may be stated with reference to Greenland that out of about thirty-four strictly American migratory birds which frequent that region all belong to the eastern province of the latter continent, and of these only six have turned up in Europe; again, Iceland, lying to the east of Greenland, receives scarcely an American bird, either migratory or accidental, whilst on the other hand it furnishes more European birds than Greenland. It would therefore appear, whatever may take place on the western Arctic shores of North America, that, anyhow, it is improbable that the intercontinental transfer of species from America to Europe can be by the Arctic route; thus adding an additional proof that the conveyance of the birds of the New World to Europe is by the atmospheric currents we have just indicated. Among the accidental arrivals in Europe from America are enumerated several non-migratory species, which may have been carried out to sea by gales. Among others, as I noticed with reference to one of its European congeners, in Malta,*

* *Op. cit.*, p. 92, and *Popular Science Review*, vol. iv., p. 330.

the tiny ruby crowned kinglet (*Regulus calendula*), and several small American warblers, in no ways constituted to bear the hardships of the Atlantic, are transported for long distances by means of gales. But, as a general rule, the majority of the wanderers are hardy birds, given to making long and venturesome journeys.

Taking into consideration the advanced state of our knowledge of the ornithology of Europe as compared with America, it cannot be expected that the laws which govern the distribution and migrations of its birds will admit of the same exactness as to details; indeed, it may be said with truth that the study of zoological geography generally is still in its infancy; at the same time, from what has already been accomplished in this department of natural science, there is every cause to expect that the time is not far distant when many of the obscure points in relation to the origin of animated objects will be cleared up by means of more diligent studies in connection with their habits and distribution.

Reverting to the migrations of the birds of the region under consideration, it will be observed that the majority of the migratory water-fowl of north-eastern America stick more or less to the coast lines on their ways north and south, and keep more together in autumn, for the simple reason that more than half are young and inexperienced birds following the leadership of their parents. This, however, only applies to such birds as are gregarious; for it is a remarkable circumstance, and one not explicable unless on the belief of inherited instinct, how such a tiny creature as the humming-bird, born in northern Canada, should find its way alone to Mexico and the West Indies. Referring to such birds as breed in regions north of New Brunswick, and winter in the United States, the islands, and Mexico, it is well known, in the cases of snipe, woodcock, geese, ducks, golden plovers, and so forth, that for one seen in spring a dozen or more will be observed in autumn. This

is no doubt to be explained, partly by the increase of numbers, but also by the fact that the bird hurries forward to nidificate in spring, retiring only step by step in the fall. Thus I invariably noticed that more migratory birds arrived in central New Brunswick before the snow had disappeared than tarried after the first fall in autumn. This I supposed was owing to the impulse to breed which drives the bird to seek its summer retreat before the country is quite ready for it. But these were generally hardy finches, such as the Pennsylvanian sparrow, song, snow, and chipping finches, which, as already stated, appear along with migratory thrushes early in April, often coming in for several snow-storms after their arrival. There can be no doubt that birds which perform their migrations in flocks have the advantage over the solitary wanderer which has to trust to its own judgment alone. Hence it may be inferred that the latter would be most likely to be found beyond its boundaries, unless when stragglers get detached from the main body, just as now and then a couple or more of Canada geese stop in New Brunswick and breed, whilst the multitude goes to the Hudson Bay Territories.*

Besides failure of food and change of climate, the inherent desire of certain species to pair may perhaps prompt the bird to migrate, but I very much doubt if this is generally the case. I dissected several species in Malta in spring, when on the way to their summer retreats, but in no instance were the genital organs enlarged excepting in such as tarry and breed in the island.†

The bird when it starts in autumn for its winter quarters is invariably plump and in good condition; some remarkably so; indeed, in the case of Wilson's snipe, individuals I

* There is an interesting paper on this subject by Mr. J. M. Jones, F.L.S., "On Some of the Rarer Birds of Nova Scotia," in the *Trans. N. Scotia Inst. of Nat. Science*, vol. ii., p. 70.

† *Op. cit.*, p. 102.

have shot in autumn appeared inconveniently loaded with fat, the average weight of several specimens being five ounces and a half. But the bird is not by any means in such good condition in spring. Mr. Boardman visited Florida during several successive winters, where he found nearly all the summer migrants of this region leading inactive lives as compared with their habits in the north; and all the song-birds, and such as are usually vociferous, very mute: precisely the same obtains with the water-birds, especially of the Old World, as I have shown in my "Natural History and Archæology of the Nile Valley and Maltese Islands,"* with reference to the goose, duck, and other winter visitors to Egypt. Under such conditions, therefore, we should expect them to push rapidly forward in spring to their breeding grounds. The rule, as regards the water-fowl of the New and Old World, applies more or less to the land birds of the latter at both seasons; inasmuch as the spring quails on their way from Africa to Europe are particularly fat and plump, and the same is the case with the smaller warblers, including the garden warbler, which is the far-famed beccafico of the Italians; in fact, most grain and insect-feeding birds keep in a good bodily state in either retreat, and in the case of the warblers of Europe they apparently fare better in their winter than summer quarters; hence they cannot in general have such severe struggles for existence as many water-fowl dependent on certain conditions of the surface for a proper supply of food.

I was especially struck by the enormous flocks of Canada and Brent geese that pass over New Brunswick, to and from their breeding grounds, north of the 50° parallel of latitude.† Of course their times of arrival and departure are subject to some irregularities consequent on the degrees of mildness or

* Pages 19 and 101.

† Many of the gullies—to wit, Tracadie, on the north-east coast—absolutely swarm with them in May and October during the migratory seasons.

severity of the seasons; but taking them generally, I found that, in common with such birds as breed in high latitudes, they tarry longer on their way south in autumn than they do in spring; indeed, in the case of the geese, although the main body pushes to Southern Florida by the end of October, solitary individuals, and even small flocks, may be seen in the open parts of Canadian rivers throughout the winter, indeed a few breed on the lakes.

Looking at the map, we can readily suppose that flocks of birds bound for Florida and the south could not obtain a better starting-point than the projecting headlands of Labrador, Newfoundland, and Nova Scotia, from which, by keeping the land on their right, they would scarcely fail to fetch the former. The routes by which the majority proceed from the Southern States to the temperate and sub-Arctic Regions, are, however, not confined to the coasts alone. Although the mallard, pintail, shoveller, gadwall, etc. etc., proceed to the north in great numbers, but few, comparatively speaking, are seen on the Atlantic coast, possibly for the reason suggested by Baird,* that their routes may be further westward, or along the great river valleys and the Appelachian ranges. Enormous flights of golden plovers pass down the Bay of Fundy in autumn. I have a well-authenticated record of a dense flock which passed over the city of St. John like a cloud of locusts, commencing at dark, and continuing throughout the greater part of the night. It is rarely that they tarry beyond a day or two at this season, unless through adverse winds, which often send them inland; indeed, the bird cannot afford to loiter, seeing that, according to Baird,† the golden plover of North America ranges over 90° to 95° of latitude twice annually!‡ The varieties of the European and American golden

* "American Journal of Science," vol. xli.; and Jones, *op. cit.*

† *Ibid.*, vol. xli., p. 32.

‡ See Hurd's "Naturalist in Bermuda" for many interesting data in connection with the migratory movements of this and other American species.

plovers—viz., the long-legged race and the so-called Virginian bird—are noticeable characters, requiring explanation with reference to the habits of the two races. Again, departures from established habits peculiar to any genus, family, or even order of animals are of especial interest to the scientific inquirer. Thus the tree-building ducks furnish examples of a number of species pursuing very different ways of living from the generality of their compeers, so that we naturally seek to find out if any of the others do occasionally follow the same course. One of the most common and at the same time most highly prized of the resident ducks of our region is the dusky duck (*A. obscura*), which often weighs three pounds. Although its nest, as a rule, is placed on the ground, yet it occasionally builds in trees, as I am informed by Mr. Boardman, who took the eggs from its nest on a birch tree twenty feet above the level of a lake! The American sheldrake, hooded, and Barrow's golden eye, buffle-headed duck, and that prince of beauties the wood-duck,* all nestle on trees, but not invariably.

Probably, if the truth were known, this anomaly was occasioned through the force of circumstances compelling the individuals to seek positions safe from the attacks of their four-footed foes, such as the fox, otter, lynx, and the like; or is it only the relic or reappearance of a long-lost habit of their progenitors? Mr. Boardman has further furnished me with a strange instance of two sorts of birds rearing their young in the same nest. He noticed two females of the hooded merganser and wood-duck fighting for the possession of a hole in a sand-bank, where he found their broods in one nest, there being no less than fourteen of the former, and nine ducklings of the latter. It has often appeared to me, on observing a bank riddled with the holes made by the sand-martin, how easy it must be to mistake one nest for another.

Returning to the abnormal habits of quadrupeds before

* Large numbers of these birds are captured in nets during their migrations when the flocks are flying down the Penobscot River in Maine.

observed, the fisher and mink are partly terrestrial and partly aquatic. The latter is said to swim like an otter, and its toes being webbed give it advantages in this respect, and, with the inordinate growth of hair on them in winter, afford double facilities for progressing easily on snow and in water. But it clearly obtains its staple subsistence, like other polecats and martens, by feeding on mice and land animals; therefore it may be a question whether its piscatory habits have not been acquired through some failure in the numbers of the former. At all events, examples of a similar description, or any deviations from what appear to be the established laws of natural objects, deserve especial attention, as pointing towards the solution of important questions pertaining to the origin of species. We have seen that the lynx is said to capture fish; domesticated cats are very fond of fish, and instances are recorded of their hunting after them in brooks; jays have been seen acting the part of kingfishers; and I have frequently seen pigeons, rooks, and jackdaws, like gulls, picking up food from the surface of water.* How far the acquired habit might entirely supersede the natural ways of the animal, and on that account bring about modifications in its structure and outward appearance through generations of individuals, remains to be shown when sufficient data have been collated.

The purple sandpiper spends the winter on the seaside in vast numbers; although common to the eastern portion of North America and also Europe, there is not, according to Baird, any difference between specimens; perhaps, as with the spotted tringa, there is a pretty constant interchange of individuals during the equinoctial and other gales. We must agree with Mr. Darwin,† that established and regular currents of the sea or the atmosphere should not be considered altogether

* See "Wanderings in India," p. 46; and "Nat. Hist., etc., of Nile Valley and Malta," p. 33.

† "Origin of Species," p. 364.

accidental means of transport in the case of animals or plants; perhaps many species common to two widely remote regions may have been originally conveyed by these agencies; and no doubt, if the custom of destroying every strange bird were less practised, many would remain and breed and multiply; but a new comer, if at all attractive, is slain immediately. It is not, therefore, improbable that many species, now indigenous to certain countries, may have in the first instance been transported by means of the winds. Again, such as overstep the usual limits of their annual migrations, and settle down and breed, may occasionally spend the winter, and become partially indigenous to the region, and through many generations return to the same district as in the case of swallows. I am certain that several species of warblers and other birds which come to this province in summer do not breed, possibly for the reason that they are so few that no mate can be procured. This, for example, would seem to be the case with the following warblers, of which solitary individuals may be seen every summer in New Brunswick woods and forests; doubtless, however, they do breed when they have a chance. I give them for the reason that I have invariably found only single birds, and these most generally males, viz., the *Sayornis fuscus Sialia sialis, Regulus calendula, Dendroica canadensis* and *castanea.* No doubt many more might be added. In some springs the scarlet tanager is common, at others not an individual is seen. Of the warblers which breed here, few manage to rear more than one family, and, with the exceptions already noticed, all arrive within a few days of one another, and usually earlier on the coast districts than inland, where likewise they tarry longer in the fall, in consequence of the milder climate. I think certain water birds, such as curlews and sanderlings, do not invariably breed, inasmuch as flocks may be seen throughout the entire year feeding together, and showing no disposition to nidificate. I was very much struck by this

apparent anomaly as regards India, where some birds do not seem invariably to nidificate in spring and summer. For example, the house sparrow of Hindostan appears to breed at any season, and others, more especially certain warblers, if they have any regular period, do not usually pair at the same time with other members of their species. I may, moreover, record the like observations of Mr. Rowan. He states, as regards the island of Anticosti, that "In the hatching season I observed several small flocks of geese, which were not encumbered with families, and evidently intended to remain in that happy condition. I shot a good many of these birds, and found them, unlike the hatching ones, fat and plump. I noticed the same thing with ducks. On the 18th of June I came across a flock of bachelor and maiden black ducks (*A. obscura*); I shot three or four of these, and I never tasted better ducks in my life."*

The GREAT NORTHERN and RED-THROATED DIVERS are characteristic objects on almost every New Brunswick lake during the summer months. The red throat of the latter (common to the two sexes) is often entirely wanting in specimens frequenting this region, and, as is usual with birds remarkable for their abundance, several instances of albinism have been noticed, but not two together. The Loon is particularly conspicuous; not only on account of its stately form and attractive plumage, but also for the loud plaintive wōō-lōō, which is often the only sound that breaks the stillness of the forest loch. Although wild, and not easily approached, yet by waving a hat or displaying any conspicuous object, such as a piece of red cloth, they may be brought within rifle range. Mr. Rowan says,† with reference to this bird and others frequenting the island of Anticosti in summer: "I found that many of the waterfowl, including the geese and the divers, were of a very inquisitive turn of mind, and I used often to decoy them within shot by waving a coloured pocket-handkerchief.

* *Field*, May 1st, 1869. † *Ibid.*, May, 1867.

The geese, mistaking my dog for a fox, would often approach quite close to him in a defiant way. But more inquisitive even than a woman is the red-throated diver. These birds are sometimes a positive nuisance, coming in from miles round to look at a canoe, and then circling, chattering and shrieking, around it. On the plains I have brought them up from a great distance by standing on a hummock and shouting and waving my hat. Although there are great numbers of them, I could not find a nest. They are called 'wobbies' by the fishermen, who often catch them in their nets. On the high rocks on the north shore of the island, incredible quantities of sea-birds hatch—cormorants, gulls, puffins, sea paroquets, and pigeons. These birds all live sociably together. Hundreds of them lay their eggs side by side on the same ledge of rock, and may be seen seated in front of them in rows like soldiers. On one occasion, when I fired a shot to alarm them, the number that rose was so great that for a minute or two I could hardly see the sky, and their droppings in the water resembled a heavy shower of rain or hail." Both the divers before mentioned breed in the lakes of the province, arriving just as the ice commences to break up. I have seen many broods of the great northern diver, but rarely more than one young one was observed with the parent, although the usual number of eggs seems never less than two. The chick remains for a long time with the parent, and is seldom fully fledged and able to fly until towards the end of September; however, what it wants in this respect is made up by activity in the water. During my excursion to the Schoodic lakes, in the adjoining state of Maine, as the canoe was gliding along the surface of Grand Lake, among the numerous islets where the loon breeds, we were attracted by the loud calls of two of these birds, which were accompanied by a young one, not larger than a teal. It was an interesting sight to observe how the parents attempted to defend the object of their solicitude, by redoubling their cries, and making vigorous efforts to outstrip our light

bark, which, however, gained steadily on them, until the male rose and flew towards an islet, thinking perhaps that we should follow him. Then, as matters began to look desperate, the female, unable to remain longer, began alternately to swim away, and to face us, until, fairly driven to extremity, she raised her graceful piebald figure like a mermaid, and, half flying, half treading on the surface, and at the same time splashing the water with her wings like the paddles of a steamboat, shot along for some fifty yards, and alighted, uttering louder and wilder cries, as with desperate struggles she essayed to entice the fledgling to follow. Just as my gun was being raised, she got up, and again beating the water for some distance, gradually rose higher, and flew away disconsolate to join her mate. We then set to work to capture the chick, but soon found it was much too agile, as every time the skiff approached it dived under water, reappearing some ten or twenty yards off. Once it popped up its head by the side of the canoe, and I made an attempt to seize it, when down headforemost shot the little creature, and I could discern its form far below us.

The trappers and fishermen on many of the lakes complain of the depredations of the loon among the fish in stake nets. I was informed by my friend Captain Wolseley, of the 22nd regiment, that during an excursion to the Sciff Lake, in the upper Schoodic waters, where the great spotted togue and silvery salmon trout are plentiful, his attention was directed by a trapper to numbers of mutilated trouts in nets, supposed to have been attacked by either otters or large individuals of the former fish, which is the *Salmo ferox* of the lakes of New Brunswick. At length several northern divers were seen regularly in the vicinity, and finally the mystery was solved by one being caught in the meshes of the net.

The REPTILES of New Brunswick are neither numerous nor formidable. None of the serpents seem to be poisonous, provided that the Rattlesnake is not found within our limits.

It is said, however, to have been observed in the south-western parts of the state of Maine, but there is no record of its presence in the province as far as I can discover. The period of activity of many species of reptiles common to this region and more southern latitudes is, of course, relatively very much smaller in the former. Few are seen before the middle of June, and such as frequent the land disappear, for the most part, by the end of August. I have seen several specimens of the Snapping Turtle, which is said to be rather common in many rivers and lakes communicating with the Bay of Fundy. The Painted Turtle is not rare in ponds and streams. I have also seen an individual of the Spotted Emys. The Wood Terrapin is very generally distributed, and is often found in woods at a considerable distance from water. The Musk Tortoise affects ponds and ditches; its very small size (seldom over three inches and a half in length) and strong odour readily distinguish this species. I have not been enabled to identify more turtles, but in a list of the reptiles of Maine* there is included with the above one specimen of the Box Turtle (*Cistudo Virginea*).

The Striped Snake (*Eutainia sirtalis*) is said to appear about New York towards the end of May; here it is rarely seen before the end of June, and disappears fully a month earlier than in the New England states. There is evidently considerable variety in the outward colouring of this adder, as several small specimens I have examined seem to agree with the so-called Little Brown Snake (*Coluber dekayi*) of Holbrook. One of our most common fangless snakes is the active little green species (*C. vernalis*), and the Milk or Leopard-spotted (*Coluber eximius*), which is readily distinguished by the beautiful oval chestnut spots and the minute red punctations distributed over its upper surface. The *Bascanion constrictor*, or Black Snake (*Nerodia sipedon*, or Water Snake), *Storeria occipito-maculata*, and the Ring-necked Snake (*Diadophis punc-*

* Dr. Fogg, *Proc. Portland Nat. Hist. Society.*

tatus) having been identified in Maine, may doubtless turn up here also.

I well recollect, soon after my arrival in the country, meeting a soldier of my regiment one afternoon, and talking over our experiences of the New World. "This is a strange land," said he, "where the frogs whistle and the crows bark!" and certainly these two familiar denizens of home remembrance are here represented by species which, however little they may differ from them in appearance, are widely divergent as regards voice.

The great expanse of swamps and stagnant waters presents admirable retreats for various species. In the still summer evenings, when the firefly is about, and the crickets, grasshoppers, and the like have just ceased their noisy utterances, then comes forth from the dank places such a medley of voices, in different notes, that we can hardly believe that all are produced by frogs. There is the loud hoarse cough of the large Bull Frog (*Rana pipiens*), accompanying the clear pipe of the Yellow-throated Green Frog (*R. fontinalis*), and the less musical croak of the handsome Leopard Frog (*R. halecina*), and other species, to wit, the Pickerel and Wood Frogs. I have, besides the above, which are common, identified the little Tree Toad (*Hyla versicolor*), whilst the well-known common *Bufo Americanus* abounds in all suitable localities.

Salamanders are numerous. I have confirmed the presence of the following species: *S. subviolacea* (Dekay), the Blue-tailed Skink (*Scincus fasciatus*), Dusky Triton (*Triton niger*), and Red-backed Salamander, besides several sorts not determined accurately. The following species I was unable to name: "A true triton—length, five inches; body, smooth and tapering; head, ovate, depressed, rounded in front; eyes, prominent and converging; upper parts plumbeous in life, darker after death, and brown after immersion in spirits for a day; tail, tapering and compressed; sides of body faintly spotted with white, lower parts pale; anterior feet, four-toed, the second and

third toes largest; posterior, five-toed, third and fourth the largest.

The reptiles of the region, as well as of Canada, and even North America generally, deserve a closer attention than has yet been accorded to them; indeed, the list in the Appendix is by no means perfect.

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Appendix

PART III.

FISHES.

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FISHES.

CHAPTER IX.

Salmon; its Decadence—Object of my Excursion to the Schoodic Lakes—Forest Scenery—Incidents of Travel—Maine and its Liquor Laws—Lewey's and Long Lakes—Silvery Salmon Trout—Fly Pest—Trout Fishing—Description of the Silvery Salmon Trout—Grand Lake; its Scenery—Glacial Erosion—Parasites in Fishes—Effects of Light on Coloration of Fishes—Sea Trouts of Europe and America.

THE extermination of the land animals, water birds, and shell fishes before noticed, contrasts, in the modes by which they have disappeared, with that of the salmon, which used to abound from the frozen region to the 40th parallel of latitude; now it is rarely met with south of 44°; but although it has been long known, there are several interesting features connected with its natural history and its connections with northern forms to be worked out. The chief migratory movements of the fish in New Brunswick waters are such as usually obtain elsewhere, a good deal depending on the breaking up of the ice. The spawning season is over by the beginning of November, when the majority make a rush for the sea. Parr are common in April and May in the rivers, and its smalt are taken in vast numbers by fly and bait towards the end of August, when, like the former, they are possibly on their way to the sea. No doubt, however, although the chief runs of fish towards the sea are in

April and May, and the return takes place before the rivers are frozen over, there is a general and continuous passing up and down throughout the year, as obtains in the Old World rivers; moreover the shrouding of the Canadian fresh waters in ice for lengthened periods, makes it difficult quite to settle the up and down courses of migratory species.*

I started with my friend Professor Loring Bailey, of the University of New Brunswick, in the month of August, 1866, on an excursion to the great chain of lakes, on the south-western frontier of the province, known as the Schoodic Lakes, which drain into the St. Croix River. One of the objects of my journey was to ascertain the truth of certain reports made to me in connection with a belief which prevailed in the district, to the effect that the salmon exist in these inland reservoirs, and their effluent and influent waters, but is so much stunted in growth, that its average weight seldom exceeds three pounds, the largest rarely attaining seven pounds. This so-called pigmy race is supposed by European fishermen to have been brought about by a constant residence in fresh water, the individuals having been prevented from getting to sea by dams and artificial barriers, and having, as it might be, lost themselves among the network of lakes which covers the frontiers of Maine and New Brunswick.

The scenery between Fredericton on the St. John, and St. Stephen on the St. Croix, n othe western frontier of New Brunswick, presents a monotonous sameness. The country

* Some idea of the extermination of the salmon through human agency may be gathered from the following data in connection with this region. It is in the recollection of persons now living that the Kennebeckasis, a large influent of the St. John, literally swarmed with salmon; now it is rare to find a single fish. Mr. Vinning, in his report to the Local Government, says: "The inhabitants appear to be actuated by an insane desire to destroy every salmon that appears in its waters." The same may be said of other branches of the St. John, such as the Oromocto, Nashawaak, etc., once famous salmon waters, now without a single fish, in consequence of the mill dams which stretch across them, and the wholesale destruction of the fish on its spawning beds.

is flat, and for the most part covered with wood and forest clearings, or, in other words, sparsely settled, and that only, for the most part, along the line of our route. One of the chief physical features in the otherwise level country, is Bald Mountain, about twenty miles west of Fredericton. This eminence or hill, to which further reference will be made in the sequel, rising only a few hundred feet above the surrounding district, is composed of trap, and forms a portion of the igneous belt which fringes the great coal basin of this and the adjoining province of Nova Scotia. The view from its top shows an unbroken expanse of forest, stretching far and wide on every side, and as far as the eye can reach, with long-drawn ridges alternating with valleys, whilst here and there the blue waters of a forest tarn, a gap, or a clearing, are seen peeping through the tree-tops. The dark shades of the spruce and pine consort well with the lighter green of the maple and other hard woods, whilst far above their brethren stand the charred and weathered forms of many a noble tree that perished in the afore-mentioned conflagration of 1825, which swept almost diagonally across the entire province. Along the road to St. Stephen's, a distance of eighty-five miles from the capital—as, indeed, anywhere throughout this portion of the continent—the geologist is constantly impressed by indications of the Glacial Epoch, in the shape of rocks planed and polished, as if by a lapidary, with grooves and scratches running for the most part north and south, whilst long trains of granitic and other boulders, with their concomitant drift and clay, strew the surface everywhere, more especially on the sides of slopes and valleys, where vast accumulations of sorted sand and gravel form great mounds and "horsebacks." These seem to indicate, as will be pointed out in another chapter, at least two periods in the above far-back epoch—one when the land was for ages clad in an enormous mantle of moving ice; another when the climate became less rigorous, and the country was subjected to considerable further denu-

dation from the thaws that took place towards the close of that glacial period. This was the idea presented to my mind's eye on viewing these phenomena, and it seems to me to accord best with the facts as they now stand; better, no doubt, than the theory that the land had all been under the ocean, and that of polishing and scratching the rock was done altogether by icebergs, which no doubt is true enough to some extent, where the land was clearly submerged under the sea. But these wide-spread indications can scarcely be put down altogether to the latter, at all events in the case of the inland portions of this continent.

To return to the journey and its agreeable concomitants, which always add to the naturalist's pleasure when contemplating objects of interest. With unusual delight I recall to mind many incidents of the above excursion, the more so as my companion's tastes were congenial with my own. Indeed, one is better without a companion than in the society of an individual who will not fulfil the behests of good fellowship and friendship; more especially the selfish man, who looks on every one else's occupation as secondary to his own; he is surely best alone! I met two persons on the Nile who had been travelling together for many weeks, and through their own faults had managed to make each other as uncomfortable as possible. One ridiculed his companion because he was always hunting beetles, whilst the latter retaliated with sneers of contempt on an utter absence of intelligent curiosity on the part of his comrade! But bad as is the want of affinity in such cases, what must it be when the companionship extends to a lifetime, in the shape of husband and wife? and verily like instances are not rare. We are familiar with the appellation of "nonsense books," given by Lady Scott to the productions of her gifted partner, and we see daily examples of men of science and learning, making permanent alliances with natures absolutely incapable of estimating the aim and object of their lives; hence, marriage often makes or mars

the student; for it is easy to shake off a temporary alliance, whilst an absence of similarity in character and disposition in husband and wife can only culminate in conjugal unhappiness. Blessed indeed must that pair be who can say,

> "Smit with love of sister arts, we came,
> And met congenial, mingling flame with flame."

There is a monotonous sameness in forest scenery very apt to tire even the most ardent naturalist; for it is made up of the eternal succession of trees, broken only by settlements here and there along the highway, the majority only isolated cottages, with a small cultivated patch sufficient to supply the wants of the inmates, while around the fields are extensive tracts, terminating abruptly at the forest, and overspread with snags not yet uprooted, and significant of the labour yet required for reclamation.

Primeval as is the native forest, so primitive also are the habits of the settlers who struggle for existence in its wilds; where mile upon mile not a billet or shelter of any kind is observable; and the straight road, like an avenue, is seen gradually narrowing in the distance, with one eternal vista of tree and bush along its sides. Here it crosses a swamp, over which the usual corduroy foundation of logs threatens to smash the axle, or overturn the cart, by the wheel frequently sinking halfway in some muddy pool. Now we rattle pleasantly along some gravel bank, among a second growth of birch, poplar, and so forth, when the presence of fields and the tinkling of the cattle bells tell of our approach to civilization. In a trice we arrive at a cottage; there is no sign-board, and, as far as outward appearances go, it seems large enough for the inmates alone. Here it is that the stage-coach changes horses, and you may bait, and if inclined to dine, can be regaled, on short notice, with fried bacon and eggs, and any quantity of tea, but no liquor is allowed. "We have not the licence!" adds the dame; yet I dare say there is a private bottle. In the loft there is a spare bed for the benighted traveller,

and a kind welcome to gentle and simple, whether he pays his way or is a penniless tramp. I will not particularize individual instances, which indeed would be black ingratitude for more substantial benefits received, but I may state in a general way, for the information of the wayfarer in the wilds of New Brunswick, nay, even in the so-called teetotaling state of Maine, that there is little difficulty in procuring at all events abundance of "white-eye,"* or even better liquors, provided there is a clear understanding between him and "mine host." I recollect an occasion, during one trip, when a very civil and obliging landlord in Maine informed me that he had just been fined heavily, and even narrowly escaped several months' imprisonment, on account of several bottles of brandy having been discovered in sacks of flour he had imported from the British provinces. Of course *he* knew nothing about them—how could he? He had no licence! At length dinner came, but no beer, and only tea, tea, tea! It was in vain we tried to insinuate ourselves into the good graces of the host. He was obdurate; in fact, there was a general suspicion that we might be persons in authority pretending to have come over the border; so it was "pot-luck" or nothing. At length tobacco, that grand substitute for strong liquids, asserted its sway. We all got talkative, and from that became confidential. At last mine host disappeared, and I was preparing for bed, when a small boy coming up to me requested that I should follow him. So, from room to room, down several steps into a dark cellar, through another into total darkness, when a door opened, and behind a small bin, like a ticket-seller's box, was seated the landlord, with a bottle of Bass's ale in one hand and a pewter mug in the other. We refresh ourselves, the bottles are restored to a hiding-place, and *mum* is the countersign as we shut the little doors and hasten into daylight, and rejoin our companions as if nothing had happened. It is perfect

* A vile concoction called whisky, but pure *fire water*. I have seen soldiers under its influence exhibiting symptoms of furious mania.

nonsense to speak of the Maine liquor laws. It is well known all over the state that if spirituous liquors cannot be got at the druggist's shop on medical grounds, there are plenty in every hotel, and those who dare not drink openly and get intoxicated in the towns and villages, repair to the wilderness, where in autumn what are called "blackberry parties" generally end in drunken brawls. I remember, when encamped on the banks of Grand Lake, being astonished at seeing two young men quite intoxicated, who had only passed our tent an hour before, apparently perfectly sober. The Indian told us that they had come out for "a spree," and fetched a bottle of whisky, on the consumption of which they would return either to replenish it, or to end their debauch. What pleasure it could have been to these two young men to sit down in the wild wilderness among the blackberries and make themselves insensible with vile liquor smuggled from New Brunswick, was more than I could divine! Before I proceed to the consideration of the natural objects observed during our excursion, I must not omit notice of an amusing instance of inquisitive curiosity on the part of several "loafers" about the little inn of Princetown, on the banks of the Schoodic lakes. As we drew up at the door, there happened to be some half-dozen idlers seated on a bench smoking and whittling sticks; but no sooner did the dog-cart and its inmates make their appearance than all gathered round to see our goods and chattels being removed. "They're going a-gunning and fishing, I guess!" said one, as my implements of the chase and my rod were handed down. Next came the professor's botanical vasculum, and his wooden machine, somewhat like a large double sampler-frame with a wooden back, for compressing plants, together with a rather unusually-shaped portmanteau and a large carpet-bag. Every one gazed intently at the two first, and particularly at the machine, when a rather elderly-looking, bearded man "guessed it might be a cheese press!" "They are pedlars!" said another. I heard it remarked by

the ostler that we were "photographers!" but the crowning absurdity was when my friend, bursting with laughter, came to inform me that he had just been accosted by one of the lookers-on, who asked, in confidence, "when the performance would take place?"—whether Punch and Judy, a panorama, or a musical entertainment were "guessed," I cannot say, but nobody could divine our legitimate undertaking. The sporting part was intelligible, and the geologist's hammer looked like prospecting for minerals and such-like, both of which they could understand, and appreciate in a way; but the gathering of wild flowers and putting them in paper was beyond the conception of these goodnatured backwoodsmen.

Owing to the kindness of my excellent friend Mr. Boardman, on the following day we found a bell-tent, an Indian, and a canoe at our service; so taking in the necessary stores for several days' consumption, we at once launched our frail bark, and shot across the glassy waters of the Schoodic lakes, into the wild wilderness.

Thus, on the 11th of August we left Princetown, on the side of Lewey's, the most south-westerly of the Schoodic chain. Here the surrounding country is flat, and the banks of the lakes are more or less covered with dense forest and shrub, which also clothe several islets, whilst the margins are profusely overgrown by aquatic plants, where, among the violet-blue flowers of the pickerel weed, I recognized the well-known Cardinal flower, with its intensely red and elegant petals. The Yellow Water-lily was plentiful, but its far more gorgeous rival, the White Nymphæa, was less common, and confined to secluded reaches, where, with "snowy bosom sunward spread," it blooms gaily by the side of broods of the exceedingly handsome wood duck (*Aix sponsa*), and its far less attractive congener the black duck (*Anas obscura*). In such forest-locked and weedy ponds, as the canoe shoots through the rushes, it will require only some practice in order to secure a fair bag of wild fowl, or, with bait or spinning tackle, to

capture pickerel and perch in numbers. Some fifty years since the salmon and brook trout ruled supreme; but the mills and lumber dams have most effectually barred and forbidden their entrance, and about ten years since an American introduced the pike (*Esox reticulatus*) into Lewey's, which communicates directly with Long and Big Lakes. The result is that it is fast exterminating all the other fishes, viz., trout, chub, dace, redfin, eel, etc. The diminution in the numbers of these fishes, and the rapid increase of their destroyer (I am assured on good authority) have been remarkable.

The distance from Princetown by canoe to the debouchure of the Grand Lake Stream is about twelve miles. The latter is about four miles in length, and connects the upper waters of Grand, etc., with Big Lake by a series of rapids, in which abundance of SILVERY SALMON TROUT reside. The pike has apparently not yet settled in the Grand Lake, and I hope may never obtain the mastery of its waters, were it only for the sake of this splendid salmonoid. The waters of the Grand Lake are clear compared with the others. This arises from the circumstance that its bottom is covered with granitic boulders and sand, instead of mud, which prevails in the Big, Long, and Lewey's Lakes. Moreover, the former is the abode of the Togue, which our Indian informed us is not met with in the adjoining basins just mentioned. At the east end of Big Lake are seen the huts of the Passamaquoddy Indians, the remnants of a tribe that once lorded over the wild wilderness around for ages. One of their number steered our canoe, and proved, on short acquaintance, an able hunter; and, what is not common with his race, he was honest, truthful, and willing. From him I obtained much valuable information that no personal experience within my grasp could obtain; and, first, I made him find out if the Silvery Salmon Trout was known to the old men of his tribe, when it turned out that they had speared and taken it from time immemorial, even in the St. Croix, along with the salmon, from

which they distinguished it by another name, something like *onnenook*. But without this testimony, I was assured by Mr. Boardman that it is only of late years that the silvery salmon trout has been repelled to its present situation; indeed, he recollects full well the time when it and the salmon frequented the St. Croix River, from its mouth to its sources. Thus the fact that both inhabited the same region, within the influence of the tideway of the Bay of Fundy, closes the dwarfed salmon argument, to which further reference need scarcely be made.*

After a pleasant row through these two lakes, where broods of wild ducks kept my gun in constant requisition, we disembarked at the debouchure of Grand Lake stream, and pitched our tent under the trees, where the unfortunate Professor spent a night of intense torment from mosquitoes. I don't know exactly why these pests do occasionally single out certain persons in preference to others, but, although I have had very good cause to complain in common with others, I must say neither black fly, sand fly, nor mosquito managed to make me so miserable as many of my companions. Indeed, on the following morning, after breakfast, whilst the Indian

*. Dr. Gunther, in his Catalogue of the Salmonidæ in the British Museum, says: "The question whether any of the migratory species can be retained in fresh water, and finally accommodate itself to a permanent sojourn therein, must be negatived for the present. Several instances of successful experiments made for this purpose have been brought forward; but all these accounts are open to serious doubts, inasmuch as they do not afford us sufficient proof that the young fish introduced into ponds were really young migratory salmonoids, or that the full-grown specimens were identical with those introduced, and not hybrids or non-migratory trout of a somewhat altered appearance in consequence of the change of their locality. We have seen the experiment tried at two places in South Wales, by the Rev. Augustus Morgan and by W. Peel, Esq., of Taliaris, and in both cases the salmon and the pure sewin died when not allowed to return to the sea. However, the latter gentleman pointed out to me that the hybrid fishes from the sewin and the trout survived the experiment, and continue to grow in a pond perfectly shut up from communication with the sea. In that locality neither these hybrids nor the trout spawn."

was conveying the canoe and our chattels along the portage by the banks of the torrent, it was an odd and I must also allow a ludicrous sight to see our party on the march. Like a gentleman suddenly caught in a shower, at the same time suffering from an excruciating toothache, his coat collar raised, and pocket-handkerchief tied round his head, my friend led the van, with his vasculum on his shoulders, and in his hand a spruce bough which he whisked about his ears, whilst the tormentors, blackening his neck and hands in tens of thousands, were almost driving him distracted. Whether my East Indian experiences had anything to do with their selection of the Professor in preference, it was clear, from the swarms which enveloped him, that he had greater attractions; whereas the native, with the major portion of his person hidden in the canoe, which he carried on his shoulders bottom uppermost, seemed the most indifferent. At length, after an uncomfortable two hours' march, we gained the banks of Grand Lake, and encamped on a clearing close to the point of exit of its effluent. Here a lumber dam or bridge stretches across, and occasions a rapid flow through several sluices, which empty into a deep basin immediately below the dam. This is the general rendezvous of the Silvery Salmon Trout, where as many as fifty may be captured by one rod in a day during May and June, and where barrelfuls are annually salted or iced, and transported to the large cities of the United States. The excitement then is intense, and the banks of the river are covered with encampments. One would fancy that in such a circumscribed area it would only require a few years' fishing to destroy the entire colony; but I was assured on very good authority that, in spite of the increased number of fishermen, there is no diminution whatever; on the contrary, that the fishes are rather on the increase. It is stated that the larger the number of adults captured gives a better chance for the young to come to maturity, as the former devour the fry.

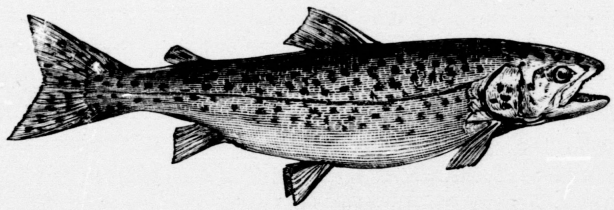
I lost no time in repairing to the scene, and sorting my fishing gear, when at the second throw two salmon trout jumped simultaneously at the brilliant red hackles; the next minute I struck them, and, after a pretty and exciting run of about five minutes, both were landed on the pier.

We soon found that it required no great art or skill to capture this fish; for the Indian, borrowing a piece of line, fastened it to an alder rod, and baiting with a grasshopper, seemed more successful than with my spinning tackle and artificial flies. In spring the fish are more voracious, dashing furiously at any light object drawn rapidly against the current. The alimentary canals of many, dissected on the spot, were, with few exceptions, filled with the small fry of the silvery dace, redfin, roachdace, brook minnow, and red-banded species, besides the two-spined stickleback, with its strong pectoral spines, and another species very plentiful in the stream and adjoining lake. A few stomachs were empty, or contained only a light-coloured mucus. The back and crown of the head, as seen immediately after the fish is taken from it native element, are of an intense olive-black, profusely spotted with darker spots, which extend to the dorsal fin, and decrease towards the lateral line. The spots on the back are scarcely to be observed after exposure for a short time to the atmosphere, and the upper parts rapidly shade into blue-black. The largest out of eight or ten captured by our party measured sixteen inches in length, and its greatest depth, just anterior to the dorsal fin, was three inches and a quarter. The smallest, possibly a third or fourth year fish, measured thirteen inches in length, its greatest depth being two inches and three-quarters. It differed only in the number of spots on the gill covers, there being four and six on opposite sides, whereas nine large rounded spots usually characterize the adult. The fish spawns in the above situation early in November, and also pushes into the lake for the same purpose, where numbers are caught, but they do not jump readily in still water;

indeed, in July and August it is frequently impossible to "get a rise," although hundreds may be seen lying at the bottom of the lumber dam basin. The flesh is of a rich salmon-colour in spring, getting paler as the summer advances. The flavour, although not equal to that of the salmon, and wanting the delicious relish of the brook trout, is vastly superior to that of the togue, or any of the lake trouts.

I now come to the descriptive details of this beautiful and little-known salmonoid, which, the reader will observe, formed the main object of my excursion to these lakes. Although long familiar to the natives and whites under various appellations, it did not receive attention from scientific observers until 1855.*

In comparing data of the various waters in which it has



THE SILVERY SALMON TROUT (SALMO GLOVERI).

been hitherto recognized, I feel that, irrespective of records, I should have been unable to fix its geographical distribution without the assistance of several observant fishermen friends, who chose to interest themselves in the natural history

* Girard was the first to describe this trout under the name of *S. Sebago*, calling it doubtfully a salmon trout. (*Acad. Nat. Sciences, Penn.*, 1853.) And subsequently, unaware that he was characterizing the same fish, names it a new salmon trout, *S. Gloveri*, from Union River in the state of Maine. (*Proc. Phil. Ac. of Arts and Sciences*), 1855, p. 55.) I learn from Mr. Boardman that it has been exterminated in the Sebago Lake. We find Dr. Gilpin (*Nova Scotia Institute of Nat. Sciences*, April, 1866, p. 86), recognizing the *S. Gloveri* in the lakes of that province, and Loch Lomond in New Brunswick. He states, moreover, that it is named the "gray ling" about Halifax.

of this remarkably fine salmon trout. My especial thanks are therefore due to Dr. Gilpin, of Halifax, and Dr. Fiske, of St. John, also to my friends Major Monk, Captain Wolseley, and Lieutenant Young of the 22nd regiment.

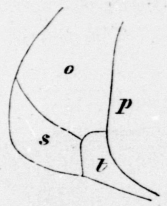
The haunts of the *Salmo Gloveri*, which I have named the Silvery Salmon Trout, as far as is yet known, appear to be restricted to the Atlantic provinces.* No doubt, like other species rather localized, it is frequently confounded with varieties of the Brook and Sea Trouts. This may be owing to the diversities in colouring of specimens caught in different seasons, and also to its dimensions, which apparently differ in certain waters. It would seem, from information furnished me, that there are few of the great rivers fed from lakes and flowing into the Bay of Fundy in which the "shiners"† have not been seen, and perhaps the same may be said of the Gulf of the St. Laurence, as its presence at the present day in the Saguaney might demonstrate. The westward distribution has not been defined, and therefore I am inclined to believe in its restriction to the eastern portion of the Canadian Dominion and the state of Maine, which, regarded as a zoological province, is only a portion of New Brunswick. I opine that the chief reasons why it came to be considered a dwarfed race of salmon are that according to prevailing opinions it was only to be met

* These are as follow: Schoodic Lakes, on the western frontier of New Brunswick; Loch Lomond, and Mispeck River; Union River, Maine; Saguenay River, and its head waters. In Nova Scotia its presence has been established in St. John's Lake, Grand Lake, Salmon River, and Pockwock Lake. According to Mr. Herbert, in his "Fish and Fishing of the United States," it is said to have once frequented the Kennebec River in the state of Maine. I have no doubt, however, that further researches will greatly extend its boundaries. It was noted as far back as 1842 by the late Dr. Gesnser, in his "Geological Report on New Brunswick," under the name of "shiner," from specimens seen by him in the situation I am now describing.

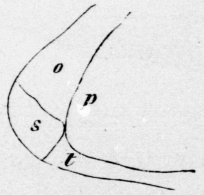
† So called by Europeans, from the very brilliant white lower parts of individuals captured in early spring or in autumn; when "struck" it flashes forth the molten silver of its lower parts in a very dazzling and conspicuous manner.

with in lakes and rivers cut off from the sea by mill-dams and such-like artificial or natural obstructions; however, it is now known that such is not invariably the case, for in some instances, doubtless, like the sea trout, it at all events visits the tidal waters; and yet, as we shall see, like the smelt, white fishes, cusk, etc., it can also prosper and multiply without going into salt water.

There are few fish, if any—not even the king of fresh-water fishes included—that rival this beautiful salmonoid in the game qualities which the rod and line involve, or surpass it in



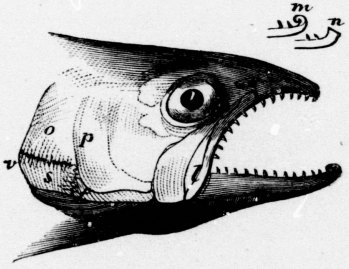
GILL COVER OF S. SALAR.



GILL COVER OF S. GLOVERI.

beauty, strength, and symmetry, although there may be some difference of opinion as regards the relative excellence of its flesh, which, in point of richness, cannot be compared with that of the salmon; however, the persons who maintain its connection with the last, allege that the differences in these respects are owing to its restriction to fresh water. I shall, therefore, now proceed to show the anatomical distinctions between the two and other salmonoids of the North American continent.

In the first place, the outlines of the gill covers of allied species with which it is at all likely to be confounded, show, for example, as regards the salmon (*S. salar*), on the preceding page, that the posterior point of juncture between the operculum (*o*) and the sub-operculum (*s*) is about *half-way* between the upper end of the gill opening and the lower angle of the sub-operculum in the salmon, whereas in the silvery salmon trout and sea trouts it is nearer to the *lower* angle of the sub-operculum than to the *upper* end of the gill opening. The operculum is, moreover, relatively larger in *S. salar* than in *S. Gloveri* or *S. trutta* of Europe, indeed than in any other recorded salmonoid. The maxillary in the adult sal-



HEAD OF SALMO GLOVERI.

mon extends as far back as the posterior margin of the eye, but in Glover's trout (*l*) it reaches further; and whilst it reaches only to the middle of the eye in the parr and smalt of the salmon, in the same conditions of Glover's salmon trout I found it extending almost to the posterior margin of the orbit.

The vomer has a double row of small teeth in the young salmon, whereas there is only a single row in the smalt of *S. Gloveri*. The number of vertebræ also differ, being fifty-nine in the former and fifty-seven in the latter; as also the pyloric coeca, which from numerous instances I found to

vary from forty-nine to fifty-one,* whilst it is well known that the average in the salmon is between fifty-five and seventy-seven.

These data of themselves might be accepted as characteristic of the specific differences between the fish in question and the salmon, without reference to outward appearances and colouring; but as both also present important distinctions, it is necessary to revert at greater length to their chief peculiarities. At the same time, to a casual observer who is content to trust to external coloration, it must be admitted that there is a decided resemblance in this respect between the salmon grilse and the adult of the silvery salmon trout. In form they also assimilate; but the latter is the more elegant, the head being contained five times in the total length. We shall recur to the coloration presently; but before doing so it is necessary to compare our fish with the sea trouts. I sent several specimens to Dr. Gunthur, F.R.S., in 1868, who, after comparing them with the *S. trutta* and its form *S. Cambricus* of England, informed me that, "It differs from *S. trutta* only slightly in the shape of the gill covers, and from *S. Cambricus* in having a few more coeca—forty-nine. It has one vertebra less than either of the two British species. The fish has nothing to do with the salmon." The last remark, as might be expected from what has been already detailed, may be considered conclusive as regards the Silvery Salmon Trout being a dwarfed race of *S. salar.*

But the interest connected with the silvery salmon trout, either from a scientific or economical stand-point, requires that all should be recorded of its characters and habits. To proceed, therefore, with my personal examinations. The head is rather long as compared with its depth; I refer to

* In four specimens, including two small and two full grown, the vertebræ were invariably as stated, whereas the pyloric coeca were fifty in two and forty-nine and fifty-one in the others. Gilpin says the latter are about thirty,—evidently a mistake.

the breeding season. The operculum (*o*) is rather short, its length being not more than half its depth in the adult, whilst in the young it is much more. The operculum is well ossified, presenting the usual striæ observed also in the sewin and other sea trouts. The sub-operculum (*s*) bulges out at *v*, beyond the end of the operculum. The point of junction between the two posteriorly being, as I before stated, nearer to the lower margin of the gill opening in the adult, and about equidistant in its smalt. The pre-operculum, (*p*) has a very distinct lower margin, which passes by a wavy, rounded angle into the hinder margin. The snout is long, and knobbed in males during the breeding season, and for some months subsequently (see *m* and *n*), the prominence being of one or other of these shapes, *i. e.*, either truncated, or, recurving in the old fish, where it is always more or less permanent, and sinks deeply into a corresponding hollow in the upper jaw. The labial (*l*) is very strong, and longer than the snout. The head of the vorner differs from that of the sewin in having a few permanent strong teeth, which, as before stated, extend in the young in a zigzag line down the bone for nearly the entire length of the palatines. In the adult they gradually disappear to two or three on the head of the vorner. It would appear, therefore, that the teeth differ in the *sewin* and *Gloveri*.

FINS.—The fins of the *S. Gloveri* are moderate in length; the tail is deeply forked in young and adolescent specimens up to eight inches in length, but the longest rays are not twice as long as the middle rays. In the adult and aged the hind margin of the tail is nearly even, but never rounded. I have examined its parr in June, and the smalt in December, when the blue bars seem to be present even in specimens from eight to ten inches in length, which, moreover, retain eight to ten red spots along the lateral line. There are always large circular black spots on the gill covers, more numerous and conspicuous in certain specimens than in others, and scarcely ever in the same numbers on both sides. The result

of many investigations has led me to establish the fin formula as follows :—The gill rays being 11 to 12, D 14, P 13-14, V 9-10, A 10, C 21$\frac{5}{5}$-$\frac{6}{6}$.*

The head of the silvery salmon trout is bluish-black above, silvery on the cheeks, increasing to pearl-white on the throat. There is often a tinge of brown on the lower jaw and pre-operculum. In fresh specimens captured in rapids during the breeding season, and in spring, there will be found numerous dark circular spots on the crown of the head. The back and tail are of the same colour, sides silvery, belly pearl-white and spotless. Black spots extend over the dorsal region, on its fins, and the tail, and along the sides of the body, between the lateral line, but stop short of the belly. In males, a few red spots are met with here and there in the centre of the black spots. The inner surfaces of the pectoral and ventral and the sides of the anal fins are tinged with black. I have failed, among the extensive collections examined at all seasons, to observe the X-shaped spots of the sea trout and sewin. Here again there is another apparent distinction between it and its close allies.

The eye is large in proportion ; its sclerotic is a dirty white, and the iris pale yellow. The molten silver colouring of the breeding season is especially brilliant in this fish, and the brown taints on the head sometimes extend in irregular patches along the abdomen ; indeed, when in full dress, I do not know a more attractive salmonoid.

The teeth are largest on the tongue, where they vary in number from eight to twelve, decreasing relatively from the outer maxillaries to lower labials, labials, palatines, and vomer.

The average weight is from two and a half to three pounds, but individuals are captured of seven pounds, and on reliable authority I know of one caught through the ice on these lakes weighing ten pounds and a half. Even larger fish are mentioned

* Gilpin (*op. cit.*, p. 88) gives the formula thus : D 12-13, P 14, V 9, A 9, C 20, but the number varies, and dividing rays are apt to be counted as two.

by fishermen, but any weighing over six pounds are uncommon. It is extremely prolific, swarming at certain seasons in the effluent and influent lake streams, where thousands are speared, netted, and taken by rod. Unlike the sea-trout, when struck it leaps often out of water, and never dives.

The relative dimensions of the individual, page 213, drawn from a photograph, when compared with a salmon of nearly the same size, are as follows:—

	Silvery salmon trout: weight, 1½lb.		Sea salmon; weight, 15 oz.	
	In.	Lines	In.	Lines
Length from tip of snout to ends of tail	17	5	15	6
„ „ ends of central rays of tail	16	1	14	5
„ „ end of scales on tail ...	15	1	13	7
„ „ end of base of adipose fin	12	5	11	1
„ „ end of attachment of anal	12	5	10	11
„ „ anus	11	...	9	7
„ „ first rays of ventrals ...	8	5	6	9
„ „ end of dorsal	8	6	7	2
„ „ commencement of dorsal	6	5	5	9
„ „ posterior edge of gillcover	3	6	2	8
„ „ nape	2	5	1	8
„ „ posterior edge of orbitar bones	1	7	...	...
„ „ base of snout, *i.e.*, hind part of orbit... ...	1	9	1	2
„ „ centre of orbit	1	5	1	...
„ „ tips of labials	1	9	...	...
Length of labial bone	1	2	1	...
„ lower jaw	2	1	1	7
„ pectoral fin	2	...	1	10
„ ventral	1	5	1	5
„ ventral appendage	...	3/10	...	...
„ attachment of dorsal	2	1	...	...
„ longest rays of ditto	2	2	1	8
„ last ray of ditto	...	9/10	...	7/12
„ attachment of adipose fin	...	6/10	...	6/12
„ height of ditto	...	6/10	...	7/12
„ attachment of anal	1	2	1	1
„ longest ray of ditto	1	6	1	5
„ space between anal and tail	2	2	...	...
„ lobes of tail	3	...	...	...
„ central rays of ditto from end of scales ...	1	...	1	5
„ depth of caudal fork	1	...	...	7/12 *

* These two last admeasurements are very diagnostic between this species and the salmon; the rays being less scaled in the latter, whilst the caudal fork is not so deep.

In the same stream, and in company with the above, my friend Mr. Young captured two small fish, which appear to me to be the smalt of this species. These I carefully compared with the silvery salmon trout and parr of the salmon, and found that as regards shape, fins, gill rays, and outward form, they agree in every particular with the former. The settlers and trappers about Sciff Lake, in the upper Schoodic region, state also that this is the young of the "shiner;" and as the salmon does not frequent these waters, the probability is strong that this is the parr or smalt of the *Salmo Gloveri.* The following are the distinguishing points of the two specimens referred to. Both were males: length, five inches and a half; upper parts and tail bluish-black with evident traces of darker spots on the head and back. Sides, silvery below the lateral line. Upwards of nineteen brilliant vermilion spots along the lateral line; gill covers silvery, with two or more round black spots on the operculum. There are ten oval light blue bars crossing the lateral line, as in the parr of the salmon, and most evident when the scales are removed.

The best, and, as far as I know, the only recorded description of its spawning bed, is given in an interesting report on the "Fisheries of the State of Maine," by Mr. Foster.* He says: "These beds are made in the gravel where the current is rapid, but just on the verge of a ripple in the water; rarely seen on the lower side of a ripple. They make large excavations—the sand and gravel for which are carried out by the current, and form a mound below. A large number of both sexes are often seen together in one hole. No fighting is observed among the males. It is more common, however, to see a single pair working together, lying side by side in the nest. They make the excavation by fanning with the tail, no digging with the head being observed. They spawn near the entrances to the lakes. Whether the spawning beds lie in their course, or that the fish are attracted by the rafts, but in early

* See Report for 1867-8.

spring they keep in the tracks of the rafts, crossing the lakes as if following them (the rafts) to the debouchure."

One of the most picturesque portions of the western Schoodic region is Grand Lake. This noble sheet of water is broken here and there by islets, and surrounded, even to the water's edge, with forests of pine and hard wood, whilst its bottom is covered with granitic boulders, which, in combination with drift, are spread far and wide among the arboreal vegetation around. Great banks of gravel run along the side of the effluent stream, where a slate formation, possibly Silurian, has a dip scarcely less than the perpendicular, and a strike right across the mouth of the Grand Lake Stream. The slate, again, is flanked on the lake side by syenitic rocks, which form the basin of this and the other lakes. The hypothesis that many lake basins have been brought about by the friction of solid masses of ice during the Glacial Period, requires, when applied to the Schoodic and other New Brunswick lake reservoirs, that the glacial erosion should have been enormous to have excavated these vast troughs in solid granite, even supposing the existence of highlands in their vicinity from which the frozen masses received their momenta, which however in this case are entirely absent, besides the fact that lake basins are wanting in other situations where the beds are composed of much softer rocks. That these lacustrine depressions may have resulted from phenomena in connection with previous aqueous erosion, and irregular or violent oscillations of level during periods of upheaval and depression, and moreover that the pre-glacial deposits existed at the time when the glaciers first passed down the valleys and were removed by them, are to me apparently legitimate deductions when the facts in connection with the strata and surface geology are duly weighed. But speculations with reference to this remarkable epoch in the earth's history must of necessity be at variance with one another, more especially when one set

of observers continues to adhere *entirely* to what is called the "glacial" and another to the "iceberg" theories.

The stillness of the scenery is impressive, and after the eye has ranged over the great expanse of wood and water, or revelled in the varied, changing, and unparalleled beauty of the maple and other leaves in autumn, and got accustomed to the prospect, the mind naturally longs to know what manner of animals live in these forests of maple, poplar, spruce, and pine, with the charred and weathered forms of their dead brethren towering weird-like above the living.* Or, peering downwards, we desire to become familiar with the denizens of the deep, for at this season in vain we scan the mirror-like surface in quest of waterfowl, and to no purpose troll for "togue," and run silently up the weedy shores in quest of ducks. Then, shooting across the placid bosom of the lake for several miles, we begin to meditate a return to camp, when hark! at last the solitude is broken. What is that loud plaintive cry proceeding from yonder island, and echoed back in scarcely feebler sounds from the opposite cove? It is the familiar "wu-loo" of the great northern diver, and we spy its long neck in the distance. Louder and more frequent are the cries; another and another chimes in on our starboard side as we move rapidly forward, and the Indian spies young loons with their parents not five hundred yards off. More garrulous do the old birds become as we approach; at length, after expending their cries in vain, they raise their graceful figures, and in the usual way, half flying, half swimming, splash the waters with their wings like the paddles of a steamboat for upwards of fifty yards, then rising above the surface, shoot rapidly away to yonder islet in the distance, and abandon their offspring to their fate.

During our sojourn at Grand Lake, I captured several red-

* During a short excursion on the shore I came on the trail of bears among the blue berries, and several footprints of Virginian deer were also noticed.

fins, chub, dace, sticklebacks, etc., and, strange to say, found almost every individual enormously distended by a species of TAPEWORM. The abdomen was so enlarged that in many cases the flat worm could be discerned through the attenuated walls, slight pressure producing rupture, when one or more of the creatures were seen lying loose in the cavity. I examined one five inches in length, extracted from the abdominal cavity of a young chub not over three inches long. This specimen, like the others, belonged apparently to one species, and represented the undeveloped and jointless state of the *bothrocephali*, or broad tapeworms. The head was pointed, body rapidly widening for the anterior third, then tapering steadily towards the tail, which was slender and pointed. None of the silvery salmon trout or perch captured contained them, nor were there apparently any embryos of the parasite in the livers and viscera of redfins and dace, which contained the above in the abdominal cavity. On the generally received opinion that these worms never attain a perfect state until they get into the intestines of other species of fish that prey on their host, one would expect to meet with perfect *bothrocephali* in the silvery salmon trout, perch, and pike, that devour the redfins, etc. Moreover, the water-fowl, herons, etc., should be infested by them; and perhaps such is the case, although I could not discover these parasites in their interiors. But an allied species is found also in man, and apparently it has not yet been shown from whence he derives the unwelcome tenant. The subject, viewed from the above point of view, presents some unpleasant features as regard fish food; but there is a certain obscurity still hanging over the whole study, that leaves room to question whether the development of all the stages of tapeworms is not possible in the same animal. At all events, I cannot recommend the chub, etc., of the Grand Lake Stream as savoury articles of food, and am only too happy to be in a position to state that the silvery salmon trout, as far as I

know, is *piscis integer et innocens* as regards those disgusting parasites.*

The effects of LIGHT on the colouring of fishes are well-known, and doubtless the denizens of the Canadian rivers must be materially influenced in these respects, seeing that the fresh waters are hermetically sealed for nearly half the year, whereby, moreover, we are debarred from knowing what may be going on in relation to their migratory movements. Indeed, I have frequently noticed in brooks and rivers free from obstructions, that the trout is far more highly and brightly coloured, and in better condition, than the same species inhabiting waters shut off from the sea by impassable waterfalls or artificial obstructions. This is so very apparent that every one experienced in Canadian trout fishing can at once make out the difference. Thus the more rapid the stream and the less shaded by forest, with a pebbly bottom, the more brilliantly and clearly coloured are its fishes; moreover, this is so conspicuous as regards the brook trout, that the red-bellied variety was at one time considered to be a very good species.† In fact, the more one sees of fishes in nature, the more it becomes apparent that by trusting to colouring and other external characters, influenced by locality and seasonal changes, there is a certainty of falling into the grave error of proclaiming objects as distinct species which are only varieties. I am sadly afraid many naturalists in their zeal do delight in "species manufacturing," and care little for what the future may disclose, when the "truth will out," and all their beautiful species must cease to be considered other than forms of what had been described previously. In no branch of Natural History is this more apparent than among fishes, and especially the

* Dr. Holmes, in the Maine Report before quoted, speaks of a species of caligus which infests the scales of this trout. I looked for it particularly, but failed in discovering the parasite. Perhaps it is peculiar to the lake life of the fish, and disappears when the latter enters the rapid streams in June, which to the above is seemingly as the sea is to the salmon.

† "Natural History of New York," vol. iii., p. 236, pl. 39, fig. 136.

family *salmonidæ*, which at present contains several hundred species.

I have dwelt at length on the natural history of the silvery salmon trout, not only on account of the scientific interest in connection with the appearance and habits of a rare and very little known fish, but also with the view of attracting more attention to its presence, in hopes that, through the efforts of the pisciculturist, it may yet find its way into the lakes and rivers of the Old World, as I am informed by Mr. Boardman it is now flourishing in the New Hampshire waters, into which it was introduced some years since. A lake fed or drained by rapid rivers is its favourite resort at present, although I believe this condition has resulted more or less from the pressure of circumstances, and that the fish originally pursued habits similar to its close allies the Canadian and European sea trouts, from which it differs in some characters, which entitle it to be considered a salmon trout distinct from any of the others. At the same time it recommends itself to the notice of all followers of Walton, for, indeed, any old fisherman's heart will beat audibly on witnessing the spring of this fine fish when struck; then I have seen it toss itself fully four feet out of water, and at the Grand Lake Stream sluice I watched an individual stem a powerful torrent for several minutes.*

It is rather remarkable that no one has yet established specific distinctions between the so-called SEA TROUTS of north-east America and the well-known European fishes of the same name. There is a very poor drawing and meagre description in Cuvier's great work of a sea trout sent to him from Canada by Colonel Hamilton Smith, and to which he has given the name of *Salmo Canadensis*. This is the more to be

* In the Madawaska, one of the rivers draining off the contents of the great lakes near the sources of the St. John, I was told that there is a "silvery sided pigmy salmon, or small grilse," which the French settlers name the "pointeur," from its aptitude to jump at bait or fly, but whether it be this fish or not, I do not know.

wondered at seeing that sea trouts are abundant on the eastern Atlantic shore from Maine to Newfoundland, and I regret I cannot in any way, from personal observation, clear up this strange hiatus in the natural history of a common fish. Mr. Perley, not only a fisherman of much practical experience, but also an observer of the appearances of fishes, considered the sea trout of Canada as being identical with the *Salmo trutta* of Europe;* but I doubt very much if he looked deeper than a few external appearances; at the same time it will not surprise me should his opinion be confirmed; indeed, as far as written descriptions and accounts of the habits of the fish extend, there is a very decided resemblance between the Old and New World species. Dr. Gilpin† gives a minute account of the Sea Trout found in the rivers and salt waters of Nova Scotia. I perceive, moreover, in comparing Dr. Gilpin's description of *Salmo Canadensis* with *S. Rossii* of Richardson,‡ that there is again a decided resemblance. I shall point out again presently how the sea-run brook trout is often mistaken for this species; indeed, in some of the rivers on the north-eastern shore of New Brunswick, to wit, Tabucintac, incredible numbers are captured by the settlers, who consider they are taking the BROOK TROUT. But the important question comes to be, is there any connection between it and the silvery salmon trout just described? Is the latter a land-locked variety of the former? Mr. Wheelright§ observes that the sea trout of north-western Europe gets land-locked, and individuals in consequence never visit the sea. It would be exceedingly curious and instructive to show whether or not the changes in *Salmo Gloveri* admit of contrast with *Salmo Canadensis*, so far that by natural selection we could safely allow it to be a variety of the other, more especially as I have pointed out that the anatomical characters common to both as established by one of the most competent of living ichthyologists, indicate that a very

* *Op. cit.*, p. 197.
† *Op. cit.*, p. 84. 18[illegible].
‡ "Faun. Bor. Amer.," p. 163.
§ "Spring and Summer in Lapland."

close and specific relationship does exist. I have, moreover, a strong conviction that the so-called *Salmo Canadensis* will turn out to be specifically identical with *Salmo trutta*, or else there is more than one species in the cis-Atlantic waters. As to the sporting qualities of the former, although it was not my fortune to capture it in the main rivers and briny deep, I have the descriptions of several fishermen vivid in my thoughts; and there is also the record of two, whose practical experience may be accepted by those who may desire to indulge in the exciting sport. "The sportsman will find it a thoroughly game fish, rising well at a brilliant fly of scarlet ibis and gold (in June), and affording sport second only to salmon fishing. The writer has caught this fish with the scarlet ibis fly in the water of the Nuf, at the entrance of St. Peter's Bay, on the north side of Prince Edward Island, to the weight of five pounds; but the most sporting fishing is from a boat under easy sail, with a 'mackerel breeze,' and oftentimes a heavy 'ground swell.' The fly skips from wave to wave at the end of thirty yards of line, and there should at least be seventy yards more on the reel. It is truly splendid sport, as a strong fish will oftentimes make a long run, and give a sharp chase down the wind."*

Frank Forrester, in his "Fish and Fishing," calls it "royal sport;" moreover, a friend informed me that on the north-eastern shore of this province, in July, himself and two other fishermen landed no less than 400 sea trout in one day with the fly, from the waters of the river Tabucintac, which flows into a gully of the same name, famous, as before stated, as one of the best wild-fowl shooting-grounds, and where, in the beginning of October, abundance of wild geese and ducks are readily obtained.

* Perley, *op. cit.*, p. 199.

CHAPTER X.

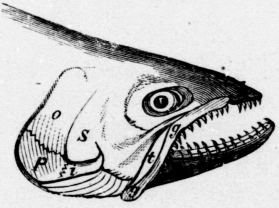
The Brook Trout of North America, and its Varieties—Trout Fishing, and Game Qualities of the Brook Trout—Lake Trouts of Boreal America—The Mackinau Salmon or Namaycush, or Great Trout of the Lakes—The Siscowet—The Togue—Distribution, Haunts, and Distinctions of the Species—Lake Trout Fishing—Smelt of North America—Capelin—White Fishes—Shads—Cusk—Alewive—Striped Bass Fishing—Perches and Lake Bass—Sturgeon Fisheries—Lamprey—Cat Fish—Eels—American Hake—Marine Fishes.

THE BROOK TROUT of North America is what naturalists call a good species; nevertheless it is being constantly confounded on the Atlantic seaboard of Canada with the sea trout, with which it is frequently found; but the shortness of the intermaxillaries (page 230, *h*), and the length and narrowness of the labials (*g*) are very characteristic. Indeed this ready method of characterizing the fish is worthy of the especial attention of persons in the way of procuring these salmonoids, inasmuch as Europeans are constantly confounding the one with the other during the migratory seasons, when each is on its way from or to the ocean.

The brook trout is further distinguishable in the following particulars: the labial (*g*) is four times larger than the intermaxillary, extending for some distance behind the orbit; its crest (*t*) is thin and sharp on its upper edge, and differs consequently from the sea trouts of both Europe and America, as well as the brook trout of the former, which has a much broader crest and labial. Again, the distance from the tip of the snout to the extremity of the labial equals the length of

the upper surface of the head. The inter-operculum (*i*) is short and triangular, the sub-operculum (*p*) is about half as high as the operculum (*o*). The pre-operculum (*s*) has its lower margin well rounded, resembling a shepherd's crook, with the extremity turning *upwards*, and not *forwards*, as in many allied trouts.

The triangularly-shaped cluster of sharp teeth on the outer part of the vomer is another pointed character. The lingual teeth appear to vary in number from three to six on each side, but I am not certain if this is not a sexual distinction, or connected with age; the gill rays also vary from eleven to twelve on either side. The fin formula is as follows:—Dorsal rays, 10-13; pectoral, 12-13; ventral, 8-9; anal, 10; caudal, $19\frac{5}{5}\text{-}\frac{8}{8}$.



BROOK TROUT.

The lateral line contains 116 scales; the vertebræ are 68; and there are 38-39 pyloric cœca. The above are the only safe characters whereby this trout is to be distinguished; indeed the naturalist or fisherman trusting to outward aspect and colouring must be prepared to meet perplexity in every brook and inland water. The lower fins have invariably white margins, with more or less of a black lining, whilst the vermilion and golden spots, red hues, and pale of the belly are subject to much diversity, and are unquestionably connected with the food and haunts of the individuals. Thus, the darker shadings will invariably be found in the denizens of muddy lakes and dark waters,

whereas the trout of clear sunny brooks, as also the sea sun-fish, display most beautiful vermilion and golden spots with intensity of the white, the latter often appearing like molten silver.*

The aspect of the fish changes rapidly once it has got into the tidal waters, the contour then being much like that of the sea trout, whilst the flesh becomes pink from feeding on mollusca and echinæ. So changed is the individual then from the permanent denizens which do not migrate to the sea, that it is a common assertion by persons who capture the fish on such rivers as the Miaramichi that there are "two sea trouts" met with in summer, the one being the above and the other the true sea or salmon trout. I procured many specimens of the former, and after subjecting them to careful comparison, find that, with the exception of the brilliancy of colouring and salmon-like form, all were but highly-dappled brook trouts, very different, it must be granted, from denizens of the forest-shaded loch or dark inland waters. Indeed, so distinct are the colourings of the trout after it has dipped itself in the sea, and those of individuals from the latter, that when they are placed side by side I do not blame the observer trusting to outward signs in connection with colouring, should he at once pronounce them distinct species; moreover, irrespective of the conditions above mentioned, no doubt the long sojourn under ice exercises also an influence, as the colouring of fishes is apparently greatly predisposed to be acted on by these and such-like influences.

The brook trout averages from one to two pounds, the largest attaining to five or six pounds. Although many pro-

* I noticed that this species is very sedentary in many brooks and influents of the St. John River; so much so, that there is no difficulty in distinguishing individuals from different localities. The red-bellied trout (*S. erythro-gastra* of Dekay) is a good example of the highly coloured denizen of the clear sunny waters, especially such as flow over the Devonian and Silurian slates of the middle and northern portions of the province.

ceed to the tideways of rivers in autumn, the migration is by no means general, even in rivers free from artificial or natural obstructions.

Allowing for the majority of the larger trouts being captured, many brooks absolutely swarm with the fish, with very few exceptions not averaging over a quarter to a half pound in weight, whilst in the lake from whence the brook rises, large dark-coloured residents called "bull trouts," which never leave it, are found, to the exclusion of the small fry. This is so remarkable in some instances that the settlers account for it by supposing that the adults prey on the young and expel them from their haunts; hence fishermen say that more spawn and fry of this and the other salmonoids are destroyed by the animals themselves than by rod, line, or spear.

Notwithstanding the varieties consequent on the external surroundings, there are one or two associated brook trouts which may be distinct species. For example, should the following turn out to be only a race of the brook trout, it is assuredly a very well-marked one. Into Lake Utopia, before noticed, flows a small stream from a tarn in the vicinity. In October vast quantities of the true *S. fontinalis* are met with on their way to spawn in the tarn; whilst in Lake Utopia, the entrance of the brook, is a trout of an average smaller size, of a silvery grey, profusely spotted with yellow all over the back and sides, including the dorsal fins; the lower fins are white-margined, but otherwise there is a very decided difference between the two sorts. The former are then heavy with ova, but the light-coloured have neither the ovarium nor the milt highly developed; and as to size, individuals of the same dimensions of each sort are plentiful, so that the differences in colouring are not dependent on age. I could find no anatomical distinctions between the two; and as neither can get to the sea, on account of a very precipitous water-fall, and the light-coloured trout seems peculiar to the lake, and is not seen in any of its influent or effluent waters, but always apart

from the other, this question might fairly be put, Is the light-coloured trout a distinct species? If not, what is the cause of the abnormality? The so-called *Salmo oquassa* (Girard),* met with in the deep lakes in Maine, would seem from description to be closely allied to if not identical with the last. Its local name, "blue back," with the general colourings of the sides and lower parts, very closely approach the above, which therefore may be considered distinct from *S. fontinalis*—at all events, as usually met with in New Brunswick. I do believe however, if we were to note all the peculiarities of the fresh-water salmonoids of even the region now under consideration, that as far as differences are concerned the number hitherto recorded might be quadrupled. Indeed the question, "What constitutes a species?" may well be asked in connection with the salmon family, but we can scarcely blame the cabinet naturalist, with only skins, preserved specimens in spirits, drawings, and descriptions before him, should he be disposed to multiply their numbers. A feasible explanation is the interbreeding of allied species forming fertile varieties, which under such conditions would be increasing the already extraordinary number of forms which, even as far as the British Isles are concerned, have become very numerous, indeed perhaps too numerous.† By this I mean that if we studied their habits and haunts as carefully as we do specimens, no doubt many so-called species would turn out to be only seasonal conditions or local forms.

The brook trout, unlike its European congeners, seldom refuses the earthworm at any season, but in July will readily jump at the artificial fly, generally preferring a "red hackle." In the numerous streams it is met with in enormous numbers; perhaps no salmonoid is more prolific, whilst few, if any, excel

* "Boston Society of Natural History," vol. iv., p. 262.

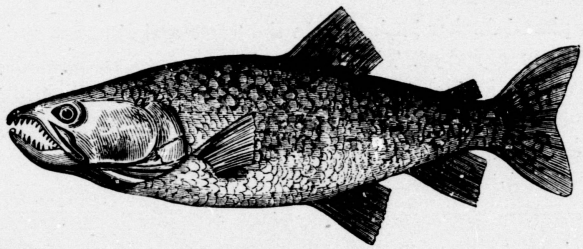
† See Gunthur in his admirable monograph published in the "Proceedings of the Zoological Society," and also the "Catalogue of Fishes" in the British Museum. 1862.

it in the grace and elegance of its motions. I think it a more powerful fish than its European ally, as certainly it equals, if not surpasses, any of its tribe in brilliancy of colouring.

A more beautiful sight can scarcely be imagined than, by the side of some pool "o'erhung with wild woods thick'ning green," to peer through the darkening waters, and watch the finny tribes pursuing their various modes of life. It is not often one is so fortunate, but now and then, among the clear waters of the numberless brooks running over the granite and slate rocks of New Brunswick, I have come on a basin below some cataract, with its bottom covered with rounded stones, where, by the side of the water-logged pine or jutting shelf, half hidden from view, and tiger-like prepared for a sudden dash, lurks the brook trout. See, those large bright eyes are scanning every corner! How graceful are the movements of the fins, every ray of which is in motion; whilst the regular heaving of the gills, and the play of the lissom but muscular body, show that he is able and ready to pounce on whatever objects his choice may determine. At length something appears, and before we can well note his absence he has shot through the clear waters, captured his prey, and returned once more to his hiding-place!

LAKE TROUTS.—The non-migratory lake trouts of North America, as far as has yet been ascertained, comprehend three forms, to which the following specific names have been given: the NAMAYCUSH, or GREAT TROUT OF THE LAKES; the TOGUE, or GREY-SPOTTED LAKE TROUT; and the SISCOWET. The first was described by Pennant at the close of the last century, the second by Dekay in 1842, and the third by Agassiz in 1850. According to the present state of our knowledge of their haunts, it appears that the namaycush inhabits the great lakes extending from the Northern United States to the Arctic Sea. The togue is said to frequent only the New England, Nova Scotian,

and New Brunswick lakes, including the state of Maine; whilst the siscowet is seemingly restricted to Lake Superior, where Agassiz also recognized the namaycush. But little is known of their habits; moreover, several instances have occurred lately of one or other of these trouts turning up in lakes where their presence was unsuspected; it is, therefore, not unlikely, when their geographical distributions are better worked out, that this seeming partiality to certain waters may, after all, be more apparent than real. Further, it appears that their claims to be considered distinct species rest altogether on certain minor details of structure and colouring in each, which, however, have been further abridged by late researches. It



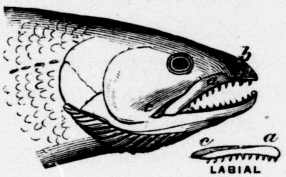
THE TOGUE, OR GREY-SPOTTED TROUT OF THE LAKES.

will not, therefore, be surprising to such observers as may have enjoyed opportunities of studying them in their native haunts, should these so-called species turn out to be only varieties of seasonal or sexual conditions of one grey-spotted lake trout, common to the boreal regions of the continent. I shall now point out the recorded differences between each, together with my own personal observations of the togue, as met with within the boundaries of our region.

The namaycush, Mackinau salmon, and salmon trout of the Canadians is known to Indians by various other names. It was first described by Sir John Richardson, who gives a lucid account of the fish.* The most noticeable differences

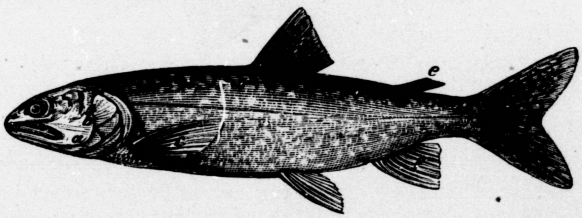
* "Fauna Boreali Americana," p. 197, pl. 79, 85.

between it and the other two are in the formation of the labials (*a*), where the crest (*c*) projects beyond the limb of the bone, the latter being not quite three times the length of the intermaxillary (*b*). This peculiarity (if persistent) is certainly very characteristic of the namaycush. The ventral fin



HEAD OF THE NAMAYCUSH.

is placed further back than in the togue and siscowet, and the tail is more forked. There is a double row of teeth, extending at least half an inch backwards on the vomer. The teeth, gums, and roof of the mouth have a tinge of purple, hence Mitchell's name, "Amethystine Salmon."



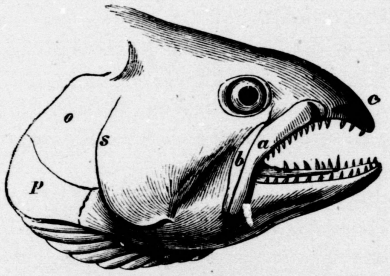
THE SISCOWET.

The siscowet is known by this native name apparently in contradistinction to the last, which is also found in Lake Superior. The former appears to be very plentiful about Isle Royal. Agassiz makes out the following distinctive characters; but as many are also common to the other two, I merely indicate the discrepancies. The lower branch of the pre-operculum (*a*) is more extended than the upper (*b*). The pectoral fin (*c*) is

longer, and further from the gill opening, than in either of the other two trouts, and the dorsal (*d*) is said to be larger, with a more slender and less club-shaped adipose fin (*e*). The anal (*f*) is as high as the dorsal, but not so long.

The Togue was supposed to be identical with the namaycush until Dekay's description, when he named it *Salmo confinis*.*

I find, however, that his so-called differences are in several instances not general; and perhaps a better acquaintance with their natural histories will further establish a closer connection between the two. For several years this fish, as met with in our waters, was supposed to be identical with the Loch Awe



HEAD OF THE TOGUE.

trout (*S. ferox*),† from which it seems to differ in many points.

I had abundant opportunities of seeing the togue at all seasons and in various stages of its growth, so that, as far as the denizen of our forest-shaded lakes is concerned, I believe the following will be found to be an accurate description of its appearance and habits.

The external colouring varies of course according to the

* "Fishes of New York."

† Mr. Perley was, I believe, the originator of this opinion, from a comparison between figures and general descriptions of the European fish.—*Op. cit.*, p. 197.

nature of the lake bottom, and whether or not the individual may have been caught during the breeding season. When in full vigour, in October, during the spawning month, the males, with the exception of the unusually large individuals, will be found very much alike, and more or less of a dark greenish-grey, getting fainter towards the belly, which is dappled with dull and purer white patches. The yellowish-grey spots, some as large as buck-shot, extend over the body and tail. The latter is said *not* to be the case in the namaycush, but from Agassiz' drawing,* they are evidently present on the tail of the siscowet.

There is more or less of an orange tinge on the lower fins, especially the pectorals, but the purple in the inner surface of the mouth of the namaycush is seemingly absent in the togue.

In full health and vigour the Togue presents a close resemblance to the full-grown salmon. The head forms one-fourth of the total length from the snout to the tip of the caudal. It is rather flat above and convex in profile. (See pages 235 and 237.) The eye is midway between the tip of the snout and the nape, and about twice as near to the former as to the hinder edge of the gill cover. The labials (p. 237, *a*) are fully three times as long as the intermaxillaries (*c*), thus contrasting with the namaycush, but identical with the siscowet. The labial crest, (*b*) does not extend beyond the extremity of the bone, as it does in the namaycush. The length of the lower jaw is equal to that of the upper surface of the head. Like other lake and river salmonoids, it has a prominent knob on the extremity of the lower jaw, which in ordinary sized males is not permanent, and only seen during the spawning season. In old males, however, it is very conspicuous, and, as in the salmon, fits into a cavity in the upper jaw; indeed it would appear to become developed with age, so that all very large salmonoids have it more or less throughout the year. The gill covers

* "Fishes of Lake Superior."

are almost similar in the three, and broadly distinctive as compared with the brook trout, and the sea and salmon trouts, whilst the outline of the gill cover, and the relative dimensions of the operculum (*o*), and its points of junction with the sub-operculum (*p*) in all the American lake trouts, assimilate closely to the salmon (*S. salar*), whilst the crescentic outline of the pre-operculum (*s*) is broadly distinctive, and resembles that of *S. ferox* of Europe.

In the New World lake trouts, the pre-operculum bulges to a degree, owing to the enormous development of the great masticating muscle in front. The general features of the opercular apparatus in lake trouts, as compared with other salmonoids, are distinctive: the operculum (*o*) is four-sided, well rounded, and of greater height than breadth; the sub-operculum (*p*) is nearly one-third smaller than the last, and is triangular in its upper half, elliptical in its lower borders, and terminates at its articulation somewhat in the form of a fish-hook. The operculum (*s*), with the exception of the siscowet, is long, slender, crescentic, and almost vertical, with a prominent ridge, and the usual foramina upon its anterior surface.

The teeth of the togue are strong, slightly curved, and conical; those on the outer and lower maxillaries are the largest. The vomer is armed with a few teeth in a cluster or in regular double row, as is said to be the case in the namaycush—although in the young of the former the teeth run in a zigzag way down the bone in a single row for some distance; but in old fish there are usually seven. Two adult male togues examined by me gave the following formula, which it may be remarked is absolutely identical with that given by Richardson as the scheme of dentition in the namaycush, viz., intermaxillaries, 7-7; labials, 19-19; palatines, 13-13; lower jaw, 19-19; tongue, 8-8; vomer, 7-7.*

It is worthy of note that in young and adolescent individuals of the togue, a third row of teeth is frequently observed

* "Fauna Boreali Americana," p. 182.

on the centre of the tongue, where sometimes one or two may be met with in the adult.

The fins vary considerably. By compounding many notes taken at different times from a large number of specimens, and striking an average, I found that the same discrepancies are applicable to the three American lake trouts.*

The adipose fin is club-shaped in the togue and namaycush, and, as before stated, not so long and slender as in the siscowet. The specimen represented in page 235 was a very fine togue captured during the spawning season in the Toledi Lakes, Upper St. John. It displays the powerful proportions of the fish at this time of the year, which are very different to what obtain subsequently when fecundation has taken place. The scales of this species, and seemingly of the other two, are small and elliptical, decreasing in size from above downwards. I counted in two instances 132 along the lateral line, which some authorities state takes its origin at the upper angle of the operculum, but this statement, made I believe originally by Dekay, is incorrect in the case of the togue, and it would appear, also, in the other two. The line commences at the upper third of the operculum (*a*), and curves slightly downwards until beyond the pectoral fin, when it runs straight for the tail. The latter, although furcate in the old, is by no means so in younger individuals. There is often an abnormal thickening or enlargement of the lower caudal lobe which I have seen in several instances, and the same has been noticed by other observers. It is met with in both sexes, but whether congenital or induced I cannot say; it may have originated from the friction in digging the sand for the deposition of the ova. I counted 130 pyloric cœca and 62 vertebræ† in two females of the togue.

* Thus in the namaycush, siscowet, and togue the fin rays are as follows: Gill rays, 12-13; D, 12-14; P, 12-14; A, 11-13; V, 9-10; C, $19\frac{8}{8}\frac{5}{5}$.

† "Holmes, in "The Maine Agricultural and Scientific Report, 1862,"

The togue abounds in the great lakes at the sources of the St. Croix and St. John rivers, deriving one of its local names from the Toledi Lake, where, and in Lake Temiscouata, it is extremely plentiful. Dr. Gilpin, of Halifax, seems to have been the first to proclaim its presence in Nova Scotia. According to Dekay, it is common in the lakes of New England, where Europeans give it a variety of names; its western and northern extension, however, is imperfectly noted. I am unaware of the namaycush and togue having been met with in the same waters. The partiality of the latter for certain lakes, or at all events its seeming absence from others to all appearance better adapted to its habits, may be more apparent than real, seeing that, like non-migratory lake trouts in general, it passes much of its existence in the profoundest depths, as is shown by the frequent use of a thirty fathom line in fishing for togue through the ice. It repairs to shallows to feed on trouts, smelts, and the like; indeed the last-named fish would appear to constitute its favourite winter subsistence, inasmuch as out of several individuals dissected by me in midwinter, and from different lakes, all contained smelts. It preys extensively also on eels and cyprinids, and is in fact a tyrant with an appetite so voracious, that quantities of twigs, leaves, and fragments of wood are constantly found in its stomach. The great monster will sometimes rise to spinning tackle, but in so sluggish and undemonstrative a manner, that the troller may fancy he has caught a water-logged pine or stone. In this way, I had my line checked on the Schoodic lake, when striking gently, I found I had missed a large togue, whose trenchant teeth had made a series of deep furrows in the chub with which the hook was baited. It is rare for this fish to rise to spinning tackle, and the Indian who steered the canoe assured us that he had not

p. 110, gives 113 cœcal appendages and 65 vertebræ, which, unless it is a mistake, shows considerable irregularity in the numerical proportions of the former.

seen the like before. No doubt the flashing of the blades attracted the monster, to find the chub on the hook. It is naturally sluggish and inert, and apparently much of a bottom feeder. As we glided along the shore of one of the islets, composed more or less of granitic boulders, our attention was directed by the guide to a large black object on the bottom, among a mass of stones. This he asserted was a monster togue, which, if such was the case, must have exceeded three feet in length ; moreover, he showed us two notches on the side of his canoe, representing the dimensions of an enormous individual, which an Indian had speared in the same waters during the spawning season, the admeasurement being no less than four feet five inches.

The average weight of the togue is seemingly about nine pounds, but this may not be altogether correct. I have seen individuals weighing fifteen pounds, and fishermen and Indians speak of having captured togues from twenty-five pounds to thirty pounds, and even forty pounds in weight. Probably the largest seldom leave the deep bottoms of the great lakes. A noble specimen of this uncouth-looking denizen of these forest-shaded lochs is now before me. If ever bull trout deserved the name, those prominent eyes, huge muscular jaws, broad back, deep sides, with the force of the frame centred in front, might well win that appellation for the togue. The Indian indulges his love of the marvellous when talking of him ; and although often impromptu stories are got up to amuse and impress you with the learning and knowledge of the speaker, still, even in the absence of unwritten history, one may detect figments of their wild legends and mythology, strangely mingled even with the traditions of their earliest Christian instructors,—of monster togues and sturgeons that appeared on the surface of the lakes at night, striking such terror among the tribe that they were forced to abandon their hunting grounds ; indeed such, with the pigmy fairies, giants, and other offspring of their ever-fruitful imaginations,

rendered famous whatever localities the apparitions were said to frequent.

Raftsmen accustomed to pass along Grand Lake assured me that they had often seen a shoal of togues depositing their spawn, and surrounded by thousands of eels, hornpouts, dace, etc., which assemble to feed on the ova; moreover, that neither the males nor the females remain beyond a few days on the ground. Sometimes the roe is deposited between stones, where the males may be observed fertilizing it. At this season the Indian plies his spear unmercifully, killing hundreds and wounding more. The flesh varies in colour, from orange to cream colour—according, I imagine, to the season of the year. As an article of food it is very fat, with little flavour, unless in the shape of "fish-cake well seasoned by Harvey's sauce," when the fisherman's appetite will pronounce it a delicacy, only surpassed a hundredfold by a broiled or fried brook trout, or its congener the silvery salmon trout.

The SMELT of the western Atlantic seaboard differs assuredly in several particulars from the European fish. Moreover, it may be that there are more than one species in the former waters; at all events, there is a set of smelts that never go to sea, and another that comes up the rivers merely to spawn, and returns to the ocean. Perhaps, like the brook trout and the white fish, it can live altogether in fresh water. I carefully compared many specimens from land-locked lakes, open rivers, and the sea, but could not discover any distinctions, all agreeing with the *O. viridescens* of Lesueur, and *O. operlanus* of Artedi,* the fin rays being, D, 10-11; P, 12-14; V, 8-9; A, 16 (will stand 17 if the last ray, which is cleft, is counted). The teeth and gill rays are absolutely the same as in the above; it has sixty-two vertebræ.†

* Dr. Gunthur (*op. cit.*, p. 167) also says that the American fish is scarcely distinct from *O. operlanus*.

† I examined a female which had sixty-three, this single exception occurring among eight to ten specimens examined.

As soon as the ice breaks up and drifts seaward, sculls upon sculls of this savoury fish push their ways up the rivers, where they bite bait readily, and are captured by nets. Again, at the same season the individuals of the land-locked lakes, impelled by the same instinct as the others, issue from the deeper waters, and crowd many brooks and streams so densely that the struggling mass is often lifted out of water by sheer pressure from below and behind; indeed, so plentiful are they then in the brooks running into Lake Utopia, before noticed, that I have been told by persons who had captured them by thousands, that there is no difficulty in filling a landing net at every haul. As just observed, the smelt is a favourite prey of the great spotted lake trout, which, with the brook trout, pursues them during winter, the former chasing the sculls to the influent waters, whilst the latter follows them up stream. The smelt is heavy in spawn in spring, but I have frequently obtained individuals in this state in midwinter from the sea coast; and in the large river estuaries on the Gulf of the St. Lawrence enormous quantities are captured in January in the same state. Whether the roe is retained in these smelts until the rivers open, or whether there is one set which deposit their spawn in the sea and another which deposit it in the rivers, is not apparent; at all events, the same crowding together takes place in salt as in fresh water. I observed in the St. John River that the first captured in April and May were females, and most probably they precede the males to the spawning-ground, as is seemingly the case with other fishes, and notably so with the togue and other lake trouts, as I have been told by raftsmen and others who have watched them; moreover, I have frequently supposed that the desperate scrambling which takes place in the brooks when the former is pushing up to spawn may be in part, if not altogether, caused by the combined excitement of both sexes in their desperate efforts to reach their goal.

Enormous numbers of smelt are caught on the seaboard in midwinter, mostly to feed pigs, the flesh of which becomes tainted by the cucumber flavour of this fish. As will be shown in the sequel, like herrings and others which congregate in dense shoals, the vast mass may occasionally become the sport of the waves, and, like the caplin (seldom seen so far south as New Brunswick), is sometimes cast in vast quantities on the rugged coasts of Labrador and Newfoundland.*

The sea-going smelt, after depositing its spawn, disappears, and is said to return to the sea about midsummer, when the land-locked fish repair to the profound depths of the lakes; and it is assuredly remarkable to observe how quickly they all vanish from streams and rivers that had been literally swarming with them. Indeed, like the white fish, they readily devour worm-bait in spring, whereas afterwards nothing induces them to touch it—for the reason, probably, that the excessive demand in the one case being beyond the resources of the locality, induces the fishes to eat what they might refuse when food is plentiful.

There would appear to be two species of WHITE FISHES (*coregoni*) in the salt and fresh waters of New Brunswick, but their characters have not been carefully marked out. Every spring, with the breaking-up of the ice, there appears on the St. John a salmonoid to which the settlers give the name of *gizzard fish.* It has the squarely truncated snout and upper jaw overlapping the lower, and to all

* Referring to the former on the shores of Anticosti, Mr. Rowan remarks in the *Field*, May, 1869: "In the month of June the caplin come in shore to spawn, followed by all the hungry monsters of the deep. Each tide leaves thousands of these little fish high and dry on the beach. After a storm I have seen cartloads of dead caplin on one little strip of beach, and I have fished up enough live ones out of the water with one scoop of my kettle to do for breakfast. They are the best bait for cod fish." Moreover, the caplin forms a staple article of food of the salmon and other fishes along the northern shores of the St. Lawrence.—*Watt Canadian Naturalist*, vol. vi., p. 111.

appearances equals the *C. albus* of Richardson, and is not distinct from *C. sapidissimus* of Agassiz,—thus, perhaps, being identical with the far-famed attihawmeg of the Cree Indians. The gizzard-like construction of the stomach, the walls of which in many specimens I examined were fully three-quarters of an inch in thickness, is said by the author of the "Fauna Boreali Americana" to be distinctive of the last-named species.

Although it is stated that it feeds on shells and small fishes, I have most frequently found insects, larvæ, and vegetable fibre in its stomach; and the tongue, which Agassiz states to be smooth in *C. sapidissimus* of Lake Superior, is covered with minute conical teeth in the denizens of St. John River. It is truly a delicious article of food, and seems never to pall on the appetite of even those dependent on it for their entire subsistence. The distribution of the coregoni as regards New Brunswick, is very much like that of the smelt, there being a set that cannot possibly leave the fresh water, and another which goes and returns regularly. With reference to the former, exactly the same obtains as with other land-locked salmonoids; there is a season of the year (summer in this case) when the fish retires to the profound depths of lakes, where it remains unobserved until autumn, and then repairs to shallows, where numbers are captured. We might suppose that the fish was originally a resident fresh-water species restricted to the great inland lake basins, and shut off from the sea by insurmountable barriers, such as that which isolates the great lakes at the sources of the St. John River, and, as Perley remarks, a few may have accidentally been conveyed over the Grand Falls.* I have not seen individuals from the former situation; and whilst allowing that they may be distinct (perhaps two or more species), from a close scrutiny of the sea-going sort, there cannot, to my mind, be a question but that it is identical with the

* *Op. cit.*, p. 205.

attihawmeg. The average weight of the latter is barely two pounds, whilst individuals of the former, from the head-waters of the St. John, are reputed to weigh from five to six pounds. There the white fishes are so plentiful, that Professor Bailey informs me they jump in dozens to the splash of the canoe paddle as the Indian shoots his skiff along the Tobique lakes.*

The same remark is applicable to the CUSK, or SPOTTED BURBOT (*L. maculosa*), as obtains in the case of the smelt and white fishes, there being a set that never leaves the fresh water, and another that comes from and returns to the sea regularly. I compared specimens from the two situations, and, excepting in the former being rather darker in colouring, there are no appreciable distinctions. The sea-going set ascend the rivers in winter, and are captured through the ice when heavy with spawn. Nothing further is observed with reference to its movements until October, when numbers are captured on sand shoals, some from six to seven pounds in weight.

In the introductory remarks at the commencement I mentioned the prevalence of the Gaspereau or "Alewive" (*A. tryannus*) in vast sculls in the Bay of Fundy during spring, when they collect for the purpose of pushing up the rivers to spawn. According to Perley,† it spends the winter in the south, and does not enter the Bay of Fundy until April. As in the case of the other migrants, the return to salt water is not marked by any indications of its presence, so that it is probable they return independently. The SHAD (*A. sapidissima*), in the opinion of Dekay,‡ comes also from the south to the northern waters, running up the rivers for shorter

* Perhaps the shad salmon (*A. clupeiformis*) included in my List as being met with in Maine, might turn out to be this land-locked white fish. (See Report of the Agriculture, etc., of Maine; 1st series, 1861, and 2nd series, 1862, pp. 31 and 60.) A superficial examination would soon tell the differences between it and the *C. albus*.

† *Op. cit.*, p. 208.

‡ "Fishes of New York."

distances to spawn ; although occasionally a few push up the great rivers a long way.

None of the migratory fresh-water fishes—the salmon excepted—afford better sport to the angler than the far-famed STRIPED BASS (*R. lineatus*). Although its head-quarters are evidently in the briny deep, where it may be captured at all seasons, still, as soon as the rivers open in spring, there is a rush of bass up the St. John ; probably the males precede the females, seeing that the first fish usually captured belong to the former; at all events, the reproductive organs are then fully developed in both sexes. About the middle of June they commence to play on the surface in a remarkable manner, jumping and gamboling like bonito or porpoises. The shallows around the islands near Fredericton are evidently a favourite resort, as annually, from time immemorial, the natives have repaired to the locality for the purpose of spearing them. It was at one time very plentiful in many of the large rivers and seaboard creeks, but, like the salmon, has not only been forbidden its ancient haunts and spawning-grounds through mill-dams, but the seine, bag net, and spear, recklessly used at all seasons, have caused the complete extinction of the fish in various localities, and promise to bring about a speedy annihilation, at least as far as the inland waters are concerned. The experiment of transferring it into lakes above the dams has been tried in Maine, but with rather imperfect success; perhaps the fish cannot entirely subsist in fresh water. According to the Indian belief, it is asserted that the males chase the females on these occasions ; most probably, however, it is the stronger males driving off the smaller from the spawning-beds. Be that, however, as it may, the scene on a beautiful summer afternoon is extremely exciting. There a few canoes containing the remnants of the Melicite tribe, with a sprinkling of European spectators, may be seen dropping quietly down the river, each with an Indian in the prow, spear in hand, and another at the stern paddling gently: then a sudden splash

close by calls for his utmost exertions, and, like an arrow, the birch-bark skiff is shot towards the spot, when the man in front, resting on his knees, with much force and dexterity sends his three-pronged harpoon straight on the fish, which, if large, may give a considerable deal of trouble before it is safe in the canoe. This bass attains an enormous size, individuals of eighty pounds in weight having been captured. The generality, however, of all I have seen taken in the above situation, with one or two exceptions, did not exceed six pounds, although I know of many of from twenty to thirty pounds having been speared in the rivers at distances varying from sixty to ninety miles inland. The numbers found in fresh water in winter make it uncertain whether or not there is any regular season for its return to the ocean. From all accounts, it is partial to seaboards indented by long creeks and fiords,* with rocky bottoms and shoals, where it delights in following the boats in winter. Whether there be really a dormant condition or not during winter, it is the case when the rivers are frozen that numbers of bass† may be seen lying perfectly motionless on the bottom, when by making holes in the ice they may be easily speared or captured by dip nets. It rises to a red and gold artificial fly, but evidently prefers bait, more especially squids, clam shell-fish, smelt, lobster, etc. As a game fish and as an article of food the striped bass stands high, whilst the beauty and symmetry of its outline, more especially of the smaller-sized individuals, recommend it to notice.

The YELLOW PERCH is one of the most common of the resident fresh-water fishes,‡ as I have noticed elsewhere, even in lakes frequented by the ravenous pike. Its congener, the white species (*M. Americana*), is also widely distributed. Some observers surmise that perches, sticklebacks, and such fishes armed with spines, hold their own against the pre-

* Perley, *op. cit.*, p. 180.

† The word is derived evidently from its native name, "bassagis."

‡ It spawns early in May, on sandy bottoms.

datory species, and perhaps with a certain degree of truth; still I found a specimen of the TWO-SPINED STICKLEBACK in the stomach of the soft-mouthed SILVERY DACE (*L. chrysoleucas*); rather remarkable, seeing that the former is distinguished for the very stout and large size of its armature. The percoids of the New Brunswick waters require careful study; indeed, from specimens and reports of fishermen, I am much inclined to believe that there are undescribed species. For example, in one of the inland lakes there is a perch captured in midsummer, and again through the ice in midwinter, so very distinct from the white species, with which it has hitherto been confounded, that I do not hesitate to consider it either new to science, or else that imperfectly described species named by Dekay * the White Lake Bass of Lake Erie (*L. albidus*).

The two specimens I examined were caught in Lake Oromocto, one of the head-waters of the Magaguadavic River, by my friend Colonel Anderson, of the New Brunswick Militia. These, compared with *Merone Americana*, showed the following peculiarities. The former has the back more arched anterior to the dorsal fin, with a hollow at the nape, and a more produced snout. The spines of the opercle differ also; and the lateral line, which is concurrent with the back in the white perch, is straight in this bass. These points are very apparent when specimens of the two are placed side by side; moreover, in the fish in question we find the scales advancing to the tips of the fins, besides disparities in the relative length of the rays, as well as in the size and colouring of their bodies. These and probably other important details I have not observed seem to establish a specific character for this perch, two specimens of which were twelve and fifteen inches in length. The settlers about the lake say it is plentiful, and individuals are often captured weighing two pounds. Its flesh is firm, and better flavoured than that of either the yellow or white

* "Natural History of New York," vol. iii., p. 13.

perch. Although not apparently known to frequent the other lakes, I make no doubt that the so-called white perch of inland lakes will turn out to be this species; at all events, as far as I had opportunities of knowing, there is no doubt a third species has been overlooked by Perley and other ichthyologists who have worked at the fishes of north-eastern America.

The SHARP-NOSED STURGEON is the only species of the genus met with in New Brunswick waters. It is strange that neither natives nor whites have yet succeeded in discovering its spawning-grounds, although no doubt it deposits its ova in the rivers and lakes, more especially in the reaches within the influence of the tides; nor is the isinglass collected; indeed the Indians seem to be unaware of the substance, although very fond of the flesh, which they collect and salt for winter use. As soon as the rivers are cleared of ice, and the spring freshets have subsided, sturgeons collect at several points in the rivers, where the natives spear them. Now and then a monster seven or eight feet in length tosses himself out of the water, falling lengthways with a loud splash, as if in wanton playfulness. The natives assert, however, it is to escape from the Lamprey Eel, which is reputed to attach itself to their bodies, and prey on their vital parts. With reference to the latter fish, which is very common in certain rivers in summer, migrating seaward in the cold months, during autumn there is a strange phenomenon often observable, in vast numbers of lampreys being found dead along the sides of the smaller influents of rivers, as if they had been destroyed by some general cause. Indeed, unless it is that they had delayed their sojourn too long in fresh water, it would be difficult to account for such wholesale destruction as is not unfrequently observed in many streams. On the Miramichi, where numbers are found dead towards autumn, Mr. J. L. Price told Mr. Perley* that "he often observed lampreys in August in languishing conditions, head and throat greatly bloated, and

* *Op. cit.*, p. 226.

the whole body covered with a white mucous secretion;" moreover, that "when disturbed at the spawning season, it will pursue the intruder, however formidable, with great spirit, even beyond the bounds of the water."

The tough and mailed hide of the sturgeon * must have tried the flint spear-head of the Indian of old; and yet, judging from the prevalence of its remains in the kitchen middens, the fish must have entered greatly into the fare of the natives. The two-barbed steel weapon used by the present race contrasts with the former; and, unless left in the body, or unless many were driven in in succession, it is difficult to understand how the simple pointed flint was retained during the struggles and scuffles such as ensue at the present day with the formidable and efficient harpoon; for even with all its superior advantages, canoes are frequently upset when a large sturgeon is struck and suddenly makes off. No doubt there is a spice of the old savage hunter still lurking in the hearts of these degenerate descendants of a ruder race, and it is interesting to note how apethetic and unimpressionable they are on most subjects, until recurring to exploits of the chase, such as bass and sturgeon spearing, deer hunting, and the like, when the minutest details are preserved and narrated afterwards with marked delight. The smallest sturgeons captured in the rivers are seldom under a foot, whilst intermediate sized individuals, up even to fifteen feet in length, are taken in the fresh and salt waters; the generality, however, are about half as long.

During June, when the silvery salmon trout is plentiful in the streams connecting the various lakes, there is found associated with it a RED-BANDED SUCKER, five to six inches in length, with a brilliant red bar extending lengthways down its sides. I examined several specimens of this fish, kindly procured for me from the Sciff Lake stream of the eastern Schoodic chain of lakes by Major Monk and Captain Wolseley. It seems to

* *Pasagis* of the Melicite Indians.

be also found in the upper waters of the Androscoggin River, in the state of Maine; but further there are no accounts of its presence north of the state of Vermont, where it was discovered by Lesueur, and named by him *Catostomus longirostris.* The specimens above referred to were examined by Dr. Gunthur, who informs me that they differ only from this species in the length of the anal fin, which varies according to sex and season. The well-known TOM COD (*M. pruinosa*) is the only other representative of the family *Gadidæ* frequenting our inland fresh waters. The "frost fish," as it is familiarly called, seldom exceeds eight to twelve inches in length, and, although very plentiful along the shores and brackish waters, does not push far up the rivers; but I have occasionally seen individuals captured through the ice at a distance of ninety miles from the sea. The most plentiful and generally distributed of all our fresh-water fishes are the numerous representatives of the carp, chub, sucker, dace, shiner, minnow, etc., which crowd the still waters of all the lakes and slow-flowing rivers. Few have yet attracted the fisherman or angler, either on the score of food or sport, and in all probability they will be discarded as long as there are better fish to fry; still, several species are worthy of attention, at least as articles of food. There is evidently great confusion in the nomenclature of many species, and, unless one has specimens wherewith to compare the varieties of chubs and dace of our rivers and lakes, he will find it next to impossible to establish the specific identity of certain representatives of the genera *Catostomus* and *Leuciscus;* indeed, from published details and plates of the fishes of any portion of this continent to which I have had access, it would seem to me no easy matter to identify even the more common species of these soft-finned fishes. I shall therefore refer merely to such as I have been enabled to recognize, without reference to the published lists, which evidently accept certain species as common here because they are found in adjoining regions.

The common SUCKING CARP of the larger rivers (in which it is very common) agrees in every particular with the *L. cephalus* or Chub Big-head of Kirtland.* It may be the same as the Horned Sucker of Lesueur;† but the description by that author does not come up entirely to our fish in relation to the exact position of the horny tubercles on the head, which, as far as I can discover, are restricted to the male fish, and only cuticular appendages, being easily rubbed off, and evidently a seasonal condition, referable to winter and spring. So various are the changes in some species, that I observe that what were considered perfectly distinct are now proved to be the same fish at different seasons of the year. The use of the horns may be to scrape up the sand or mud when the female deposits the ova; at all events, this sucker, when captured in June and the three following months, wants these tubercles, and may be distinguished from any other of its congeners by a black spot at the anterior base of the dorsal fin, a dark band on the side of the body in the course of the lateral line, with a golden band above it—the latter best seen immediately after the fish leaves the water. This species takes bait, but is often very sluggish and inactive, and may be seen in small schools on the sandy bottoms of streams near their debouchures, and lying listlessly, so that there is no difficulty in capturing them with dip nets. The flesh is certainly superior to that of the common chub, red-fin, and the smaller dace, although that may be paying it a small compliment. The most common chub is seemingly subject to certain varieties, or else there are two or more species very closely allied—so near, indeed, that they seem to run into each other, and yet the extremes make what some naturalists call good species. My impresssion on comparing a great many specimens of New Brunswick chubs with descriptions of those of the Northern States, is that authors have made distinct what appear to be

* "Boston Journal of Natural History," vol. iii., pl. 5, fig. 2.

† "Journal Acad. Natural Science," vol. i., p. 93.

only phases of one fish; at all events, the nearest description of our chub is recorded under the head of the *Leuciscus nitidus* by Dekay;* and what he calls the Bay Shiner (*L. chrysopterus*), and Storer the "silvery dace,"† seem to be only seasonal conditions of the same species. There is here a fine field for the ichthyologist, as the study of the *Cyprinidæ* of America requires especial care and attention, being beset with many difficulties, which only a large experience, and comparisons of many individual specimens, will overcome.

The New York SHINER (*C. chrysoleucas*) of Mitchell is very common in all the fresh-water streams; it never attains above six or eight inches in length, and is only useful as bait in the capture of more savoury fish; the same may be said of that pest to the angler familiarly known as the RED-FIN (*L. cornutus*), and its less beautiful but larger congener the ROACH DACE (*L. pulchellus*) of Storer. I have several times captured with bait a small dace, olive green, with a golden dorsal stripe, agreeing with the BANDED DACE of Dekay.

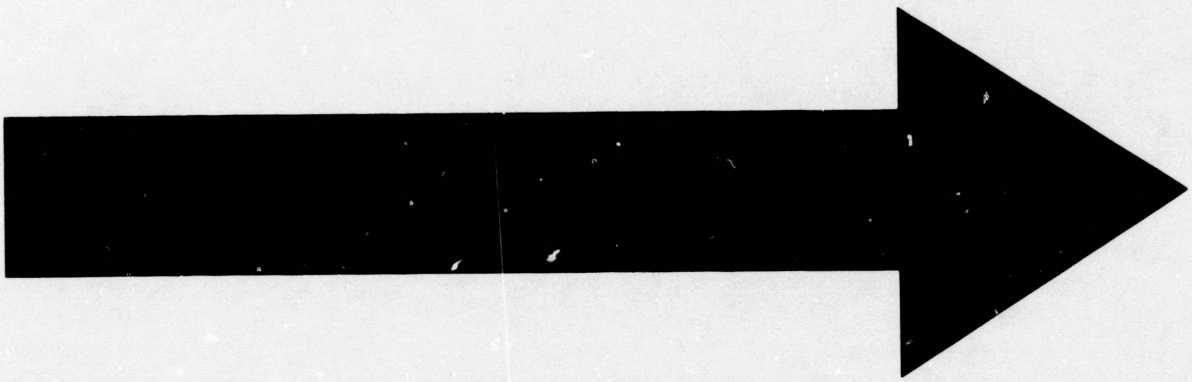
The smaller dace and minnows are numerous. I could identify the BLACK-NOSED DACE or Brook Minnow (*L. atronasus*). There is another small LEUCISCUS often found in brooks, about three inches in length, eyes large and prominent, irides silvery, pupils black, tail deeply forked; above olive, with a dark line down the back; iridescent lines on sides above the lateral line, which is single; scales on body large; lower parts silvery white and shining; tips of the fins orange.

The MANY and the TWO SPINED STICKLEBACK (*G. occidentalis* and *biaculatus*) are both plentiful, and like the dace, chub, etc., deposit their spawn in July.

The ugly CAT-FISH (*P. catus*) sometimes attains a weight of one pound. It is not plentiful, but is often found in the same haunts with the Yellow Perch. Like some of the chubs, it displays a wonderful tenacity of life, and, although frozen

* "New York Fauna," p. 211, plate 30, fig. 95

† "Fishes of Massachusetts," p. 90.



hard, may be recovered by careful thawing. This may be illustrated with any of the fishes which, after several hours' exposure to a very low temperature, may be restored to life provided the freezing is rapid after emersion and the thawing very gradual. The Pike has not hitherto appeared in any of our waters, although, as before noticed, it has been introduced into the head-waters of the St. Croix River on the western frontier, and is rapidly exterminating the cyprinids and fry of the indigenous fishes. The most common eel of our fresh waters is *Anguilla tenuirostris* of Dekay, which is said to go and come from the sea regularly. This, however, seems doubtful; at all events the majority are sedentary in the lakes, and are there captured by the Indians by means of baskets called eel-pots. The larger specimens seem to differ considerably in the shape of the head, and some greatly exceed the usual recorded dimensions of the fish. Whether the *A. Bostoniensis* of Lesueur is identical with the former I cannot say, but shall not be surprised if further comparisons show more than one species inhabiting the rivers of this province.

It is a remarkable circumstance that, contrary to the recorded habits of the fish elsewhere, the AMERICAN HAKE (*Merlucius albidus*) frequents several lakes at the head-waters of the great reaches communicating with the St. John near its delta, and is captured in numbers through the ice with hook and bait. Being essentially a salt-water species, its thus resorting to inland fresh and brackish waters would seem to indicate that it does so, if not for spawning purposes, for particular food, which (according to persons who catch them) is the young of the gaspereau.

Many of the marine fishes are very interesting, and of great economic value; but, as I have not had sufficient opportunities of gaining a close acquaintance with this branch of the local ichthyology, I will merely enumerate a few of the most important food fishes. Although not so plentiful as in the days

before the advent of the whites, still the following are abundant in the bays, creeks, and sea basins around the coasts, and furnish valuable and staple articles of commerce.

The Norway Haddock has its southern limit about New York, and is not common; but the American fish of that name is exceedingly numerous. The Spring and Autumn Mackerels and Herrings refer to several species; all are famous as articles of food, and spawn on our shores, and are especially plentiful in the Bay of Fundy. Two sorts of Cod and Hake, the Pollock, Tusk, Halibut, Flounder, and Skate, make up a bounteous supply of food fishes scarcely surpassed in quantity or quality by those of any other country. Indeed it requires only a glance at the map to be convinced of the advantages offered to the finny tribes in the way of food and shelter.

PART IV.

GEOLOGY.

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CHAPTER XI.

Geology—Rocks and Soils—Primary Rocks—Interment of recent Fishes in Strata—Coal Measures—Physical Features of the Coal Beds—Episode of Forest Life—New Red Sandstone—Glacial Phenomena, past and present—Table of Rock Formations, with their valuable Minerals.

THE geological features of New Brunswick are very interesting, but rather complicated, and in places by no means easily worked; the long winter, extensive forest tracts, general level country, with few cliff exposures and great depth of glacial drift on the surface, are antagonistic to the geologist's researches; nevertheless, the chief river valleys offer fair sections of the strata, which are well exposed in the southern parts of the province, and along the coast lines and islands of the Gulf of the St. Lawrence and Bay of Fundy, where they have been studied with care by several competent geologists.*

* See "Dawson's Acadian Geology," Drs. Gesner and Robb; Professor Bailey's and Hart and Hind's Reports; Professor Johnston's Map and Report on the Agricultural Capabilities of the Province; Mr. Matthew, *Jour. Geol. Soc. Lon.*, vol. xxi., and lately Mr. Hind's paper in vol. xxv.

The northern and wilderness regions are, however, only now being explored by the Geological Survey of Canada.

Of the fourteen grand divisions of strata so classified by Lyell,* seven have hitherto been identified in New Brunswick; these, considered in chronological succession, from below upwards, are briefly, LAURENTIAN, CAMBRIAN, SILURIAN, DEVONIAN, CARBONIFEROUS, TRIASSIC, and POST TERTIARY.

The two first comprise groups of granitic and granatoid beds, limestones, sandstones, slates, and conglomerates of vast and variable thicknesses; often much metamorphosed and altered by volcanic agencies, and also by the disturbing actions of upheaval and depression, the dips of not a few giving an angle of 90°. The discovery of traces of animal life—to wit, the so-called *Eozoon Canadense* in the Laurentian beds of Upper Canada, has not yet been further strengthened by the finding of like remains in strata of the same or any other age in New Brunswick, perhaps from the reason that the latter have not yet been so carefully examined. Iron, copper, and galena have been discovered in certain districts, but hitherto neither of the two first groups of rocks have, so far as they have been observed, been found to be very productive of useful minerals. Nor, unless where covered with Glacial Drift, do they furnish good lands for settlements.

The SILURIAN BEDS appear to overlie or flank the Laurentian and Cambrian on their inland side, but the exact position and distribution of the former have not yet been accurately determined; perhaps many beds supposed to belong to these very ancient rocks may, on closer acquaintance, turn out, as will be shown presently, to appertain to more recent formations. According to Bailey and others, about the same agricultural conditions prevail wherever these beds appear. They are productive of considerable mineral wealth, and no doubt, when carefully examined, will yield most valuable ores. Iron and antimony mines have been opened in several localities; but

* "Elements of Geology," sixth ed., p. 102.

there is seemingly a want of money and means of transport, both of which will, no doubt, in time be forthcoming. The DEVONIAN, or OLD RED SANDSTONE, is very well developed, and here, as in other lands, presents prominent topographical positions, and confers a very remarkable facies upon the scenery. However, the soils formed by its disintegration are of themselves poor, but fortunately the drift deposits covering them often make up for their unproductiveness. The granitic rocks of the central portion of the province, and also the band of slates flanking the latter, evidently belong to this series.

Until 1868 these slates were considered by Dr Dawson and others to belong to the Lower Silurian rocks; but the discovery of fossils peculiarly Devonian on their flank, would seem to make them of this age.

An interesting example of how much science is now and then indebted to outsiders in connection with some of its important discoveries is shown in the case of my friend Mr. Edward Jack, of whom reference has been previously made. This gentleman, although engaged in the very arduous and even adventurous occupation of a forest surveyor, has found leisure and not scrupled to employ the same in enriching his mind with whatever knowledge, in connection with literature and science, was within his grasp, with the ulterior object of applying the information practically during his avocations. In this way it happened one day, when seated on the side of a small brook in the centre of a wild forest tract, that he employed a short respite in examining the shelves of slate rocks in the vicinity, where he picked up several fossils which have been the means of deciding the age of the beds above mentioned. These Old Red Sandstone slates cover an extent of country in New Brunswick alone of little less than 170 miles in length, and 20 in breadth, and, in the absence of any fossils, were until then supposed (from their position and mineral consistence) to be Silurian beds.

Before referring to the next series of rocks overlying the Old Red Sandstone, I may diverge for a short time from the immediate consideration of the strata, to that referring to their fossil remains. It is well known that in this and the overlying coal formations,—for instance, in the coal measures of the Joggins in Nova Scotia, and elsewhere in the Old World,—vast accumulations of fossil remains, to wit, fishes, etc., indicate a wholesale destruction of animal life, suggesting questions of how such phenomena might have been brought about. To the philosophic mind they might indicate oscillations in the relative positions of land and sea, and no doubt such may have occasionally been the case; but a far simpler explanation is also feasible, as is shown by the following occurrence, of which I was an eye-witness.

In the Bay of Fundy, opposite the island of Grand Manan, there is the large gap in the coast-line made by Passamaquoddy Bay, into which several fair-sized rivers drain. One, the Magagudavic, before mentioned, is reached by means of a long fiord of several miles in length. At a short distance westward, there is a small creek named Anderson's Cove, formed in the trappean rocks of which the coast line is composed. These beds are considered by geologists as belonging to the Devonian or Old Red Sandstone formations of southern New Brunswick. Anderson's Cove is, in fact, the sea-ending of a ravine down which runs a small stream into a very muddy lagoon of upwards of 1,300 feet in circumference. The latter is oval in shape, and communicates directly at high tide with Anderson's Cove by means of a narrow and rocky channel, filled with masses of amygdaloid trap, fragments of which are mixed with the mud forming at the bottom of the lagoon. There is a beach of sand in front of the lagoon, besides a sea-wall formed of sand and masses of rocks and stranded logs of wood piled in disorder along the shore; so that, excepting during furious gales, the only direct communication

with the lagoon is by the passage just mentioned. During high tide the waves rush up this channel with force, stirring up the mud of the lagoon, when the water in the basin frequently assumes almost the consistency of pea-soup. Thus the lagoon is a shallow morass of brackish water at low tide, receiving a constant supply of fresh water from the stream which is depositing its *débris* on the slimy bottom; moreover, land-shells and other organic remains are being conveyed by the stream or washed by the rain into the basin, whilst on the other hand the powerful tidal wave of the Bay of Fundy brings up quantities of marine mollusca, radiata, etc., remains of which strew its bottom and sides. Such, in all probability, has been the usual state of matters in this quiet corner of the bay for unreckoned ages, broken only at long intervals by occurrences such as I shall now describe.

On the 24th of September, 1867, a very heavy gale from the west blew directly into Anderson's Cove, and more especially on the entrance of the lagoon at the eastern end. The result was, that the mud became disturbed to an unusual extent, and the amount of the water in the area was doubled in quantity. During the gale enormous numbers of dead fishes were seen floating on the surface of the turbid waters of the morass, and on the following morning, when the hurricane had subsided, a spectacle presented itself surpassing anything of the kind observed by the residents on previous occasions. The entire lagoon, from its entrance to the limits of the tide, was covered with dead fishes. The species, with the exception of a few mackerel and New York flounders, was found to be the young of the American herring (*Clupea elongata*) averaging about six inches in length. This fish is said to spawn in the neighbourhood, and usually large shoals had been observed for some weeks previously in and about Anderson's Cove. I chanced to be in the vicinity about a fortnight after the occurrence just mentioned, and, when on my way to the scene of the disaster, was made uncomfortably aware of their

proximity even at the distance of two miles, by an intolerable stench from decomposing fish, contaminating the atmosphere in every direction for five miles around Anderson's Cove. The smell was found to emanate not only from the latter, but also from the fields around, where many cartloads had been deposited by the farmers; nevertheless, the quantities of rotting fish around the margin of the lagoon seemed very little diminished by the amount taken away for manure, not to mention what had been consumed by the flocks of gulls and crows which were feeding sumptuously on their remains.

After skirting the shore of Anderson's Cove, we reached the entrance of the narrow, tortuous passage leading to the lagoon; here the first traces of the disaster were manifested by enormous quantities of fishes, impacted between and among the fallen masses of rock, which were literally besmeared all over with the crushed flesh and bones of herrings, whilst the sides and bottom of the lagoon were covered with their entire and mangled remains, forming heaps several feet in depth, more especially in places where there had evidently been eddies, whilst the limits of the tide were distinctly marked by a pile of their bodies which fringed the basin of the lagoon. On the muddy bottom they lay as thick as herrings in a barrel, interspersed with remains of crabs, lobsters, sea-mussels, and other shells, together with enormous numbers of the dead bodies of star-fishes, etc.

A friend who resides in the neighbourhood suggested that the shoal had been chased into the enclosure by sharks, or other predaceous fishes, and were subsequently suffocated by the muddy waters of the lagoon. But the mangled remains in the passage and shallow water in Anderson's Cove, together with the fury of the gale, rather seemed to indicate that the vast assemblage, getting into shallow water, and under the influence of the breakers, was driven pell-mell up the passage and against its rocky sides into the lagoon, where the survivors perished from the combined fury of the waves and the muddy

waters. During our examination of the bottom of the lagoon, it was apparent, even in the short space of time that had elapsed since the gale, that many of the fishes had been completely covered over by mud conveyed or re-disturbed by every tide, and deposited also from the water-shed around the morass. No doubt at that rate the whole of the organic remains, before long, became buried in the soft mire; and perhaps some geologists in the far distant future will be speculating on the cause or causes which brought about such a vast congregation of marine and land animals in so limited an area, just as he now theorizes on the probable causes of those vast assemblages of fossil animals he is accustomed to observe in many rock formations. For we have only to suppose one or more geological epochs to have passed away, and a slight elevation of the land, when, if a section were made of the spot where this lagoon now stands, there would be found an alluvial deposit on the surface, succeeded by a sedimentary stratum containing fragments of the Devonian trap-rock of the neighbourhood, accompanied by the vast assemblage of organic remains just described, and followed, perhaps, by similar objects at greater depths, succeeded, no doubt, by traces of the Glacial epoch, which are so vividly portrayed on the surface of the surrounding country at the present day; and lastly, the old Devonian conglomerate in which the lagoon now stands. And whilst each will supply memorials of its own peculiar but relatively distant epochs, none will furnish more lasting and wonderful phenomena than the deposit which contains the fishes destroyed during the gale of the 24th of September, 1867.

Occurrences similar to that just described are apparently not common, at least along the coast of the Bay of Fundy, but enormous shoals of herrings and other fishes are met with at stated seasons, so that the accident of the 24th of September might occur again anywhere under the same favourable conditions. Moreover, it may be pretty confidently surmised

that the fish stranded in the lagoon were but a very small portion of the original shoal which entered Anderson's Cove; and thus, supposing the locality had been many times larger, there would have been no diminution in the relative density of the dead fishes on the area.

Another example is recorded in the *Journal of the Geological Society of London.** Thousand of dead fishes, thrown on the coast of Madras, were afterwards enveloped in sand and mud along with other marine animals and plants, so as to form a densely packed stratum of fishes, etc., of unknown breadth, but extending for a vast distance along the coast-line. The fishes were supposed to have been destroyed by the enormous fall of rain from the south-west monsoon, rendering the sea water less saline. Be that the cause or not, it is by such facts as these, compared with similar phenomena of bygone epochs, that the geologist is enabled to arrive at just conclusions.

The CARBONIFEROUS BEDS form a great basin, occupying the central portion of the region, with a diameter of nearly 200 miles. Coal has been found in one or two situations, but the seams are small, none averaging over eighteen inches in thickness. The facies of the country occupied by the above rock formations is very level, depressed even in places, so as to form extensive lake basins, bogs, and barrens.

The soils, wherever the lower or sub-carboniferous strata exist, are unsurpassed in value and fertility by any others in the entire province; and wherever they exist, as Professor Bailey justly remarks, "the settler, unconscious of the cause, at once commences the work of reclaiming."

The Albertite of these beds has gained notoriety; besides this, gypsum, salt, iron, lead, silver, and manganese are met with in rocks of this age, whilst noble forests of pine and hard wood are spread far and wide over their surfaces. The

* Vol. xviii., p. 453. Moreover, on the authority of Mr. Rowan, an immense number of herring spawn and caplin are cast up on the shores of the island of Anticosti, in the Gulf of the St. Lawrence, during gales.

rapid degradation, together with the presence of lime (in the form of sulphate and carbonate), combine to make the lower carboniferous beds of New Brunswick eminently adapted for agricultural purposes.*

Thus the major portion of central and eastern New Brunswick is composed of these beds, which furnish topographical aspects familiar to the eye of the geologist. This, as before pointed out, is especially observable along the route already indicated, from the capital to St. Stephen on the St. Croix River; the chief feature being the extreme flatness of the land, which is overspread by forests, broken here and there by swamps or clearings, and scattered settlements, or else burned lands, more or less overgrown by the usual second growth of larch, pine, maple, willow, alder, poplar, and undershrubs.

Harvey's Settlement, as before stated, is an extensively cultivated patch, surrounded by enormous forests, stretching in a north-easterly direction; the only prominent feature being the rounded hill of trap, named Bald Mountain, which towers some hundred feet above the pine tops.

This mound of igneous rock fringes the great coal basin of central New Brunswick, and is a regular geological feature of the sub-carboniferous strata. It would further seem that these trap beds form the line of junction between the latter and the ordinary coal measures. The view from any commanding position in this neighbourhood is peculiarly characteristic of the region. A vast sea of pine tops is observed stretching far and wide; and either rising in undulating ridges according to the nature of the ground, or spread out in an interminable sheet of dark green, broken here and there by little gaps and clearings. Indeed, one might fancy these primeval forests stretching from shore to shore, not over two centuries ago, before the white man set foot in them, and teeming with wild

* See "Bailey's Observations on the Geology of Southern New Brunswick," Government Report, p. 104.

animals, and the native narrowing his exertions to merely hunting and fishing. Now their vast solitudes are only the resorts of an occasional moose, reindeer, or Virginian deer, with an anchorite bear or two, and very few, if any, of the lesser furred animals, such as the sable or mink.

The clearings and settlements in such level forest tracts, being often far apart, and not joined by roads or footpaths, to the person unexperienced in wood craft it became, as before observed, a serious matter to get out of his reckonings; and instances are recorded of individuals having been put to great straits on that account. Not many years ago a mysterious and melancholy occurrence of this description took place in the above region, of which the following particulars were communicated to me.

A young English gentleman took up a temporary residence in the district, for the purpose of gaining information relative to agriculture and the system of reclaiming forest land, with the ulterior view of becoming a colonist. He was healthy, strong, and active—qualities indispensable to meet the hardships of a backwoodsman. Early one autumn, when the leaf was beginning to turn, Mr. B——, the unfortunate individual referred to, set out from a friend's house, where he had been staying for a few days, for the purpose of making his way to his own residence, which lay on the banks of a river about six miles distant. The nearest route led through a large tract of forest, and was indicated more or less by "blazing," which is merely removing chips of bark from the trees.

Provided with compass, a supply of chocolate, brandy, and a gun to shoot partridges on the way, he commenced the homeward journey, and although it was new to him, it scarcely occurred to himself or his hosts that he could possibly lose the way. But in order to make this point certain, he was accompanied for a certain distance by his friend's son, who on parting with him pointed out the direction of the remainder of the route, which was clearly indicated by a swamp with a

long strip of alder bush on one side and a pine forest on the other. From the time Mr. B—— parted with his young companion, he was never seen alive. Rewards were offered, and the forest traversed by settlers and Indians in vain ; but not a sign of the lost one could be discovered. Indeed, various were the surmises—amongst others, that he had been murdered and made away with by the person in whose company he was last seen. At length, after "the fall," when the sunny days and frosty nights of November, or what is called the Indian summer, had just passed, and more than three months had elapsed since the unfortunate gentleman's disappearance, a woodman, returning from his day's work, observed the sun shining brightly on a polished substance by the side of a pine stump in the forest, and drawing near, was horror-struck at seeing the trunk of a human body resting in a sitting posture against the tree. Decay had advanced so far that the flesh had disappeared entirely, leaving only the bones of the spine and lower extremities in their original situation. Moreover, the head had fallen down, and lay by the side of the skeleton ; but the knapsack was still on the shoulders, and its belts and buckles showed no signs of having been loosened ; the gun was placed under the left knee, so as to support it, and rested against a log, over which the muzzle protruded for about a foot. The place where the body was found had evidently been selected, and wa. surrounded by tall pines—the exact spot being a hollow between two divergent roots of a spruce snag, where support to the hips and back would be best attained, especially if one was suffering from causes affecting the respiratory organs. Strange to say, it was within six yards of a lumber path leading to the main road, which, in a direct line, did not exceed six hundred yards from where the body was found ; so close even, that waggons could be heard passing along the highway, and the voices of children at play at a farmer's house close by. It was, moreover, only three miles from the house he had left, and but a mile and a half from where he parted with the settler's son. The remains

were examined, but gave no indications of violence as far as the skeleton was concerned; there was a displacement of the bones of the knee under which the gun rested, but that might have taken place during the process of decomposition. The chocolate and brandy remained on his person, and his watch in his knapsack. One barrel of the gun was loaded, and there was an ample supply of powder and caps to have fired off had he desired or been capable of attracting the attention of passers-by. The minutest inquiries failed, however, to discover any property missing except his signet ring, and the whole evidence seemed to clear his companion from suspicion of foul play. The surmises were that he might have fallen and dislocated his knee, and died subsequently from collapse, or from a sudden lesion of one of the great internal fountain-heads of life. At all events, the cause or causes of his death continue a mystery.

The next formation in upward succession to the Carboniferous series is the TRIAS, or NEW RED SANDSTONE of Prince Edward Island, and a few fragments on the southern coast. Referring to the region just described, wherever the ground admits of examination, and more especially along the sides of valleys, rivers, and streams, the geologist is struck with the evidences of bygone GLACIAL action, more especially the striæ or scorings on the surface of the harder rocks, and wherever the material is durable enough to preserve them. There, as elsewhere, all over the province, the general trend of these glacial sculpturings runs north and south, with some western variations, and often in accordance with the general direction of the St. John River, but not necessarily along river valleys; indeed they appear to cross them in places.* This brings me to a consideration of the surface deposits, which belong entirely

* The directions of the striæ, as a rule, run south, with slight easterly or westerly deviations. See observations by Hunt, Report, p. 191, and also the table compiled by Mr. Matthew from personal knowledge, and the labours of Professors Robb and Bailey.—*Canadian Naturalist*, vol. vi., p. 100.

to the BOULDER CLAY DRIFT, GLACIAL, and POST-GLACIAL EPOCHS. These cover the entire surface of the province and neighbouring regions, either in the shape of loose soil, intermixed with angular fragments of rocks, or beds of gravel on which granitic and other boulders are superimposed. The river valley gravels form large flats, vulgarly named "intervals," or islands, composed of pebbles and sand, many of which become covered during the periodical inundations in spring, and, after receiving sedimentary deposits, produce valuable crops of hay. The soils formed by the glacial drift, when cleared of boulders, and the river valley deposits, unless gravelly tracts, are very productive, being made up of the *débris* of various rocks. In some river valleys of the northern districts, the drift contains traces of gold, whilst on the Tobique the precious metal is said to be met with in Silurian beds, but, as elsewhere, uncertainty is associated with deception, and more than one enthusiastic gold finder has been grievously imposed on by designing persons.

I was often entertained, whilst accompanying Mr. Charles Robb on a few of his geological reconnaissances in connection with the geological survey of the province, by observing how intensely excited many of the settlers became when his presence was made known on their lands. To examine rocks, merely for the purpose of knowing the one from the other, was utterly beyond their powers of belief, and the more Mr. Robb tried to convince them, the more they seemed impressed with a belief that he was searching for precious metals, and had taken this mode of explanation in order to deceive them. The gold-digging mania had its day in New Brunswick, as well as elsewhere on the continent, and chiefly from some "finds" in the neighbouring province of Nova Scotia. So strong was the furor, that not a few residents in the wilderness districts forwarded large packages of rock to the United States for analysis, and also inundated the laboratory of the professor of chemistry at Fredericton with

what they designated specimens of silver or gold, but which turned out to be only some worthless compounds of iron, mica, and such-like.

The following remarkable appearances in connection with many of the inland lakes of this region are worthy of notice. Mounds of soil, gravel, and stones in the form of high walls—sometimes one mound within another—are seen surrounding portions of lake basins; these, according to Dr. Dawson,* are considered to be of modern origin, and caused by the drifting to and fro of masses of ice in spring; but I am aware of at least one instance of a small lake near Fredericton where these mounds are very clearly defined, and yet, according to the testimony of a person who has lived for thirty years on its banks, I have been informed that no such movements of the ice have taken place during his residence in the vicinity. Their connection with the Glacial epoch is not clear, whilst in many larger lakes, where the ice is annually driven on the shore, no such appearances exist; at all events these remarkable accumulations are interesting with reference to the elucidation of similar phenomena relating to the Drift and Boulder periods. Turning from the lake margins, I shall now record some notes on the river terraces, more especially of the St. John, excellent examples of which are observable on the right bank of the river at Fredericton, as seen in the diagram on page 275.

According to some geologists, all such terraces belong to the epoch of the elevation of the rock formations in which they exist, and are therefore pre-Glacial to any extent according to the antiquity of the strata, the drift having been subsequently moulded, as it were, into their hollows by Glacial action. Again, the theory that they were brought about during the so-called post-Glacial submergence, indicating spasmodic movements, contrasts with a more gene-

* "Acadian Geology," 2nd edition, p. 35.

RIVER TERRACES.

Section of the St. John River Valley at Fredericton.

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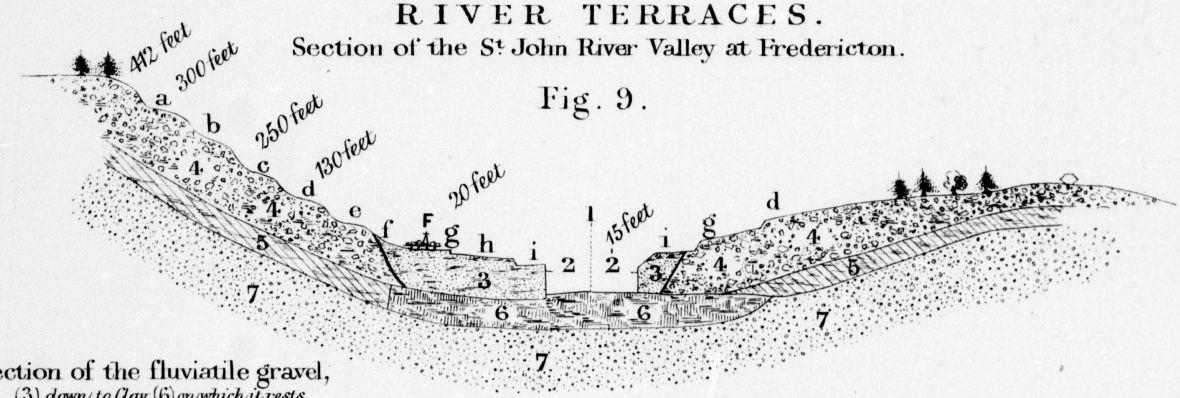
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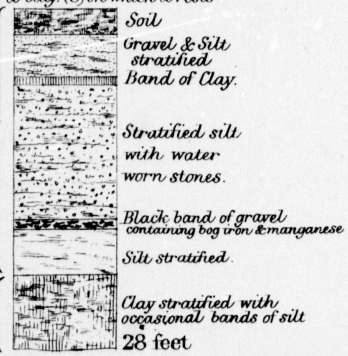
RIVER TERRACES.

Section of the St John River Valley at Fredericton.

Fig. 9.



Section of the fluviatile gravel,
(3) down to Clay. (6) on which it rests



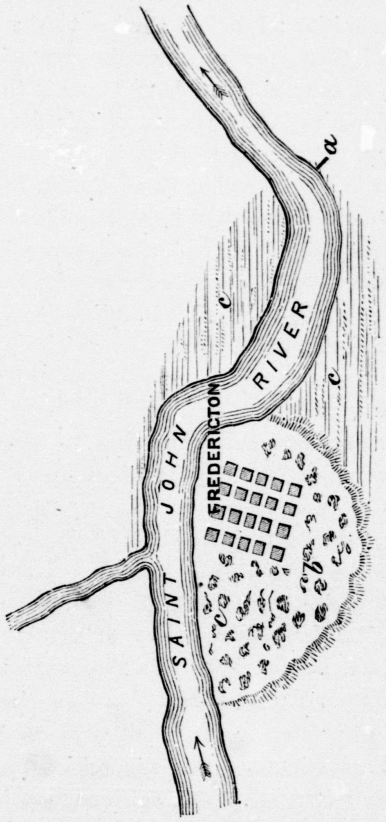
a to f *shew the various River terraces.* g.h.&i. *being formed on stratified river gravel, the others on drift.*
1. *River.* 2. *Highest point of annual inundations of the present day.* 3. *Stratified sand & gravel.* 4. *Drift with granitic and other boulders.* 5. *Boulder Clay.* 6. *Finely stratified clay.* 7. *Sandstone (Carboniferous)*
F. *Fredericton about 350 feet above the level of the Sea.*

E. Weller, lith.

Henry S. King & Co. 65 Cornhill. London.

rally received hypothesis that they may have been caused by ice damming back rivers during, or subsequent to, the Glacial epoch.

Indeed the facts admit of being taken in support of widely



a, The narrow portion where the ice jam took place.
b, The plateau of Fredericton, twelve to fourteen feet above the usual level of the river.
c, Extent of the inundation.

different conclusions. I repeat, 1st, that the river terraces, of the St. John for example, were formed during the elevation of the carboniferous sandstone, and therefore might be pre-Glacial or not. 2nd. Sometimes a glacier, running down a

valley, runs straight across another; and when thaws take place, there would be a jamming and banking back of the waters, which would indicate levels of subsidence much like the terrace cliffs. 3rd. That the terraces indicate fitful oscillations of level is also a feasible hypothesis. Referring to the banking-back supposition; I before alluded to the fact that there are now and then jams of ice on the great rivers of a serious character, so as to inundate large tracts in the valleys, and add to the deposits. An instance of this description is shown on page 277. It occurred during a sudden freshet of 1831, when the ice broke up suddenly on the St. John. The result was an enormous piling up of huge icebergs at a portion of the river called "The Narrows," about two miles below Fredericton, causing the river to overflow its banks and inundate the flat on which the capital is built.

So sudden and simultaneous was the breaking up throughout the river's course on the above occasion, that vast islands of ice got stranded, or set on end like polar bergs, and rose even to the level of the housetops, so as to threaten the complete destruction of the city as they passed onwards, scraping and tearing up the banks, and carrying destruction to everything that opposed their irresistible movements.

Now we might easily believe that similar phenomena (of course on a very much grander scale), at the close of the Glacial epoch, would be equal towards the formation of the heaps of valley gravels observed throughout the river courses and drainage hollows; moreover, without perhaps doing any violence to facts, we might on this supposition explain the great mounds and ridges of sorted detritus seen in various situations. I conceive, therefore, if a higher elevation of the country is allowed, and the land-ice theory entertained, that, as far at least as the fluviatile, or rather stratified gravel and clay deposits of the inland valleys are concerned, there is an apparent solution of the difficulty in these modern examples.

At all events, in speculating on the past we do well always to seek for any present conditions which, if even multiplied by twenty or more degrees of intensity, would in their ways account for the above accumulations. As applied to the climate of New Brunswick, it may be stated that the meteorological conditions of the central and northern portions are pretty regular in kind. The mean temperature of the year may be put down at 44° Fahrenheit, the extremes attaining rarely 30° below zero, and 98° in the shade. (See Appendix, page 307.) The prevailing winds in the winter are from the



north, and in summer from south and west. Snow averages three feet for four months, and is deepest in the northern districts, which are said to owe their greater fertility to that circumstance. A thaw takes place with considerable regularity shortly after New Year's Day, and when this is not the case an unusally cold winter is certain to result, such as took place in 1867-8. The cause of this sudden rise of temperature is not apparent, unless the prevailing winds, being then from south and east, might indicate a deviation of the regular atmospheric currents of South America, the West Indies, or

Mexico; at all events, the same phenomenon is remarked at least over the north-eastern portion of the continent. The influence of warm winds in spring on the melting of the snow is remarkable. A sudden change from the north to south or west will raise the thermometer some forty degrees in the course of a few hours, when the thick mantle of snow seems to vanish as if by an enchanter's wand. Indeed the warm air currents appear to have a greater influence than rain on the vast accumulations of snow in the forests. Such rapid transitions of temperature occurring during the Glacial epoch would have flooded the valleys, and on the grand scale consequent on the arctic climate of the time, must have been equal to produce the vast gravel and river valley accumulations seen everywhere throughout the length and breadth of this region.

With reference to the interesting and suggestive appearances already detailed in connection with the breaking up of the ice in the Canadian rivers, which, although on a small scale as compared with past epochs, is of great importance to the geologist when speculating on the conditions in connection with Glacial and post-Glacial epochs; we have seen the effects of sudden thaws in damming back the rivers and inundating the intervals, or "carse lands" as they would be called in Scotland. Moreover, the pressure of these ice-floes furrows and tears up the river's banks, whilst masses form in shallow places and pick up pebbles and *débris* from the bottom, and deposit them wherever the bergs melt, often far below the places where they were first soldered by the icy matrix. The accumulated impetus gained by the crowding of the bergs as they float along must be enormous, carrying off trees, dwellings, or whatever obstacles impede the onward progress of the floating chaos.

Many stately pines and birches growing on the banks of the St. John, were pointed out to me, showing, by being nearly bent double, how the force had pressed on them. I recollect

an old birch which a resident informed me used to grow outwards towards the river, now bent in the opposite direction, not from displacement of the roots, but from sheer over-stretching of the fibres of the trunk. As formerly stated, so enormous is the *vis-a-tergo* of these bergs, that they have been known to impinge on jetties of wood, and remove them entirely. In one instance a projecting mass caught a house on the bank, and shaved away the upper story, leaving the lower portion intact.

The general conclusions, therefore, elicited from what has just been detailed might stand as follows. There may have been a greater elevation of the country during the Glacial epoch than at present, when the glaciers, moving generally from the high lands to the north (not in every case, however, but with slight deviations to the east and west according to slopes), scored the underlying rocks and bore boulders from centres of dispersal to lower levels. At this time, or subsequently, the river terraces were formed as the land began to subside. The thaws then setting in, there would be a damming back of the waters in many of the valleys and lakes, which brought about the deposition of their gravels, "horsebacks" and "mounds of detritus," while portions of the land becoming submerged under the sea, would explain the presence of marine shells in the clays along the coasts and high reaches of gulfs, and so forth. Finally, there was a partial elevation, which brings us to our times. I allow, however, that this view of the case admits of question; but, without being dogmatic, I cannot agree with Dr. Dawson* that the land-ice theory demands the most "portentous changes," for surely the depression of the country to the extent of 6,000 feet, to allow for the striæ on Mount Washington, implies a far more exorbitant demand on our belief than an elevation of a few hundred feet, which is all the glacialists ask for, if indeed that is requisite, to account for the entire phenomena. I should like to conceive that the conditions of the epoch referred to were in kind, but

* "Acadian Geology," 2nd edition, p. 68.

not in degree, such as obtain now in the north-eastern portions of the continent, and allow a fair share of the scorings and deposition of boulders to icebergs and floating ice islands. But to credit the latter with the wide-spread appearances observed even on the surface of New Brunswick, to the complete exclusion of land ice moving over the country, such as obtains in Greenland and elsewhere at the present day, appears to me scarcely in accordance with facts. I do not know a more impressive instance of these conditions than is observable at the little country town of St. George, situate at the top of the long fiord of the Magaguadavic River, where I should like to bring the "iceberg theorists," and ask them if they think that floating masses of ice, packed closely with sharp and angular stones and rocks, were of themselves equal to produce the magnificent appearances recorded in unmistakable characters on these ancient Silurian slates. Standing on the bridge above the falls of this river, and looking up the valley, it is no stretch of imagination to such as myself (who have seen far grander phenomena on the Himalayas) to suppose that a vast field of ice at one time poured down the slope into the long fiord below, where it calved its bergs, that floated away laden with rocks and *débris*. I have seen some of the largest existing glaciers of the Old World, and, judging from what they present to the eye, there appears to my mind nothing so exactly similar as the scorings and scratchings, the roundings-off, surface accumulations—to wit, drift, clays, boulders, and so forth—of this corner of New Brunswick. But, although willing to accord much to floating ice, I cannot attribute these complicated and wide-spread appearances to it alone; nor is it in accordance with the latest researches on glacial action to suppose that the vast accumulations of stratified gravel in the river valleys were sorted by the sea during a period of submergence at the close of the Glacial epoch. That a depression of the land took place at this period there can be no question and that the continent at present is not so elevated above

the sea as when the glaciers existed is probable; but that the whole of New Brunswick and Northern America were submerged totally, or to one-tithe of the extent asserted by certain theorists, I have no belief. Again, quoting the words of the well-known geologist just mentioned,* when referring to the direction of the force which caused the striæ, he says: "I have no hesitation in asserting, from my own observations as well as from those of others, that for the south-west striation the direction *was from the ocean towards the interior against the slope of the St. Lawrence valley. . . . We cannot suppose a glacier moving from the Atlantic up into the interior.*" At the same time he admits that the striation on the rocks of the Saguenay River, which flows at right angles into the St. Lawrence valley, were possibly caused by a local glacier.† But if we allow, when the subsidence took place at the close of the Glacial epoch, that there were tracts of land that sank deeper than others, and were completely submerged, and did not rise again when the upward movement took place—a phenomenon fully substantiated in other regions—how do we know that there was not a centre or centres of dispersal far out in the Atlantic, which sent their glaciers in opposite directions, as now seen on the Alps and Himalayas?

With reference to the BOULDERS so plentifully distributed along the slopes and valleys throughout this region; having visited many districts where these appearances are well seen, and examined a very large number of the boulders themselves, I perfectly agree with Hind‡ and others that in scarcely a single instance is there any difficulty in tracing their origin to the parent strata, which, as a rule, are at no great distance. For example, the mineralogical composition of the granitic boulders of the St. John River and neighbouring slopes agree with the great central granitic belt which crosses the upper

* "Acadian Geology," p. 69.
† *Op. cit.*, p. 72, "foot-note."
‡ "Report on the Geology of New Brunswick."

portion of the province diagonally, and in which the eastern and western chains of the Schoodic lakes exist. Now, if floating ice in a shallow sea picked up these masses of rock, they must have been deposited very soon afterwards; moreover, from the all but universal rounding off and planing of their surfaces, they must have also been subjected to constant friction; again, bearing in view similar appearances observed in the boulders of the glaciers of the Alps and Himalayas, I could fancy that these boulders had been subjected to the immense weight and force of a glacier moving over a rocky bottom, and that thus they got planed and rounded. Now if icebergs were equal to do the same, it seems curious to me how the scorings should be so excessively numerous and regular on the rocks, and how, I repeat, the boulders were picked up and suddenly deposited. Lastly, in attempting to do justice to both theories, with reference to the BOULDER CLAY and DRIFT, there seems to me no exception to take to the explanation of their origin and deposition by one or the other, only that if we admit an arctic current steadily setting in from the north, there should be more signs of sorting or stratification of both than are usually observed, at least inland. As to the river terraces and their origin; being localized, and often, as at Fredericton, not equally defined on both banks, we cannot, I once more repeat, argue positively whether these are the results of oscillations of level during the first upheaval of the rocks in which they exist, or whether they have been formed during subsequent movements connected with the Glacial epoch, or by means of fluviatile or marine currents. Doubtless more facts and a closer study of Glacial phenomena are required before any positive conclusion can be safely arrived at. At the same time it would be doing scant justice to the labours of those who have devoted their best energies to the special study of surface geology, to overlook the views of the latest advocates of the iceberg and land-ice theories; and feeling that every one has a right to

form his own views, provided he has duly studied the subject, as far as my humble apprehensions extend from a knowledge of the opinions of others and personal observations on the Alps and Himalayas, I feel that any impressions I have formed have been strengthened by making fair allowances for the influences of land and floating ice. And I apprehend there are few competent geologists nowadays who do not take a similar view, rather than ascribe all the vast and varied phenomena entirely to the one or to the other—to wit, long epochs of glaciation, subsequent changes of climate with depression, such as might here take place at the close of the Pliocene period, when deluges swept the land, and icebergs were carved in the fiord and river valleys, and so deposited their contents along the coasts.

The following list shows the superposition of the various strata met with in the province,* arranged from above downwards with their chief associated minerals :—

RECENT PERIOD.

Peat mosses, "carabou barrens," river "intervals," estuary and lacustrine deposits, lake mounds.

POST-PLIOCENE PERIOD.

River terraces and raised sea beaches, valley gravels and ridges, glacial drift clays and boulders. Gold is met with sparsely in the drift, but nowhere in remunerative quantity.

NEW RED SANDSTONE PERIODS.

Fringes the southern margin of the province, and composes Prince Edward Island. Oxide of manganese is found in small quantities.

CARBONIFEROUS PERIODS.

Contains coal-seams of small dimensions at various points in central and eastern New Brunswick; none exceed two feet

* The data here furnished are given on the authorities of Drs. Dawson, Gesner, and Robb, Messrs. Bailey, Hind, Hartt, and Matthew.

in thickness. Gypsum, salt, albertite, bitumen, and petroleum are found in remunerative quantities. Iron and lead sparsely, but manganese in quantity.

Devonian Periods.

Iron abundant in form of hematite. Copper in forms of copper glance, peacock ore, yellow sulphuret, green carbonate, and copper pyrites are thinly dispersed, but not as yet remunerative.

Silurian Periods.

Iron mines of Woodstock: superior ore, and abundant. Iron pyrites sparsely distributed. Antimony mines of Prince William very remunerative.

Cambrian and Silurian Periods.

Limestone and graphite of superior qualities, and abundant. Copper sparsely distributed.

CHAPTER XII.

The Naturalist's Calendar, showing the changes of Climate, the arrivals and departures of Migratory Birds, Fishes, etc.

DURING three years' sojourn in central New Brunswick I noted regularly the chief meteorological changes, and also the arrivals and departures of the migratory animals, and found that unless during unusual seasons the sequence of the latter was maintained with marked regularity. Moreover, the summer migrants were little affected as to numbers, unless by being delayed by unusual lateness in the season, or by their departure being hastened by a sudden setting in of cold in autumn, the winter visitors being invariably most numerous when the season was ushered in by inordinate severity, when they continued in unusual numbers throughout the cold months. Again, on the other hand, provided the transition was gradual between summer and winter, and the latter continued comparatively mild, then few winter birds put in an appearance as compared with unusually cold winters. I shall now attempt to convey some idea of these phenomena from notes made in my diary as follows, commencing with

"*January 1st.*—The usual midwinter thaw has set in after weeks of very low temperature, often 10° to 20° below zero of Fahrenheit. It is now that the north winds and biting cold of November and December somewhat moderate, as if the south-east winds had triumphed over the arctic blasts in a degree; indeed it is rare to have more than three days in succession of intense cold, which comes in spells, often

rapidly succeeded by a rise of the thermometer. Even in twenty-four hours I have seen the mercury mount up from 20° to 60° Fahrenheit, but only for a short time. Snow does not fall in any large quantity until after New Year's Day, when it tumbles down in earnest, so dry and finely crystallized that we can take up handfuls of beautifully formed stars, and study the theories of crystallization on the beauties as they drop on the fur of cuffs and gloves. On Christmas Day, 1868, flakes of snow of unusually large dimensions fell, the majority averaging from three to five inches, and for half an hour the air seemed to be filled with large downy feathers, slowly descending, and the trees looked like objects in a pantomime. At this season the snow bunting (*P. nivalis*), spectre-like, is seen in flocks, the only ornithic object in the landscape, unless perhaps the black-headed titmouse, regardless alike of the cold and snow, utters its well known *ica-dee-dee-dee* as it flits among the bare tops of the elms and willows; one wonders what subsistence it can find there. After the few days' thaw about the 10th, comes severe frost and more snow. The average depth of the latter about this time is four feet all over the country, down to within some miles of the coast. Very severe weather, compelling even the indigenous birds to seek the shelter of the forests. (*28th.*) The tom cod or frost fish (*G. pruniosus*) plentiful in the tideways of rivers. The fresh-water cusk (*L. maculosa*) is heavy in spawn, and with the white or gizzard fish (*C. sapidissimus*) is pushing up the St. John, and being captured through the ice."

"*February* 1*st.*—Heavy falls of snow. Snow buntings, white-winged crossbills, redpolls, and the black-headed tit, with occasionally a crow, are the only birds to be seen on the open. (*28th.*) Male redpolls showing the red on the head very brilliantly. Crossbills and Canada jays incubating."

"*March.*—Young of the winter-breeding birds are now flying. Inordinate numbers of redpolls, pine siskins, and

white-winged crossbills (during the winter of 1867 which was very cold; next winter scarcely any were observed)."

"*April 1st.*—Sunny days, frosty nights. Migratory thrush, snow birds (*J. hymelis*), the song and the chipping sparrow, Pennsylvanian finch, and the first summer warbler (*D. vestiæa*) have just suddenly put in their appearance; crossbills and pine-siskins not yet left, and about in flocks, singing very sweetly. Thaws fairly set in, but snow still thick in sheltered places. (*8th.*) Not a bud yet opened out; willows begin, however, to give indications. The migratory birds just named are increasing in numbers daily, and the crow blackbird (*Q. versicolor*) in flocks. The first butterfly (*Satyrus eurythris*) has appeared, and a few cabbage butterflies and dipterous insects; still very cold at night; wonderful that these insects withstand it. (*18th.*) Heavy snow-storms, frost every night; summer migrants have hard struggles for their subsistence; all are crowding around houses. Ducks and geese are putting in their appearance in the rivers and inland lakes, but the ice not yet broken up. (*20th.*) South winds more frequent, and the cause of the rapid melting of the snow, which is still thick in the forests and shaded places. Buds of deciduous leaved trees still unopened. Early bird arrivals, singing sweetly, and commencing to mate as if no time should be lost. The first swallow (*P. purpurea*) announced, having been seen on a swallow-cot in town. Snow still lagging, and migratory water-fowl coming in in small flocks. The American goldfinch, in full breeding attire, has just put in an appearance. (*26th.*) Ice breaking up on the lakes and rivers. Migratory fowl passing through and alighting in numbers. (*29th.*) Ice fairly broken up and running rapidly seaward. Steamers moving up the St. John."*

* The reader will form an idea of the regularity wherewith the ice breaks up in the great rivers of this region from the following census of twenty-six years in connection with the navigation of the St. John River, between Fredericton, the capital, and the city of St. John on the

"*May 1st.*—Delicious smelt (*O. mordax*) coming up the rivers in vast sculls, and readily captured with bait. Alewive (*A. tyrannus*) in great numbers in the Bay of Fundy, fiords, and entrances of rivers, preparing for their rush up to spawn. A few sand martins (*H. riparia*) arrived. No advance in verdure; trees show little sign of budding, excepting the willow. Resident and lately arrived birds pairing. Sturgeon coming up river to spawn. (*15th.*) Nights still chilly. Grass begins to sprout. Insect life much as reported last month. Alewive coming up to spawn, and bass (*R. lineatus*) is also on

coast, a distance of eighty-two miles. The data are taken from the local newspapers :—

1844.—The steamer "Fredericton" arrived on 20th April.
1845.—The steamer "Fredericton" arrived on 26th April.
1846.—The steamer "New Brunswick" arrived here on Thursday, the 9th April, from St. John. This is, we believe, the earliest period at which the St. John River has become navigable within the last forty years.
1847.—On Thursday, the 6th of May, the first trip of the season was made by the steamer "Fredericton."
1848.—The steamer "Fredericton" arrived at Oromocto on 14th April. Ice opposite Fredericton running on the 19th.
1849.—The steamer "Fredericton" arrived from St. John 12th April.
1850.—"Forest Queen" arrived on 1st of May.
1851.—"Reindeer" arrived on 16th April.
1852.—"Forest Queen" arrived on 30th April.
1853.—"Forest Queen" arrived on 17th April.
1854.—"Forest Queen" arrived on 5th May.
1855.—"Forest Queen" arrived on 27th April.
1856.—"Forest Queen" arrived on 24th April.
1857.—"Forest Queen" arrived on 27th April.
1858.—"Anna Augusta" arrived on 22nd April.
1859.—"Forest Queen" arrived on 15th April.
1860.—"Anna Augusta" arrived on 25th April.
1861.—"Forest Queen" arrived on 20th April.
1862.—"Forest Queen" arrived on 23rd April.
1863.—"Anna Augusta" arrived on 25th April.
1864.—"Magnet" arrived on 26th April.
1865.—"Sunbury" arrived on 8th April.
1866.—"Sunbury" arrived on 23rd April.
1867.—"David Weston" arrived on 27th April,
1868.—"Sunbury" arrived on 26th April.
1869.—"David Weston" arrived on 21st April.
1870.—"David Weston" arrived on 14th April.

the same errand. Birds incubating, but summer arrivals not so far advanced as the resident birds. May Flower (*E. repens*) in fragrant bloom—it is assuredly the snowdrop of Canada. Warm showers, southern blasts ; frost still in the soil, which is hard under the surface. Frogs croaking and piping furiously in bogs. (*22nd*, 1867.) A late spring this year after the almost unparalleled cold of the previous months. Swifts (*C. pelasgia*) arriving. Hawthorn budding. Hard-wood trees throwing off their bud-scales. Maple-tree tapping nearly over, the sugar being collected. No warblers, save the brave little yellow warbler above noticed, have yet ventured to visit us. River rising fast and overflowing."

"No doubt the preponderance of forest over bare and cultivated tracts, thus retaining the snow in spring, keeps up an average longer winter than would be were the former cut down. Although tree-felling is going on actively—mostly, however, by the selection of the most valuable trees—there has been no extensive clearing sufficient to produce this change, unless perhaps in parts of southern New Brunswick, where the climate, tempered by the sea, is always milder than in the more inland parts. It is the length of time that the snow lies in the woods that keeps up the chill and retards the melting of the frost in the soil below, often frozen for three feet in depth. Thus, it is well on in May before the land is fit for cereals and seeds, inasmuch as, after the frost has disappeared, there remains a coldness in the earth sufficient to retard germination until the beginning of June, when after several warm showers nature makes a grand effort, as if her time had now come. Hence the fresh arrival is struck by rapid growth of trees and plants. In a few days bare the branches become covered with dense verdure, and the fruit rapidly succeeds the flower, and ripens with amazing rapidity, and apparently often at the expense of its flavour."*

* This is remarkable with many trees, such as the lilac, which bursts suddenly into flower, and before a few days is in seed , the same with the hawthorn, apple, etc., etc.

"(*27th.*) Ruby-throated humming-bird is commencing to show itself. East winds and warm showers, trees budding rapidly. Grass and plants springing up. (*30th.*) Night jar (*C. Virginianus*), and with it legions of warblers of all sorts, are coming in daily. Ice still encrusts the sides of wells, and the deeper alluvium continues hard and frozen. Birds are setting to pair as soon as they arrive."

"*June* 1*st.*—Sea Trout (*S. Canadensis*) coming up the rivers, and also such of the brook trout (*S. fontinalis*) as go to salt water. (*6th.*) Leaves of the maples and hard wood trees scarcely out. The white and blue violets (*V. blanda et palustris*). Fern fronds bursting rapidly from their buds—'fiddle-heads,' as they are named—are greedily devoured as substitutes for green vegetables, to which the residents have been strangers for many months. The dandelion, Indian turnip, trillium, and anemone in full flower. (*10th.*) Ruffed partridge hatching, males 'drumming' all day and night over the forests. The elm and ash still leafless. Vegetation advancing with amazing rapidity. (*13th.*) We have stridden into a tropical summer during the last ten days. All animated objects are exulting in the delightful weather. The Carolina waxwing is coming into the forests in great numbers. (*15th.*) The striped bass playing on the surface, and the Indians and Europeans are spearing them on the St. John. (*27th.*) Passenger pigeon is putting in an appearance, but not in the numbers of former years, when, according to the narratives of old settlers, enormous flocks assembled in the buckwheat fields, and crowded the trees round the settlements, bearing down the very branches, and were slaughtered by thousands to feed pigs. Probably the diminution is in part owing to this cause, and to the extension of agriculture."

"*July.*—Snipe and woodcock breeding. The black fly (*Simulum molestum*), mosquitoes, midges, and bot-flies very annoying in the forests for the last few weeks."

"One of the greatest obstacles to wilderness wanderings in

midsummer is the constant and serious annoyance by night and day from insects. Nowhere are mosquitoes more abundant and bloodthirsty than in the forest tracts; indeed they fairly outstrip their Old World *confrères* in this respect; as if their shortened tenure of life required them to make greater efforts; and possibly it is so; but annoyed as I have been by them in the plains, jungles, and fens of India and Cashmere, I have never seen the mosquito introduce its proboscis and draw blood with the rapidity of the denizens of the wilderness of Canada. The black fly, however, disappears with the forest, and has no doubt been entirely exterminated in many parts of Canada and the United States; but the others delight as much in the open as in the forest: swarming in myriads on head and hands, they fearlessly adhere to the skin, and will suffer death sooner than give up their hold, thus making the woodman's life anything but pleasant; and there is no escape short of remedies perhaps more uncomfortable than the evils themselves. Nets, veils, and so-called 'insect-killers' signally fail. Pennyroyal and camphor are effective, but require to be constantly applied. The lumber man covers his body with pork fat until he is encased in lard—a sort of enamelling process which seems to occupy several days. They drive the old hunter distracted, and I have seen an experienced fisherman so pestered as to throw down his rod and decamp; while bears, moose, etc., betake themselves to the lakes."

"Salmon commence to run early this month. (25*th.*) Wild strawberries and blueberries abundant. (30*th.*) The crow blackbird and purple swallow are practising their broods preparatory to returning south."

"*August* 15*th.*—The swallows and crow blackbirds have gone. Snow finches drawing near to houses, and in large numbers. All the insect vermin have suddenly ceased their torments. The nights are cold. House-fly a perfect pest indoors. Salmon smalt common in rivers last year's fry on their way to the sea. The white fish is about in the rivers;

Is it on its way to the sea after spawning? (*26th.*) All birds of passage assembling. Leaves of maple and other deciduous foliage rapidly changing colour, but no further appearance of decay in plants."

"*September* 1*st.*—Passenger pigeon breeding. Thrushes feeding exclusively on swamp berries and fruits. (14*th.*) Humming-bird still lingers, although the temperature at night falls often to 35°. Deciduous-leaved trees in their full autumn attire. Majority of the soft-billed birds have fled; crickets and grasshoppers very numerous and noisy in pastures. (20*th.*) Nearly all the migratory summer birds have fled. *First frost* at night, killing suddenly all exotics in the open; leaves of melons, squash, pumkins, cucumbers, etc., quite black and dead. Wilson's snipe coming in from the north in grand condition. Migratory thrushes moulting. The brave little summer or yellow warbler, which arrived first, is now the last to depart."

"*October* 5*th.*—Splendid autumn weather; more enjoyable than any of the months of summer, as there are no insects to annoy, and the heat is subdued. Many of the hard-wood trees have now put on their gorgeous autumnal attires, always most varied and beautiful in saplings. I notice that the first leaves to open out in spring are the first to change colour in the fall; and these are usually near the extremities of the lower branches, and thus fully exposed to the sunlight; hence, maples in the middle of the forests do not change colour so soon as trees on the skirts or in the open. As to the change in the coloration of the leaf, as displayed in the Canadian forest, it may, I think, receive the deep tinge of colouring from a sudden check to the circulation through cold drying up the sap, inasmuch as I have always found that as soon as the change begins to appear, then the connection of the leaf-stalk with the branch is so slender that there is no difficulty in separating the two; whereas in the healthy leaf this is accomplished with difficulty. And no doubt the low temperature,

either by a sudden effort, or by causing a strangulation at some point (perhaps the point of junction between the stalk and stem), brings about the colorations alike remarkable for their brilliancy and variety, as compared with the leaf of more temperate climates."

"To persons who have not seen them before, there is an amount of grace, elegance, beauty, and variety in the grouping and coloration of the Canadian forest trees at this season really beyond conception. The bright and variegated hues of the maple and moose wood, with the birch, beech, etc., either dispersed, grouped, or solitary, form beautiful pictures, each tree vying with the other in the transcendent beauty of its dapplings and shadings, which, coupled with the cool, bracing climate, create such happy feelings in the lookers-on, that I certainly think if the question is asked the traveller what he most admired in a Canadian forest, he would unhesitatingly decide in favour of the autumnal change of the leaf. (*15th.*) Weasels and hares not yet showing signs of winter change, although the nights are frosty, and migratory water-fowl from more southern regions are passing through rapidly. (*17th.*) First snows, cold winds. (*21st.*) Winter migratory birds arriving, the first 'snow bunting' of the season. Cusk coming up river. (*25th.*) Snow and frost now the order of the day. All migratory water-fowl pushing rapidly southwards; and winter residents and new-comers putting in their appearance. The last of the summer migrants—to wit, robins, chipping sparrows, and snow birds, lagging on in small numbers; the last to go as they were the first to come."

"*November 6th.*—The pine bullfinch (*P. Canadensis*) arrived, and feeding on the elder-berries; so tame and unconcerned that you may slip a horsehair noose over its head when so employed. (*9th.*) Hare and weasels changing colour rapidly. Ruffed partridge and Canadian grouse about to take to the pine boughs for food. Cusk increasing in numbers in the river.

Snow buntings in flocks. (18*th.*) Rivers and lakes frozen over. Snow falling thickly."

"*December* 12*th.*—All winter changes on the fur of animals completed. Crossbills, pine bullfinches, and the Canada jay commencing to breed."

APPENDIX.

QUADRUPEDS.

THE following is a list of the mammals of New Brunswick as far as I have been enabled to determine :—

Common Bat . . .	Vespertilio Noveboracensis *Gm.*	Common, and generally distributed.
Hoary Bat	Vespertilio pruinosus *Say.*	Probably not so plentiful as the last.
Mole Shrew . . .	Blarina talpoides . *Gray.*	Very common in the forest and inland settlements.
Star-nosed Mole . .	Condylura cristata . *Ill.*	Common.
Puma or Catamount .	Felis concolor . . *Liv.*	Doubtful.
Loup cervier (Loo servee)	Lynx canadensis . . *Raf.*	Generally distributed and not uncommon.
Grey Wolf	Canis occidentalis . *Rich.*	Found in the northern parts only.
Red Fox	Vulpes fulvus . . *Rich.*	Common, and very general.
Silver Fox, Black Fox	Var. v. argentatus . *Schreb.*	This and cross fox subject to varieties ; latter is the most common of the two forms.
Fisher Cat	Mustela Pennantii . *Erxl.*	Not by any means common.
Sable	Mustela martes . . *Linn.*	Common, but steadily decreasing in numbers.
Brown Weasel . .	Putorius cicognanii . *Baird.*	Very common, and generally distributed.
Ermine	Putorius Richardsonii *Bona.*	Common.
Black Mink . . .	Putorius vison . . *Gapp.*	Common, and very generally distributed.
Otter	Lutra vulgaris . . *Lin.*	Not rare, but confined to wilderness rivers.
Skunk	Mephitis mephitica . *Baird.*	Common, and appears increasing.
Raccoon	Procyon lotor . . . *Storr.*	Very rare.
Black Bear	Ursus Americanus . *Pallas.*	Common, and generally distributed over forest lands.
Common Seal . . .	Phoca vitulina . . *Linn.*	Common on the coast.
Hooded Seal . . .	Stemmatopus cristatus *Gm.*	Now and then seen in Bay of Fundy.
Walrus (extinct) . .	Trichecus rosmarus . *Linn.*	Extinct for nearly a century.
Red Squirrel . . .	Sciurus Hudsonius . *Pallas.*	Abundant, and common to wastes and reclaimed districts.

Grey Squirrel . . .	Sciurus migratorius . *And.*	Common in the south-west, and along the western frontier ; partial to localities.
Flying Squirrel . .	Pteromys volucella . *Cuv.*	Not uncommon.
Northern ditto . .	Pteromys Hudsonius *Fischer.*	Perhaps more common than has been supposed.
Striped Squirrel . .	Tamias striatus	Very common, and found in reclaimed as well as forest regions.
Woodchuck . . .	Arctomys monax . . *Gm.*	Common, and possibly increasing.
Beaver	Castor canadensis . *Kuhl.*	Repelled to the wilderness regions of the north.
Jumping Mouse . .	Jaculus Hudsonius *Wagner.*	Not uncommon.
Brown Rat (introduced)	Mus decumanus . . *Pallas.*	Confined to the coast towns and cities, and along the banks of navigable rivers, but not in the wilderness settlements.
House Mouse, ditto .	Mus musculus . . . *L.*	
Whitefooted Mouse .	Hesperomys leucopus *Wagner.*	Common, not seen in the same parts frequented by the two last.
Hamster Mouse . .	Hesperomys myoides *Baird.*	Plentiful in field and forest.
Redbacked Mouse .	Arvicola Gapperi . *Vigors.*	The same as the last, and also about houses.
Musk Rat	Fiber zibethicus . . *Cuv.*	Common in streams in the wilderness, and also in reclaimed districts.
Porcupine	Erethizon dorsatus *F. Cuv.*	Common in woods and forests.
White Rabbit . . .	Lepus Americanus . *Erxl.*	Increasing rapidly, and frequenting cultivated as well as forest regions.
Moose	Cervus alces . . *Cuvier.*	Generally distributed, but its range is being narrowed rapidly.
Caribou	Rangifer caribou, *And.* and *Bach.*	Confined to the forest regions; decreasing.
Virginian Deer . .	Cervus Virginianus *Boddaert*	Localized ; few found eastward of the Saint John ; common in the hilly country along the course of the Magaguadavic river.
Right Whale . . .	Balaena mysticaetus . *Linn.*	Seen occasionally on the coast.
Sperm Whale . . .	Physeter macrocephalus, *Lacepe.*	Rarely observed.
Beaked Rorqual . .	Rorqualus rostratus . *Fabr.*	Several specimens recorded.
Northern Rorqual .	Rorqualus borealis . *Knox.*	Rarely met with.
Black Fish	Globicephalus melas *Lesson.*	Not uncommon.
Porpoise	Phocæna communis . *Cuv.*	Common.
Grampus	Phocæna orca . . (*Fabr.*)	Not rare at times.

LIST OF THE BIRDS OF NEW BRUNSWICK.

A., means *accidental;* M., *migratory;* R., *rare.*

Birds marked * have been captured in Europe.

Many of the land and a greater number of the water birds in the list

are given on the authority of Mr. Boardman, whose determinations have been more or less confirmed by Professor Verrill, in Proc. Boston Soc., Nat. Hist., vol. ix., p. 122.

Cathartes Aura, *Illig.* Turkey buzzard. A.

Falco Peregrinus, *Lin.* Peregrine falcon.[a]

Hypotriorchis Columbarius, *Gr.* Pigeon hawk.

Falco Candicans, *Gmelin.* A.* Jer falcon.

Tinnunculus Sparverius, *Vieill.* M. Sparrow hawk.

Astur Atricapillus, *Bonap.* M. Goshawk.

Accipiter Cooperii, *Bonap.* M. Cooper's hawk.

Accipiter Fuscus, *Bonap.* M. Sharp-shinned hawk.

Buteo Borealis, *Vieill.* M. Red-tailed hawk.

Buteo Lineatus, *Jardine.* Red-shouldered hawk.

Buteo Pennsylvanicus, *Bonap.* M. Broad-winged hawk.

Archibuteo Lagopus, *Gray.* Rough-legged hawk.

Archibuteo Sancti-Johannis, *Gray.* Black hawk.

Circus Hudsonius, *Vieillot.* M. Marsh hawk.

Aquila Canadensis, *Cassin.* R. Golden eagle ; Ring-tailed eagle.

Haliaetus Leucocephalus, *Savigny.* Bald eagle.

Pandion Carolinensis, *Bon.* M. Fish hawk.

Bubo Virginianus, *Bonap.* Great horned owl.

Scops Asio, *Bonap.* * Mottled owl.

Otus Wilsonianus, *Lesson.* Long-eared owl.

Brachyotus Cassinii, *Brewer.* Short-eared owl.

Syrnium Cinereum, *Aud.* M. Great gray owl.

Syrnium Nebulosum, *Gray.* Barred owl.

Nyctale Richardsonii, *Bonap.* Sparrow owl.

Nyctale Acadica, *Bonap.* * Saw-whet owl.

Nyctea Nivea, *Gray.* Snowy owl.

Surnia Ulula, *Bonap.* Hawk owl.

Coccygus Americanus, *Bonap.* M. Yellow-billed cuckoo.

Coccygus Erythrophthalmus, *Bon.* M. Black-billed cuckoo.

Picus Villosus, *Linn.* * Hairy woodpecker.

Picus Pubescens, *Linn.* * Downy woodpecker.

Picoides Arcticus, *Gray.* Three-toed woodpecker.

Picoides Hirsutus, *Gray.* Banded three-toed woodpecker.

Sphyropicus Varius, *Baird.* M. Yellow-bellied woodpecker.

Hylotomus Pileatus, *Baird.* Black woodpecker.

Melanerpes Erythrocephalus, *Sw.* R. M. Red-headed woodpecker.

Colaptes Auratus, *Swainson.* M. Yellow-shafted flicker.

Trochilus Colubris, *Linn.* Humming bird.

Chaetura Pelasgia, *Steph.* Chimney swallow.

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[a] This is the Falco anatum of Bonaparte, now considered identical with the F. peregrinus of Europe. See *Proc. Nat. Hist. Society Boston*, Oct. 17, 1866, p. 64.

Antrostomus Carolinensis, *Gould.* Chuck-Will's-widow.

Chordeiles Popetue, *Baird.* M. Night hawk.

Ceryle Alcyon, *Boie.* M. * Belted kingfisher.

Tyrannus Carolinensis, *Baird.* M. King bird ; Bee bird.

Myiarchus Crinitus, *Cab.* M. Great crested flycatcher. [Pewee.

Sayornis Fuscus, *Baird.* M. R.

Contopus Borealis, *Baird.* M. Olive-sided flycatcher.

Contopus Virens, *Cab.* M. Wood pewee.

Empidonax Traillii, *Baird.* M. Traill's flycatcher.

Empidonax Minimus, *Baird.* M. Least flycatcher.

Empidonax Flaviventris, *Baird.* M. Yellow-bellied flycatcher.

Turdus Pallasi, *Cab.* M.* Hermit thrush.

Turdus Fuscescens, *Stephens.* M. Wilson's thrush.

Turdus Swainsonii, *Cab.* M.* Olive-backed thrush.

Turdus Migratorius, *Linn.* M.* Robin.

Sialia Sialis, *Baird.* M. R. A. Blue bird.

Regulus Calendula, *Licht.* M. R. * Ruby-crowned wren.

Regulus Satrapa, *Licht.* M. Golden-crested wren.

Anthus Ludovicianus, *Licht.* M. * Tit-lark.

Mniotilta Varia, *Vieill.* M. Black and white creeper.

Parula Americana, *Bonap.* M. Blue yellow-back.

Protonotaria Citrea, *Baird.* M. R. Prothonotary warbler.

Geothlypis Trichas, *Cab.* M. Maryland yellow-throat.

Geothlypis Philadelphia, *Baird.* M. R. Mourning warbler.

Helminthophaga Ruficapilla, *Baird.* M. A. Nashville warbler.

Seiurus Aurocapillus, *Swainson.* M. Golden-crowned thrush.

Seiurus Noveboracensis, *Nutt.* M. Water thrush.

Dendroica Virens, *Baird.* M. * Black-throated green warbler.

Dendroica Canadensis, *Baird.* M. R. Black-throated blue warbler.

Dendroica Coronata, *Gray.* M. Yellow-rump warbler.

Dendroica Blackburniae, *Baird.* M. Blackburnian warbler.

Dendroica Castanea, *Baird.* M. Bay-breasted warbler.

Dendroica Pinus, *Baird.* M. R. Pine-creeping warbler.

Dendroica Pennsylvanica, *Baird.* M. Chestnut-sided warbler.

Dendroica Striata, *Baird.* M. Black poll warbler.

Dendroica Aestiva, *Baird.* M. Yellow warbler.

Dendroica Maculosa, *Baird.* Black and yellow warbler.

Dendroica Tigrina, *Baird.* M. Cape May warbler.

Dendroica Palmarum, *Baird.* M. Yellow redpoll.

Myiodioctes Pusillus, *Bonap.* M. Green black-cap flycatcher.

Myiodioctes Canadensis, *Aud.* M. Canada flycatcher.

Setophaga Ruticilla, *Swainson.* M. Redstart.

Pyranga Rubra, *Vieill.* A. Scarlet tanager.

Hirundo Horreorum, *Barton.* M. Barn swallow. [swallow.

Hirundo Lunifrons, *Say.* M. Cliff

Hirundo Bicolor, *Vieill.* M. * White-bellied swallow.

Cotyle Riparia, *Boie.* M. Bank swallow.

Progne Purpurea, *Boie.* M. * Purple martin.

Ampelis Garrulus, *Linn.* A.[b] Waxwing.

Ampelis Cedrorum, *Baird.* M. * Cedar bird.

Collyrio Borealis, *Baird.* M.[c] Great Northern shrike.

Vireo Olivaceus, *Vieill.* M. * Red-eyed flycatcher.

Vireo Gilvus, *Bonap.* M. Warbling flycatcher.

Vireo Solitarius, *Vieill.* M. Blue-headed flycatcher.

Mimus Carolinensis, *Gray.* M. Cat bird.

Troglodytes Hyemalis, *Vieill.* Winter wren.

Certhia Americana, *Bonap.* M. American creeper.

Sitta Carolinensis, *Gmelin.* White-bellied nuthatch.

Sitta Canadensis, *Linn.* Red-bellied nuthatch.

Parus Atricapillus, *Linn.* Black-cap titmouse.

Parus Hudsonicus, *Forster.* Hudsonian titmouse.

Eremophila Cornuta, *Boie.* M. R.[d] Skylark.

Pinicola Canadensis, *Cab.* M.[e] Pine grosbeak.

Carpodacus Purpureus, *Gray.* M. Purple finch.

Chrysomitris Tristis, *Bonap.* M. Yellow bird.

Chrysomitris Pinus, *Bonap.* Pine finch.

Curvirostra Americana, *Wils.* * Red crossbill.

Curvirostra Leucoptera, *Wils.* * White-winged crossbill.

Aegiothus Linaria, *Cab.* M.[f] Lesser redpoll.

Plectrophanes Nivalis, *Meyer.* M.[g] Snow bunting.

Plectrophanes Lapponicus, *Selby.* M.[h] Lapland longspur.

Passerculus Savanna, *Bonap.* M. Savannah sparrow.

Pooecetes Gramineus, *Baird.* M. Grass finch.

Coturniculus Passerinus, *Bonap.* M. Yellow-winged sparrow.

Zonotrichia Leucophrys, *Swainson.* M. White-crowned sparrow.

Zonotrichia Albicollis, *Bonap.* M. White-throated sparrow.

Junco Hyemalis, *Sclat.* M. Black snow bird.

Spizella Monticola, *Baird.* M. Tree sparrow.

Spizella Socialis, *Bonap.* M. Chipping sparrow.

Melospiza Melodia, *Baird.* M. Song sparrow.

Melospiza Palustris, *Baird.* M. Swamp sparrow.

Passerella Iliaca, *Swainson.* M. Fox-coloured sparrow.

Guiraca Ludoviciana, *Swainson.* M. R. Rose-breasted grosbeak.

Guiraca Caerulea, *Swainson.* M. Blue grosbeak.

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[b] The waxwing appears only in winter, whilst the cedar bird comes only in summer; although, during certain mild winters, Mr. Boardman has noticed flocks of the latter.

[c] A winter visitor.

[d] Ditto.

[e] Ditto.

[f] A winter visitor only.

[g] Ditto

[h] Ditto.

Cyanospiza Cyanea, *Baird.* M. R. Indigo bird.

Dolichonyx Oryzivorus, *Swainson.* M. Boblink; reed bird.

Molothrus Pecoris, *Swainson.* M. Cow bird.

Agelaius Phoeniceus, *Vieill.* M. Red-winged blackbird.

Sturnella Magna, *Swainson.* A. Meadow lark.

Icterus Spurius, *Bonap.* R. Orchard oriole.

Icterus Baltimore, *Daudin.* A. Baltimore oriole.

Scolecophagus Perrugineus, *Swainson.* M. Rusty blackbird.

Quiscalus Versicolor, *Vieill.* M. Crow blackbird.

Corvus Carnivorus, *Bartram.* American raven.

Corvus Americanus, *Aud.* Common crow.

Cyanura Cristata, *Swainson.* Blue jay.

Perisoreus Canadensis, *Bonap.* Canada jay.

Ectopistes Migratoria, *Swainson.* M. * Wild pigeon.

Zenaidura Carolinensis, *Bonap.* M. R. Common dove.

Tetrao Canadensis, *Linn.* Spruce partridge. [grouse.

Bonasa Umbellus, *Steph.* Ruffled

Ardea Herodias, *Linn.* M. Great blue heron.

Botaurus Lentiginosus, *Steph.* M.* Bittern; take driver.

Butorides Virescens, *Bonap.* M. Green heron.

Nyctiardea Gardeni, *Baird.* M. Night heron.

Charadrius Virginicus, *Borck.* M. * Golden plover.

Aegialitis Vociferus, *Cassin.* M. * Killdeer.

Aegialitis Semipalmatus, *Cab.* M. Semipalmated plover.

Aegialitis Melodus, *Cab.* M. Piping plover.

Squatarola Helvetica, *Cuv.* M. Black-bellied plover.

Strepsilas Interpres, *Illig.* R. Turnstone.

Recurvirostra Americana, *Gm.* A. American avoset.

Himantopus Nigricollis, *Vieill.* A. Black-necked stilt.

Phalaropus Hyperboreus, *Temm.* M. Northern phalarope.

Phalaropus Fulicarius, *Bonap.* M. Red phalarope.

Philohela Minor, *Gray.* M. American woodcock.

Gallinago Wilsonii, *Bonap.* M. English snipe.

Macrorhamphus Griseus, *Leach.* M. * Red-breasted snipe.

Tringa Canutus, *Linn.* M. Knot.

Tringa Maritima, *Brünnich.* M.[1] Purple sandpiper.

Tringa Subarquata, *Temm.* M. Curlew sandpiper.

Tringa Alpina, var. Americana, *Cas.* Red-backed sandpiper.

Tringa Maculata, *Vieill.* M.* Jack snipe.

Tringa Wilsonii, *Nuttall.* M. Least sandpiper.

Tringa Bonapartii, *Schlegel.* Bonaparte's sandpiper.

Calidris Arenaria, *Illiger.* M. Sanderling.

Ereunetes Petrificatus, *Illiger.* M. Semipalmated sandpiper.

Symphemia Semipalmata, *Hartl.* M. * Willet.

[1] In winter common.

Gambetta Melanoleuca, *Bonap.* M. Tell-tale ; Stone snipe.
Cambetta Flavipes, *Bonap.* M. * Yellow legs.
Rhyacophilus Solitarius, *Bonap.* M. Solitary sandpiper.
Tringoides Macularius, *Gray.* M.* Spotted sandpiper.
Philomachus Pugnax, *Gray.* A. Ruff.
Actiturus Bartramius, *Bonap.* M.* Field plover.
Limosa Hudsonica, *Swainson.* M. Hudson godwit.
Numenius Longirostris, *Wils.* M. Long-billed curlew.
Numenius Hudsonicus, *Latham.* R. * Hudsonian curlew.
Numenius Borealis, *Latham.* R.* Esquimaux curlew.
Porzana Carolina, *Vieill.* * Common rail. low rail.
Porzana Noveboracensis. R. Yel-
Fulica Americana, *Gmelin.* M. Coot.
Anser Hyperboreus, *Pallas.* R. * Snow goose.
Anser Albatus, *Cassin.* A. White goose.
Bernicla Canadensis, *Boie.* M. * Canada goose.
Bernicla Brenta, *Steph.* M. Brant.
Anas Boschas, *Linn.* R. Mallard.
Anas Obscura, *Gm.* Black duck.
Dafila Acuta, *Jenyns.* M. Sprig-tail ; pin-tail.
Nettion Carolinensis, *Baird.* M. Green-winged teal.
Querquedula Discors, *Steph.* M.* Blue-winged teal.
Spatula Clypeata, *Boie.* R. Shoveller.
Chaulelasmus Streperus, *Gray.* R. Gadwall.
Marcca Americana, *Stephens.* R.* Baldpate.
Aix Sponsa, *Boie.* M. Summer duck.
Fulix Marila, *Baird.* R. Greater black-head.
Fulix Affinis, *Baird.* M.* Little black-head.
Folix Collaris, *Baird.* R.* Ring necked duck.
Aythya Americana, *Bonap.* Red-head.
Bucephala Islandica, *Baird.* R.[l] Barrow's golden eye.
Bucephala Albeola, *Baird.* M.* Butter ball.
Histrionicus Torquatus, *Bonap.* M. Harlequin duck.
Harelda Glacialis, *Leach.* M. Old squaw.
Camptolaemus Labradorius, *Gray.* R.[m] Labrador duck.
Melanetta Velvetina, *Baird.* M. Velvet duck.
Pelionetta Perspicillata, *Kaup.* M.* Surf duck.
Oidemia Americana, *Swainson.* M. Scoter.
Somateria Mollissima, *Leach.* Eider duck.
Somateria Spectabilis, *Leach.* King Eider.
Erismatura Rubida, *Bonap.* M. R. Ruddy duck.
Mergus Americanus, *Cass.* M. Sheldrake.

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[j] Winter visitor.
[k] In winter.
[l] Ditto.
[m] Winter for the most part ; occasionally seen in summer.

Mergus Serrator, *Linn.* M. Red-breasted merganser.
Lophodytes Cucullatus, *Reich.* A. Hooded merganser.
Pelecanus Erythrorhynchus, *Gm.* A. American pelican.
Sula Bassana, *Briss.* Gannet.
Graculus Carbo, *Gray.* M. Common cormorant.
Graculus Dilophus, *Gray.* M. Double-crested cormorant.
Thalassidroma Leachii, *Temm.* Leach's petrel.
Thalassidroma Wilsoni, *Bonap.* Wilson's petrel.
Thalassidroma Pelagica, *Bonap.* Mother Carey's chicken.
Puffinus Major, *Faber.* M.[n] Greater shearwater.
Puffinus Fuliginosus, *Strick.* M. * Sooty shearwater.
Puffinus Anglorum, *Temm.* M. Mank's shearwater.
Stercorarius Pomarinus, *Temm.* M. Pomarine Skua.
Stercorarius Parasiticus, *Temm.* Arctic skua.
Stercorarius Cepphus, *Ross.* M. Buffon's skua.
Larus Glaucus, *Brünn.* Burgomaster.
Larus Leucopterus, *Faber.* White-winged gull.
Larus Marinus, *Linn.* Great black-backed gull.
Larus Argentatus, *Brünn.* Herring gull.
Larus Delawarensis, *Ord.* M. Ring-billed gull.
Chroicocephalus Atricilla, *Linn.* Laughing gull.
Chroicocephalus Philadelphia. M. Bonaparte's gull.
Rissa Tridactyla, *Bonap.* M. Kittiwake gull.
Sterna Wilsoni, *Bonap.* M. Wilson's tern.
Sterna Macroura, *Naum.* M. Arctic tern.
Colymbus Torquatus, *Brünn.* M. [Loon.
Colymbus Septentrionalis, *Linn.* M.[n] Red-throated diver.
Podiceps Griseigena, *Gray.* M.[o] Red-necked grebe.
Podiceps Cristatus, *Lath.* M. Crested grebe.
Podilymbus Podiceps, *Lawr.* M. Carolina grebe.
Alca Impennis, *Linn.* Great auk.[p]
Alca Torda, *Linn.* Razor-billed auk.
Mormon Cirrhata, *Bonap.* Tufted puffin.
Mormon Glacialis, *Leach.* R. Sea parrot; puffin.
Mormon Arctica, *Illiger.* Arctic puffin.
Uria Grylle, *Latham.* Black guillemot. [lemot.
Uria Lomvia, *Brünnich.* Foolish guillemot.
Uria Ringvia, *Brünnich.* M. Murre.
Mergulus Alle, *Vieillot.* M. Sea dove.[q]

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[n] A winter visitor.
[o] Ditto.
[p] Bones, as noted, have been found in Indian refuse-heaps on the coast of Maine.
[q] Winter only.

REPTILES.

The following list of the Reptilia include also species found in the adjoining State of Maine, and identified by Professor Verrill, and Dr. Fogg, Curator of Herpetology in the Portland Society of Natural History. The last named species are in *italics*.

TURTLES.

Nanemys guttata, *Ag.* The yellow-spotted turtle.

Chrysemys picta, *Gray.* The painted turtle.

Ozotheca odorata, *Ag.* The mud turtle.

Chelydra serpentina, *Schmig.* The snapping turtle.

Glyptemys insculpta, *Ag.* The wood turtle.

Cistudo Virginea, Ag. The box turtle. Only one specimen found.

SAURIANS.

Scincus fasciatus, Linn. The blue-tailed lizard. Rare.

SERPENTS.

Eutainia sirtalis, *B. & G.* The striped snake.

E. Saurita, B. & G. The riband snake. Common.

Storeria Dekayi, *B. & G.* The little brown snake.

Chlorosoma vernalis, *B. & G.* The green snake.

Crotalus durissus, Linn. The banded rattle snake. Rare. In the south-west parts of the State of Maine only.

Bascanion constrictor, B. & G. The black snake. Rare. In the south-west parts of the State only.

Nerodia sipedon, *B. & G.* The water snake.

Storeria occipito-maculata, B. & G. The spotted-neck snake. Common.

Diadophis punctatus B. & G. The ring-necked snake. Not common.

Ophibolus eximius, *B. & G.* The milk snake.

AMPHIBIANS.

FROGS AND TOADS.

Rana Catesbianus, *Shaw.* The bull frog.

R. clamitans, *Daud.* The yellow-throated green frog.

Rana palustris, *Leconte.* The pickerel frog.

R. sylvatica, *Leconte.* The wood frog.

R. halecina, *Kalm.* The leopard frog.

Hylodes Pickeringii, *Hobb.* Pickering's hylodes.

Hyla versicolor, *Leconte.* The tree toad.

Bufo Americanus, *Lan.* The common toad.

SALAMANDERS.

Plethodon erythronotus, Baird. The red-backed salamander. Common.

P. glutinosus, Tesch. The blue-spotted salamander. Common.

Salamandra opaca, Gray. The banded salamander. Quite common.

S. punctata, Lac. The violet coloured salamander. Common.

S. maculata, Green. The brown-spotted salamander.

S. granulata, Hol. The granulated salamander. Rare.

Desmognathus fuscus, Baird. The painted salamander. Rare.

Spelerpes bilineata, Baird. The striped-back salamander. Common.

Pseudotriton salmoneus, Baird. The salmon-coloured salamander.

Notophthalmus viridescens, Baird. The crimson-spotted triton. Common.

N. miniatus, Raf. The symmetrical salamander. Common.

FISHES.

This list represents the chief marine and fresh-water fishes as far as I have been able to discover. Many of the former I have not verified from personal observation, and therefore give them (in *italics*) on the authority of Dr. Holmes,* Professor Gill,† and others :—

Yellow or brindle perch. Perca flavescens. *Mitch.*

Striped bass. Roccus Lineatus. *Gill.*

White perch. Morone Americana. *Gill.*

Bream, flat fish. Pomotis vulgaris. *Cuv.*

Pumpkin seed. Pomotis appendix. *Mitch.*

White lake bass. Labrax albidus. *Dekay.*

Big porgee. *Pagrus argyrops. Cuv.*

Weak fish. *Cynoscion regalis. Gill.*

Spring mackerel. Scomber vernalis. *Mitch.*

Fall mackerel. Scomber grex. *Mitch.*

Tunney, or horse mackerel. Oryconis secund. dorsalis. *Gill.*

Spanish mackerel. *Apodontis maculatus. Gill.*

Sword fish. *Xiphias gladius. Storer.*

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* "Ichthyology of Maine," in *Report of Geology and Agriculture*, 1st series, 1861, p. 31 ; and 2nd series, 1862, p. 60.

† Gill, "Synopsis of the Fishes of the St. Lawrence and Bay of Fundy," *Canadian Naturalist*, 1865.

Blunt-nose shiner. *Vomer setipinnis. Ayres.*
Blue fish. *Pomatomus saltatrix. Gill.*
Bill fish. *Scomberesox scutellatus. Lesneur.*
Two-spined stickleback. Gasterosteus biaculeatus. *Mitch.*
Many-spined stickleback. Gasterosteus occidentalis. *Brevort.*
Many-spined stickleback. *Pygosteus Dekayii. Brevort.*
Silverside. *Chirostoma notatum. Gill.*
Norway haddock. *Sebastes Norwegicus. Cuv.*
Sea raven. Hemitripterus acadiensis. *Storer.*
Sculpin, Greenland bull-head. *Cottus Greenlandicus. Girard.*
Common sculpin, or bull-head. *Cottus octodecim spinatus. Gill.*
Labrador or northern sculpin. Cottus Labradoricus. *Girard.*
American aspidophore. *Aspidophorus monopterygius. Storer.*
Sea swallow. Dactylopterus volitans. *Lac.*
Toad fish. *Batrachus tau. Linn.*
Radiated shanny. Pholis subbifurcatus. *Storer.*
Butter fish. *Muraenoides mucronatus. Gill.*
Thick-lipped eelpout. Zoarces anguillaris. *Storer.* [*Storer.*
Lump fish. Lumpus anglorum.
Sea wolf. Anarrhicas vomerinus. *Storer.*
Spotted wry mouth. Cryptocanthodes maculatus.
Ghost fish. Cryptocanthodes inornatus.
Angler. Lophius Americanus. *Val.*
Bank cod. *Gadus Vulgaris* (doubtful). *Perley.*
Cod fish. Gadus Americanus. *Gill.*
Frost fish; Tom cod. Gadus pruinosus. *Mitch.*
Haddock. Melanogrammus aeglifinus. *Gill.*
Pollock. Merlangus purpureus. *Storer.*
Hake. Merlucius vulgaris. *Reisch.*
Fresh water cusk. Lota maculosa. *Dekay.*
Cusk. Brosmius flavescens. *Storer.*
American Hake. Phycis Americana. *Cuv.*
Dekay's codling. *Phycis Dekayii. Kaup.*
New York ophidium. *Ophidium marginatum. Mitch.*
Black fish. Tautoga Americana. *Storer.*
Cunner. *Ctenolabrus coeruleus. Storer.*
Halibut. Hippoglossus Americana. *Gill.*
Toothed flat fish, summer flounder. *Pomatopsetta dentata. Gill.*
Flounder. Platessa plana. *Storer.*
Shiner. Leucosomus Americanus. *Storer.*
Red fin. Leuciscus cornutus. *Dekay.*
Banded dace. Leuciscus vittatus. *Dekay.* [*Storer.*
Roach dace. Leuciscus pulchellus.
Chub, big head. Leuciscus cephalus. *Kirt.*
Shining dace. Leuciscus nitidus. *Dekay.*
New York shiner. Leuciscus crysoleucas. *Mitch.*
Brook minnow. Leuciscus atronasus. *Storer.*
Chub Leuciscus sp. (?)
Common sucker. *Catastomus Bostoniensis* (?) *Lesueur.*
Moxostomus oblongus. *Ayres.*

Chub. *Catastomus Gibbosus* (?)
Minnow, killifish. Fundulus pisculentus. *Val.*
Common pickerel. Esox reticulatus. *Lesueur.*
Salmon. Salmo salar. *Linn.*
Brook trout. Salmo fontinalis. *Mitch.*
Sea trout. Salmo Canadensis. *Smith.*
Salmon trout. *Fario tsuppitch* (?)
Salmo hamatus. Cuvier.
Silvery salmon trout. Salmo Gloverii. *Girard.*
Togue. Salmo confinis. *Dekay.*
Blue-backed trout. *Salmo oquassa Girard.**
White, or Gizzard fish. Coregonus sapidissimus. *Richard.*
Argyrosoma clupeiformis. Ayres.
Smelt, fresh water. Osmerus mordax. *Gill.*
Sea smelt. Osmerus (?)
Capelin. Mallotus villosus.
Herring. Clupea elongata. *Linn.*
Common Shad. Alosa sapidissima. *Storer.*
Alewife, or Gaspereau. Alosa tyrannus. *Dekay.*
Alosa cyanonoton. Storer.
Menhaden, Moss bonker. Brevoortia menhaden. *Gill.*
Brit. *Clupea minima. Pec. Perley.*
Autumnal herring. Alosa mattowaca. *Dekay.*
Anchovy. *Engraulis vittata. Baird and Girard.*
Dusky balistes. *Balistes fuliginosus. Dekay.*
Sharp-nosed eel. Anguilla tenuirostris. *Dekay.*
Eel. *Anguilla Bostoniensis. Les.*
American Conger. *Anguilla oceanica. Dekay.*
Sand launce. Ammodytes tobeanus. *Blanch.*
Thin head. *Leptocephalus gracilis. Storer.*
Cat fish. Pimelodus catus. *Dekay.*
Sturgeon. Acipenser oxyrhynchus. *Mitchell.*
Porbeagle. *Lamna punctata. Storer.*
Dog fish (*Perley*). *Squalus Americanus. Gill ex St.*
Basking shark. Cetorhinus maximus.† *Blainville.*
Thresher shark (*Perley*). *Alopias vulpes. Bon. ex Linn.*
Sleeper. *Somniosus brevipennis. Lesueur.*
Skate (*Perley*). *Raia laevis. Mitch.*‡
Hedgehog ray (*Perley*).§ *Raia erinace. Mitchill.*
Lamprey. Petromyzon Americanus. *Les.*

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* "Report on the Fishes of New Brunswick," p. 209.

† Bangeley Lake, Maine, only, but possibly also in New Brunswick waters.

‡ One was driven on the coast of Maine during the summer of 1868.

§ These two rays are doubtful.

CLIMATE.

THE following Meteorological Observations have no pretence whatever to completeness, but I believe afford a fair illustration of the climate, seeing that no carefully conducted data on these points have as yet been recorded, at least as far as Central New Brunswick is concerned, whilst the very valuable and precise researches of Mr. Murdoch on the coast of St. John present a striking contrast to the meagre facts hitherto tabulated of the meteorology of the interior. I have therefore selected an average year of range of temperature, more especially on account of the observations being trustworthy, as I had cause to know from personal knowledge of the capabilities of my excellent friend and late brother officer Mr. Welch, F.R.C.S., now Assistant Professor of Pathology in the Royal Victoria Hospital at Netley, who, aided by Sergeant Baird, of the 22nd Regiment, conducted a series of interesting notices on the climate by means of reliable instruments.

METEOROLOGICAL OBSERVATIONS

Taken at FREDERICTON, New Brunswick, from May, 1867, to April, 1868, inclusive.

Lat. 45° 57′ 28″ N. Long. 66° 38′ W.

The height above the Sea seems never to have been faithfully determined; perhaps 300 feet is about correct. Fredericton is 58 miles inland.

ABBREVIATIONS.

Strength of Wind.—S, strong: G, gale blowing; L, light wind; C, calm.
Condition of Atmosphere.—R, rain; F, fine, calm; C, cloudy; Fr, frost; S, snow; M, mist.

MAY, 1867.

DATE.	THERM. A.M. 8	THERM. P.M. 3	WIND. A.M. 8	WIND. P.M. 3	Strength of Wind.	Condition of Atmosphere.	BAROM. A.M. 8	BAROM. P.M. 3	REMARKS.
1	50	57	S.E.	E.	S	R	29·78	29·62	
2	47	54	E.	S.W.	G	R	29·36	29·62	
3	42	51	S.	S.	L	F	30·32	30·34	
4	44	47	N.E.	N.E.	L	F	30·52	30·36	
5	37	47	N.E.	N.E.	L	C	30·32	30· 3	
6	41	53	S.E.	E.	L	C	30·06	30·04	
7	43	55	N.E.	N.E.	L	C	29·96	29·94	
8	49	54	N.E.	N.E.	L	R	29· 7	29· 6	
9	50	62	N.E.	S.E.	L	R	29·46	29· 4	
10	50	58	S.E.	S.E.	L	C	29·51	29·53	
11	47	55	N.E.	S.W.	L	R	29·55	29·54	
12	46	55	S.W.	S.W.	S	C	29·66	29·66	
13	52	57	S.W.	S.W.	L	F	29·77	29·76	
14	43	53	S.W.	S.W.	L	C	29·73	29·63	
15	45	47	N.W.	N.E.	L	R	29·46	29·42	
16	43	47	N.E.	N.E.	L	R	29·53	29·55	
17	45	55	N.	S.W.	L	C	29·66	29·66	
*18	40	43	N.E.	E.	L	R	29·71	29·82	
19	38	42	N.	N.W.	S	C	29·85	29·85	
20	44	51	N.W.	N.W.	L	F	29·83	29·76	
21	49	58	S.W.	S.W.	L	F	29·78	29· 7	
22	53	60	S.W.	S.W.	L	F	29· 7	29· 6	
23	37	46	N.E.	N.E.	L	R	29· 6	29·66	
24	41	58	S.E.	S.E.	L	R	29·74	29·72	
25	40	58	S.W.	S.W.	L	F	29· 9	29· 9	
26	44	47	S.W.	S.W.	L	R	29·98	29·87	
27	55	63	S.W.	S.W.	L	F	29· 8	29·77	
28	57	63	S.W.	S.W.	S	F	29·91	29·84	
29	58	63	N.W.	N.E.	L	F	29·94	29·88	
30	44	55	N.E.	N.E.	L	F	29·95	29· 9	
31	44	50	N.E.	N.E.	L	R	29·78	29·74	

* Fall of snow to 3 in. at Stanley, near Fredericton.

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong ; G, gale blowing ; L, light wind ; C, calm.

Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

JUNE, 1867.

DATE.	THERM. A.M. 8	THERM. P.M. 3	WIND. A.M. 8	WIND. P.M. 3	Strength of Wind.	Condition of Atmosphere.	BAROM. A.M. 8	BAROM. P.M. 3	REMARKS.
1	57	64	N.W.	S.W.	L	F	29·94	29·88	
2	63	75	S.W.	S.	L	F	29·94	29·86	
3	53	54	S.	S.W.	C	R	29·74	29· 6	
4	52	70	S.W.	S.	S	F	29·44	29· 4	
5	59	64	N.W.	N.W.	S	F	29·72	29·74	
6	44	62	N.W.	S.W.	L	C	29·88	29· 8	
7	54	64	N.W.	N.W.	L	F	29·76	29·88	
8	62	65	N.E.	N.E.	L	F	30·18	30·14	
9	59	64	N.E.	N.E.	—	F	30·01	30·06	
10	56	69	N.W.	N.E.	L	F	30· 2	30· 1	
11	54	74	N.E.	N.E.	L	F	30·18	30·04	
*12	63	75	S.E.	N.E.	L	F	29·94	29·74	
13	62	78	N.E.	N.W.	L	R	29·76	29·75	
14	68	79	N.	S.W.	L	F	30·02	30·	
15	48	62	S.E.	E.	L	R	29·98	29·88	
16	61	75	E.	S.	L	F	29· 8	29·91	
17	64	73	N.E.	E.	L	F	30·18	30·14	
18	52	64	E.	S.W.	L	R	30·02	29·84	
19	61	68	S.W.	S.W.	L	F	29· 8	29·87	
20	52	68	N.W.	S.W.	L	F	30· 1	30· 1	
21	63	71	N.W.	S.W.	L	F	30· 2	30·12	
22	65	78	S.W.	S.W.	L	F	30· 1	30·04	
23	53	72	E.	S.W.	L	R	29·97	29·86	
24	56	64	E.	N.E.	L	R	29·98	30·	
25	66	76	E.	E.	L	F	30·05	30·	
26	69	79	S.W.	S.W.	L	F	30·12	30· 1	
27	64	75	E.	S.E.	S	F	30·15	30·04	
28	60	77	S.W.	S.E.	L	R	29·72	29· 7	
29	66	73	S.W.	S.W.	L	F	29·94	29·89	
30	57	75	S.E.	S.W.	L	F	29·66	29· 5	

* All the characters of the sirocco of Southern Europe.

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong ; G, gale blowing ; L, light wind ; C, calm.

Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

JULY, 1867.

DATE.	THERM. A.M. 8	THERM. P.M. 3	WIND. A.M. 8	WIND. P.M. 3	Strength of Wind.	Condition of Atmosphere.	BAROM. A.M. 8	BAROM. P.M. 3	REMARKS.
1	64	72	S.E.	S.W.	S	F	29·84	29· 6	
2	62	71	S.W.	S.W.	S	F	29·68	29· 6	
3	57	74	S.W.	S.W.	S	F	29· 6	29· 6	Heavy rain in the evening. Thunder storm.
4	63	70	S.W.	S.W.	L	R	29·71	29· 7	
5	62	72	S.W.	N.W.	L	F	29· 9	29· 9	
6	61	72	N.E.	N.W.	L	R	29· 9	29·82	
7	57	61	N.E.	N.E.	L	R	29·62	29·66	
8	59	80	N.W.	S.E.	L	F	29·72	29·66	
9	61	75	S.W.	S.W.	L	F	29·92	29·86	
10	66	76	N.W.	N.E.	L	F	29·96	29·92	
11	63	77	N.E.	N.E.	L	F	29·92	29· 8	
12	67	74	E.	S.W.	S	C	29· 6	29·62	
13	65	68	N.W.	N.E.	L	C	29·94	30·	
14	68	76	N.E.	N.E.	L	F	30· 2	30·13	
15	66	66	N.W.	S.E.	S	R	30·07	29·92	Thunder storm.
16	68	85	S.W.	S.E.	L	F	29·86	29· 8	
17	58	72	N.E.	N.E.	L	C	29·82	29·82	Rain at night.
18	55	65	S.E.	N.E.	L	C	30·04	30·08	
19	53	60	N.E.	N.E.	L	C	30·12	30·08	
20	54	62	N.E.	N.E.	S	R	30·01	29·88	
21	52	59	N.E.	N.E.	L	R	29·72	29·65	
22	53	56	N.E.	N.E.	L	R	29·54	29·52	Rain all-day.
23	54	73	N.W.	N.E.	L	R	29·62	29·64	
24	71	85	N.E.	S.W.	S	F	29·62	29·74	Thunder storm.
25	69	73	S.W.	E.	L	F	29·61	29·64	
26	69	72	N.W.	S.E.	L	R	29·74	29·71	
27	57	76	S.W.	S.W.	L	F	29· 9	29· 9	
28	59	76	S.	S.E.	L	F	29·78	29·62	
29	73	77	S.W.	S.W.	L	F	29· 5	29·55	
30	61	70	S.W.	S.W.	L	F	29·76	29·77	
31	62	70	S.W.	S.E.	L	F	30·16	30·19	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong; G, gale blowing; L, light wind; C, calm.

Condition of Atmosphere.—R, rain; F, fine, calm; C, cloudy; Fr, frost; S, snow; M, mist.

AUGUST, 1867.

DATE	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Strength of Wind.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	65	75	N.E.	S.W.	L	F	30· 2	30·12	
2	60	65	S.W.	S.E.	L	R	30·	29·94	
3	66	71	S.W.	S.W.	L	R	99·78	29·94	
4	68	72	S.W.	S.W.	L	F	29·93	29·97	
5	72	82	S.W.	S.W.	L	F	30·06	30·	
*6	67	76	S.W.	N.E.	L	R	30·14	30· 1	
7	69	83	E.	S.E.	L	F	30·06	30·	
8	66	84	S.W.	S.E.	L	F	30·04	30·	
9	65	80	S.	S.W.	L	F	30·05	30·	
10	72	82	E.	E.	L	F	29· 9	29· 8	
11	64	71	S.W.	W.	S	F	29·87	29·88	
12	60	77	S.W.	S.W.	L	F	29·92	29·83	
13	60	76	S.W.	S.W.	L	C	29·74	29·72	
14	58	61	S.E.	E.	L	R	29·78	29·82	
15	60	72	E.	E.	L	F	30·04	30·05	
16	63	75	E.	E.	L	F	30·07	29·98	
17	61	70	E.	E.	L	R	29·74	29·66	
18	63	75	N.W.	S.W.	L	R	29· 6	29·66	
19	72	81	S.E.	E.	L	F	29·75	29·66	
20	65	72	S.W.	S.W.	L	F	29·74	29· 7	
21	68	77	S.W.	S.W.	L	F	29·76	29·72	
22	66	76	S.W.	S.W.	L	F	29· 9	29· 9	
23	52	61	S.W.	S.W.	L	R	29·96	29· 9	
24	57	67	N.E.	N.W.	L	R	29· 7	29·67	
25	62	68	W.	S.W.	S	F	29·73	29·74	
26	56	72	S.W.	S.W.	L	F	30·	29·92	
27	64	82	S.E.	S.W.	L	F	29· 9	29·82	
28	62	73	S.	S.E.	L	C	29·85	29·74	
29	60	63	S.W.	S.E.	L	R	29·68	29·62	
30	57	67	S.W.	S.W.	L	C	29· 6	29·62	
31	53	65	S.W.	S.W.	L	F	30·05	30·	

* About a mile and a half from Fredericton a fall of snow took place during a fall of rain at the latter; the snow was sufficient to form a light coating to the clothes. There is no doubt of the authenticity of this.

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind—S, strong ; G, gale blowing ; L, light wind ; C, calm.

Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

SEPTEMBER, 1867.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Strength of Wind.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	54	60	S.E.	S.E.	L	F	29·88	29·82	
2	55	63	S.W.	S.W.	L	F	29·87	29·98	
3	67	70	S.W.	S.W.	L	F	30·22	30·15	
4	52	63	E.	S.W.	L	F	30·02	29·92	
5	54	71	S.W.	S.W.	L	F	30·07	30·02	
6	52	68	S.W.	E.	L	F	30·	29·92	
7	54	70	E.	E.	L	F	29·95	30·16	
8	58	68	N.W.	E.	L	F	30·41	30·04	
9	48	67	N.E.	E.	L	F	30·02	30·03	
10	59	61	S.E.	S.W.	L	F	29·80	29·69	
11	47	58	S.W.	S.W.	L	F	30·	29·98	
12	54	68	S.W.	S.E.	L	F	29·98	29·85	
13	49	69	S.E.	S.	L	C	29·80	29·60	
14	48	52	W.	S.W.	L	F	29·84	30·	
15	46	56	S.W.	S.W.	L	F	30·38	30·20	
16	43	65	S.W.	S.W.	L	C	30·26	30. 8	
17	49	60	E.	E.	L	C	30·26	30·30	
18	54	63	S.W.	S.E.	L	F	30·14	29·92	Heavy rain in the evening.
19	57	64	W.	N.E.	L	F	30·04	30·02	
20	42	64	S.W.	S.	L	F	30·06	29·86	
21	53	63	W.	N.W.	L	F	29·96	29·94	
22	41	60	W.	S.W.	L	F	29·96	29·82	
23	39	45	W.	W.	S	F	30·04	30·08	
24	43	52	W.	S.W.	S	F	30·32	30·18	
25	51	51	S.W.	S.W.	L	F	29·84	29·72	
26	45	43	N.	N.W.	S	R	29·76	29·82	
27	45	60	N.W.	W.	L	F	29.84	29·80	
28	56	66	W.	W.	L	F	29·96	29·90	
29	46	59	E.	E.	L	F	29·86	29·76	
30	36	40	N.W.	N.W.	S	F	29·80	29·64	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong; G, gale blowing; L, light wind; C, calm.

Condition of Atmosphere.—R, rain; F, fine, calm; C, cloudy; Fr. frost; S, snow; M, mist.

OCTOBER, 1867.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Strength of Wind.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	34	41	N.W.	N.W.	S	R	29·54	29·48	
2	39	55	N.W.	W.	L	F	29·60	29·54	
3	41	51	W.	W.	L	F	29·44	29·66	
4	38	50	W.	N.W.	L	F	30·24	30·32	
5	35	51	E.	N.W.	L	R	30·50	30·02	
6	55	45	S.	N.W.	L	R	29·62	29·84	
7	34	39	N.W.	N.W.	S	F	30·08	30·12	
8	31	39	N.W.	N.W.	S	F	30·20	30·10	
9	30	40	N.W.	N.W.	S	F	30·18	30·02	
10	29	38	N.W.	N.W.	L	R	29·72	29·70	
11	38	46	N.W.	N.E.	S	F	30·10	30·12	
12	37	40	N.E.	N.E.	S	R	29·98	29·80	
13	35	39	N.W.	N.W.	S	R	29·72	29·76	
14	34	43	N.W.	N.W.	S	F	29·80	29.80	
15	25	49	N.W.	S.	L	F	30·06	30·02	
16	32	55	S.W.	W.	L	F	30·24	30·22	
17	39	58	S.	E.	L	F	30·14	30·	
18	48	60	S.W.	W.	L	F	29·74	29·70	
19	46	60	W.	W.	L	F	30·	29·96	
20	35	55	W.	E.	L	F	30·48	30·50	
21	35	56	E.	S.	L	F	30·46	30·48	
22	50	58	S.	S.	L	F	30·14	30.	
23	33	39	N.W.	N.W.	S	R	30·28	30·14	
24	30	39	W.	N.W.	S	F	30·12	30·46	
25	27	40	W.	N.W.	L	F	30·56	30·50	
26	22	43	W.	N.W.	L	F	30·46	30·28	
27	30	41	N.W.	N.W.	L	F	30·24	30·24	
28	28	43	N.W.	W.	L	F	30·44	30·48	
29	31	45	W.	W.	L	F	30·34	30·36	
30	35	42	W.	W.	L	R	30·10	29·92	
31	39	42	N.W.	N.W.	L	R	29·54	29·56	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong ; G, gale blowing ; L, light wind ; C, calm.

Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

NOVEMBER, 1867.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Strength of Wind.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	31	45	N.W.	N.W.	L	F	29·94	29·88	
2	36	44	N.W.	S.	S	R	29·50	29·26	Very strong at night.
3	31	34	S.W.	W.	S	F	29·76	29·88	
4	39	45	N.W.	W.	S	R	29·58	29·30	
5	27	34	W.	W.	S	Fr	30·18	30·22	
6	27	28	N.E.	N.W.	S	S	29·98	30·02	First snow.
7	16	21	N.W.	N.W.	S	Fr	30·10	30·18	
8	16	26	W.	N.W.	S	Fr	30·40	30·36	River coated over by thin ice.
9	23	38	S.W.	S.W.	L	R	30·26	30·08	Foggy.
10	38	46	S.W.	S.W.		M	30·12	30·08	Foggy.
11	44	51	W.	S.W.		R	30·00	30·	
12	41	40	N.W.	S.W.		R	29·90	29·64	Rain all day.
13	38	39	N.W.	N.W.		F	29·20	29·16	
14	28	30	S.W.	S.W.		Fr	29·38	29·56	
15	24	28	S.W.	W.		Fr	29·90	30· 4	
16	19	30	S.W.	W.		S	30·18	29·90	Ice on the river. Snow all day.
17	26	27	N.W.	N.W.		Fr	29·46	29·42	
18	17	21	N.W.	N.W.		Fr	29·40	29·44	Crossing of the river on foot.
19	14	21	N.W.	N.W.		Fr	29·90	29·98	
20	5	23	N.W.	N.W.		Fr	30·28	30·14	Traffic over river.
21	21	27	N.W.	N.W.		S	30·14	30·30	
22	9	28	S.W.	S.W.		F	30·20	30·40	
23	37	28	S.W.	S.W.		R	30·24	30·26	Thaw, rain.
24	37	45	S.W.	S.W.		R	30·32	30·32	Fog.
25	38	44	S.W.	S.W.		R	30·32	30·26	Fog.
26	43	49	S.W.	S.W.		R	30· 8	29·86	Rain.
27	37	41	W.	S.W.		F	30·	30.06	
28	30	38	W.	W.		F	39·10	30·06	
29	34	37	W.	W.		S	30·12	29·98	
30	52	37	S.W.	N.W.		R	28·98	29·	River opened, and frozen over again, within 24 hours.

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong; G, gale blowing; L, light wind; C, calm.

Condition of Atmosphere.—R, rain; F, fine, calm; C, cloudy; Fr, frost; S, snow; M, mist.

DECEMBER, 1867.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Lowest during 24 hours, after 8 A.M.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	6·	9·	N.W.	N.W.	...	Fr	30·08	30·34	River bearing.
2	11·	20·	N.W.	N.W.	...	S	30·42	30·22	
3	19·	27·	N.W.	N.W.	...	Fr	29·82	29·76	
4	13·	10·	N.W.	N.W.	...	Fr	29·56	29·64	
5	·4	13·	N.W.	N.W.	...	Fr	29·84	29·80	
6	·10	10·	N.W.	S.W.	...	Fr	30·18	30·06	
7	38·	23·	S.W.	N.W.	...	Fr	29·10	29·36	
8	7·	1·	N.W.	N.W.	...	Fr	29·74	29·82	
9	·13	·2	N.W.	N.W.	...	Fr	29·98	29·94	
10	·12	4·	N.W.	N.W.	...	Fr	30·02	29·90	Snow at night.
11	7·	8·	W.	N.W.	...	Fr	29·84	29·90	
12	·8	·1	N.W.	N.W.	...	Fr	29·98	30·04	
13	8·	17·	N.W.	N.E.	...	Fr	30·22	30·16	
14	1·	32·	N.W.	N.W.	...	Fr	30·28	30·28	
15	·4	18·	N.W.	N.W.	...	Fr	30·34	30·02	
16	26·	30·	N.E.	N.W.	...	S	29·44	29·20	
17	18·	26·	N.W.	S.W.	...	Fr	29·36	29·40	
18	16·	20·	S.W.	S.W.	...	Fr	29·60	29·74	
19	·4	4·	S.W.	S.W.	...	Fr	30·20	30·32	
20	·14	8·	N.W.	N.E.	...	Fr	30·56	30·38	Snow.
21	10·	20·	W.	W.	6·	Fr	30·20	30·38	Snow at night.
22	13·	20·	W.	N.E.	2·	S	30·50	30·10	Snow all day.
23	24·	35·	N.E.	N.W.	15·	Fr	29·30	29·28	
24	9·	17·	N.E.	W.	8·	Fr	30·16	30·18	
25	16·	16·	W.	N.W.	14·	Fr	30·24	30·46	
26	24·	40·	N.E.	N.W.	14·	R	29·70	29·60	Rain.
27	20·	23·	N.W.	E.	15·	Fr	30·22	30·08	Snow.
28	39·	34·	S.W.	S.W.	21·	R	29·54	29·78	
29	5·	17·	N.W.	N.W.	2·	Fr	30·08	30·	Snow.
30	2·	3·	N.W.	W.	·6	Fr	30·22	30·28	
31	·10	·11	N.W.	N.W.	·19	Fr	30·44	30·48	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, Strong ; G, gale blowing ; L, light wind ; C, calm.
Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

JANUARY, 1868.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Lowest during 24 hours, after 8 A.M.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	2·	10·	N.E.	N.E.	·6	S	30·48	30·20	
2	20·	28·	N.W.	N.W.	·6	S	29·18	29·34	
3	19·	25·	N.W.	N.W.	14·	S	29·70	29·80	
4	·5	11·	N.W.	W.	·6	Fr	29·98	29·86	
5	·9	12·	N.W.	N.W.	·13	Fr	29·84	29·74	
6	8·	14·	N.W.	N.W.	8·	Fr	29·60	29·66	
7	9·	19·	N.W.	N.W.	9·	Fr	29·86	29·82	
8	6·	35·	N.W.	N.W.	6·	Fr	29·90	29·80	
9	18·	25·	N.W.	N.W.	12·	S	29·64	29·40	Snow all day.
10	10·	15·	N.	N.W.	10·	Fr	29·40	29·48	
11	·5	13·	N.	N.	·6	Fr	29·68	29·62	
12	·1	5·	N.W.	N.W.	·5	Fr	29·66	29·66	
13	4·	14·	S.W.	N.W.	4·	Fr	29·98	30·	
14	4·	13·	S.W.	S.W.	4·	Fr	30·24	30·26	
15	1·	29·	N.W.	N.W.	1·	Fr	30·20	30·10	Snow at night.
16	13·	22·	N.W.	N.W.	12·	Fr	29·88	29·80	Snow in morning.
17	18·	21·	N.W.	N.	10·	Fr	29·74	29·74	Snow.
18	9·	19·	N.	N.	8·	Fr	29·88	29·96	
19	·3	16·	N.	N.	·6	Fr	30·22	30·30	
20	7·	20·	N.	N.	·5	Fr	30·26	30·10	
21	10·	18.	N.W.	N.	6·	Fr	30·08	29·94	
22	10·	22·	N.W.	N.	7·	Fr	30·08	30·34	
23	·3	27·	N.W.	E.	·5	Fr	30·58	30·20	Snow in evening.
24	34·	38·	S.W.	N.W.	27·	S	29·56	29·56	
25	14·	25·	N.W.	N.	13·	Fr	29·56	29·90	
26	·8	10·	N.	N.	·9	Fr	30·28	30·36	
27	9·	17·	N.	N.	6·	S	30·14	29·96	Snow all day.
28	5·	22·	N.	N.	4·	Fr	30·18	30·22	
29	·10	10·	N.	N.	·14	Fr	30·32	30·18	
30	14·	22·	N.	N.	11·	S	29·74	29·88	
31	·7	30·	N.	N.	·12	Fr	30·32	30·30	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong ; G, gale blowing ; L, light wind ; C, calm.

Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

FEBRUARY, 1868.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Lowest during 24 hours, after 8 A.M.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMRAKS.
1	13·	30·	N.W.	N.W.	3·	Fr	30·44	30·42	
2	9·	38·	W.	S.	7·	Fr	30·18	30·02	
3	7·	8·	N.W.	N.W.	6·	Fr	30·20	30·34	
4	·13	22·	N.W.	N.W.	·16	S	30·36	30·08	
5	·15	16·	N.W.	N.W.	·16	Fr	30·48	30·42	Snow all night.
6	16·	21·	N.W.	N.W.	8·	S	29·88	29·22	Snow all day.
7	10·	13·	N.W.	N.W.	9·	Fr	29·54	29·68	
8	· 7	31·	N.W.	N.W.	·12	Fr	30·38	30·44	
9	4·	34·	W.	W.	·14	S	30·14	29·78	Snow all day.
10	24·	19·	N.W.	N.W.	24·	Fr	29·62	30·06	
11	· 8	20·	N.W.	N.W.	·11	Fr	30·44	30·36	
12	·14	24·	N.W.	N.W.	·17	Fr	30·36	30·30	
13	· 7	22·	N.W.	S.E.	· 9	S	30·40	30·12	Snow afternoon.
14	11·	18·	N.W.	N.W.	11·	Fr	30·06	30·14	
15	4·	20·	S.W.	S.W.	· 5	S	30·22	37·06	Snow all day.
16	9·	35.	W.	N.W.	7·	Fr	30·20	30·22	
17	· 2	32·	N.W.	N.W.	· 6	Fr	30·28	30·12	
18	23·	30·	S.E.	N.W.	20·	Fr	29·84	29·82	Snow all night.
19	12·	35.	W.	N.W.	8·	F	29·78	29·60	Snow all night.
20	22·	50·	W.	N.W.	17·	F	29·88	29·82	Thaw.
21	32·	26.	S.	N.W.	29·	Fr	29·64	29·86	
22	Zero	17·	S.W.	N.W.	Zero	Fr	30·30	30·26	
23	·10	24·	N.W.	N.W.	·12	Fr	30·40	30·40	
24	· 1	30.	N.W.	N.W.	· 2	Fr	30·68	30·60	
25	· 1	30.	N.W.	N.W.	· 5	Fr	30·58	30·50	
26	· 7	35·	N.W.	N.W.	· 9	Fr	30·58	30·34	
27	· 6	36·	N.W.	S.W.	· 9	Fr	30·24	29·86	Snow at night.
28	20·	32·	N.W.	S.W.	19·	Fr	29·42	29·24	
29	22·	25·	S.W.	S.W.	16·	S	29·32	29·36	Snow all day.

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong; G, gale blowing; L, light wind; C, calm.

Condition of Atmosphere.—R, rain; F, fine, calm; C, cloudy; Fr, frost; S, snow; M, mist.

MARCH, 1868.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Lowest during 24 hours, after 8 A.M.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	·1	18·	N.W.	W.	·2	Fr	29·78	29·82	
2	·20	6·	N.W.	N.W.	·21	Fr	39·94	29·58	Heavy snow all night.
3	15·	20·	N.W.	N.W.	4·	S	29·58	29·66	Snow.
4	20·	31·	N.W.	S.W.	17·	S	29·86	29·90	Snow.
5	8·	36·	N.W.	N.W.	1·	F	30·24	30·40	
6	·2	40·	N.W.	N.W.	·6	F	30·74	30·74	
7	33·	44·	S.W.	W.	29·	Fr	30·28	30·32	Snow morning, thaw
8	38·	50·	S.W.	S.W.	34·	R	30·16	29·96	Thaw. [afterwards.
9	32·	52·	N.W.	S.W.	25·	F	30·34	30·34	Thaw.
10	33·	44·	S.W.	S.W.	29·	F	30·30	30·02	Thaw.
11	19·	26·	W.	N.W.	19·	Fr	30·24	30·50	Strong wind, freezing.
12	7·	38·	N.	N.	2·	Fr	30·52	30·26	Thaw.
13	38·	45·	S.	S.	29·	F	29·70	29·62	Thaw.
14	36·	50·	S.W.	S.W.	34·	R	29·70	29·82	Thaw.
15	35·	45·	S.	S.	30·	R	30·12	30·10	Thaw.
16	38·	48·	S.	S.E.	35·	Fr	30·20	30·12	Rain.
17	40·	47·	S.E.	S.W.	36·	R	30·10	29·94	
18	42·	49·	S.E.	S.E.	37·	F	30·	29·90	
19	25·	45·	N.	N.	24·	F	30·18	30·24	
20	22·	44·	N.W.	N.W.	19·	F	30·38	30·22	
21	31·	30·	N.	N.W.	27·	S	29·96	29·60	Heavy snowstorm.
22	31·	36·	N.	N.	28·	S	29·38	29·46	Snow.
23	22·	38·	N.	N.	13·	Fr	29·74	29·70	
24	18·	31·	N.W.	N.W.	13·	Fr	29·82	29·88	
25	5·	36·	N.	N.W.	10·	Fr	30·22	30·16	
26	13·	38·	N.	N.W.	3·	Fr	30·24	30·02	
27	29·	46·	N.	N.W.	15·	Fr	29·64	29·6[illegible]	
28	25·	38·	N.	N.	17.	Fr	30·04	30·12	
29	16·	34·	N.	N.	8·	Fr	30·34	30·40	
30	16·	36·	N.	E.	7·	Fr	30· 4	30·30	
31	30·	54·	E.	E.	25.	Fr	30·06	29·88	

METEOROLOGICAL OBSERVATIONS—*continued.*

ABBREVIATIONS.

Strength of Wind.—S, strong ; G, gale blowing ; L, light wind ; C, calm.
Condition of Atmosphere.—R, rain ; F, fine, calm ; C, cloudy ; Fr, frost ; S, snow ; M, mist.

APRIL, 1868.

DATE.	THERM. 8 A.M.	THERM. 3 P.M.	WIND. 8 A.M.	WIND. 3 P.M.	Lowest during 24 hours, after 8 A.M.	Condition of Atmosphere.	BAROM. 8 A.M.	BAROM. 3 P.M.	REMARKS.
1	27°	58°	N.W.	S.E.	18°	F	29·74	29·56	
2	42°	43°	S.E.	N.E.	30°	R	29·74	29·66	Snow all night.
3	31°	38°	N.	N.E.	24°	F	29·66	29·72	
4	15°	38°	N.W.	N.W.	9°	F	29·82	29·62	
5	27°	37°	W.	W.	23°	Fr	29·50	29·40	
6	15°	24°	N.W.	N.	2°	Fr	29·78	29·88	
7	16°	35°	N.W.	S.E.	10°	Fr	30·20	30·14	Strong wind, snow all night.
8	30°	40°	N.W.	N.W.	24°	Fr	28·98	29·14	Windy, snow storm.
9	22°	36°	N.W.	N.W.	22°	Fr	29·74	30°	Strong wind.
10	20°	45°	S.W.	W.	14°	Fr	30·36	30·28	
11	31°	43°	E.	E.	23°	Fr	29·92	29·68	Snow.
12	35°	29°	N.E.	N.W.	23°	Fr	29·40	29·58	Snow.
13	12°	30°	N.W.	N.W.	3°	Fr	30°	30·06	Strong wind.
14	19°	48°	N.W.	S.W.	11°	Fr	30·32	30·18	
15	39°	54°	S.W.	W.	34°	F	29·96	29·88	
16	49°	51°	S.	W.	38°	R	29·86	29·76	Rain.
17	44°	58°	W.	S.	43°	F	29·78	29·68	Fog.
18	42°	52°	E.	E.	35°	F	29·70	29·80	
19	32°	48°	N.W.	W.	28°	F	30·16	30·20	
20	42°	61°	N.E.	S.	34°	F	30·28	30·18	
21	40°	60°	W.	E.	33°	F	30·10	30·04	
22	46°	58°	E.	S.W.	36°	F	30·08	30°	Ice giving way.
23	36°	32°	N.W.	N.	32°	F	30·24	30·10	Heavy fall of snow.
24	22°	52°	S.W.	N.W.	16°	F	30·36	30·22	Ice floating down river.
25	31°	42°	N.	W.	27°	F	30·38	30·28	
26	33°	45°	S.W.	N.W.	23°	F	30·24	30·12	First steamer up river.
27	30°	42°	N.W.	W.	24°	F	30·08	29·98	Strong wind.
28	32°	50°	N.W.	S.W.	25°	F	30·24	30·20	
29	36	62°	W.	S.W.	25°	F	30·42	30·28	
30	38°	50°	S.E.	W.	36°	R	29·88	29·54	Rain.

TABLE of Monthly and Seasonal Means of Temperature; also of Precipitation, Clouding, and Wind; deduced from observations made during the years 1861-2-3-4 at St. John, N.B., lat. 45° 16′ 42″ N., long. 66° 3′ 45″ W., and height above sea 135 feet, by G. Murdoch.

	Temperature.				Precipitation.					Clouding—Means 3 daily obs. 8 a.m., 2 p.m., 10 p.m.				Wind, 2 p.m.	
	4 years means 6 obs. daily, 6 a.m, 10 a.m. noon, 2 p.m. 6 p.m. 10 p.m.	4 years means of monthly maxima.	4 years means of monthly minima.	4 years means of daily oscillation.	4 years means No. days rain or snow fell.	4 years means nights rain or snow fell.	4 years means of rainfall in inches.	4 years means of snow fall in inches.	4 years means of rain and melted snow.	4 years means of No. of clear days.	Of days wholly clouded.	Of foggy days.	4 years means of estimated clouding.	4 years means of No. of days E. till S. W.	and W. till N.E.
MONTHS:															
January	20°28	42.5	— 8·7	11°05	5·75	9·50	2·490	22·90	4·830	9·50	15·10	0·57	5·97	7·15	23·25
February	22·37	42·5	—12·6	10·64	6·25	6·50	1.710	16·85	3·380	9·00	14·17	0·75	6·00	10·25	18·00
March	28·57	44·0	— 2·0	16 10	8·75	6·25	1·546	25·03	4·675	9·07	14·70	0·90	5·60	11·75	19·25
April	38·30	59·8	+17·5	11·58	6·00	6·25	2·810	7·37	3·618	9·10	14·15	1·50	5·72	15·25	14·75
May	49·20	72·2	31·7	11·82	6·50	7·00	3·020	…	3·020	9·30	15·70	3·40	6·00	22·25	8·75
June	55·53	73·5	41·8	12·73	4·75	6·50	1·917	…	1·917	10·17	11·70	3·77	5·53	24·00	6·00
July	60·65	75·3	51·2	9·79	6·50	8·00	4·255	…	4·255	7·47	18·30	8·75	6·80	28·25	2·75
August	60·94	73·5	47·8	10·11	6·50	7·00	4·224	…	4·224	7·92	17·70	6·75	5·90	21·75	9·25
September	55·27	67·0	38·3	10·00	7·65	6·25	5·160	…	5·160	10·17	13·90	3·40	5·50	20·75	9·25
October	47·85	62·3	28·0	9·30	6·65	8·75	4·335	…	4·335	7·25	17·50	2·90	6·90	17·25	13·75
November	38·18	55·2	18·5	7·50	10·00	9·50	6·077	1·95	6·370	5·60	20·40	2·17	7·50	11·75	18·25
December	23·74	48·3	— 5·8	10·51	7·75	9·00	2·915	14·75	4·687	9·10	18·60	0·75	6·50	6·25	24·75
SEASONS:															
Winter	22·34	48·0	—16·0	11·16	22·0	22·5	6·697	50·94	12·398	26·5	49·7	1·70	6·0	24·0	67·0
Spring	38·68	72·3	+ 2.0	11·51	17·5	22·5	7·349	32·40	11·307	25·5	43·0	6·50	5·8	49·0	44·3
Summer	58·97	78·7	41·7	10·46	17·8	21·5	10·397	…	10·397	25·5	44·7	18·50	6·0	74·0	18·0
Autumn	46·96	64·3	18·3	8·98	23·0	24·5	15·575	1·95	15·879	23·0	56·8	8·70	6·8	49·7	41·3

These observations have not been reduced, but as the temperatures are the result of six daily observations, they will very nearly represent true means.

According to Mr. Hind (*op. cit.*) the differences between the climates of St. John and Fredericton are as follows:—

	St. John.	Fredericton.		St. John.	Fredericton.
Mean Annual Temperature	41·39°	42·42°	Minimum Monthly mean	20·52°	14·79°
Maximum for the year	88·00	98·00	Extreme range for the year	105·00	136·00
Minimum	—17·00—	·38·00	Mean Monthly range	41·91	51·97
Maximum Monthly mean	62·43	66·76	Mean moisture	39 inches.	37 inches.

CONSANGUINITY OF TRACADIE LEPERS.

Extracted from the Journal of the House of Assembly, New Brunswick, for 1847.

{Anselm Laundre, the husband of
he had 19 children, including
* Ursule † who married

{Mary Brideau, the blood relative of
the sister of Lewis Brideau
the father of * Fidelle

{(1) Anne Laundre, the wife of John Savoy
the parents of Jos. Savoy, who was the

. . . .	40·90	04·3	18·3	8·98	23·0	24·5	15·575	1·95	15·879	23·0	56·8	8·7c	6·8	49·7	41·3

These observations have not been reduced, but as the temperatures are the result of six daily observations, they will very nearly represent true means.

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Maximum for the year	88·00	98·00	Extreme range for the year . . .	105·00	136·00
Minimum	—17·00—	·38·00	Mean Monthly range	41·91	51·97
Maximum Monthly mean	62·43	66·76	Mean moisture	39 inches.	37 inches.

CONSANGUINITY OF TRACADIE LEPERS.

Extracted from the Journal of the House of Assembly, New Brunswick, for 1847.

Anselm Laundre, the husband of
he had 19 children, including
* Ursule + who married { * Joseph Benoit + the son of the grandfather of * Mary Julian + the daughter of German, who married Margaret Gotreau } { Mary Brideau, the blood relative of the sister of Lewis Brideau the father of * Fidelle }
* Isabella +

Antoine Benoit, the husband of Mary Savoy, the sister of Firman Savoy, the father of Margaret, wife of Frederick Robicheau, of Riviere du Lache, the parents of * Mary Rose Robicheau
the first cousin of Joseph Savoy, the son of Anne Laundre ☞ 1 { the blood relative of Charlotte, the mother of * Julia Laundre }
{ (1) Anne Laundre, the wife of John Savoy the parents of Jos. Savoy, who was the father of Bonaventure and Victor }

* Frances + who married { Victor Savoy, the brother of the father of * Marin * Stanislaus * Bernard } { Bonaventure, and second cousin to the father of * Veneranda }
Angelica, who married { Joseph Breau, the father of * Mary Clara + }
{ Margaret, the wife of Peter Sonnier, the son of the parents of * Francis Sonnier + * Edith Sonnier + } { John Sonnier, husband of Felicity Baske, the sister of Mary Rose Baske (2) }
(3) { John Baptiste Sonnier, who married Margaret Robicheau }

John Robicheau, sr., the husband of Mary Levron, the half-sister of the father of * John Robicheau +
Frederic Robicheau, the husband of the father of * Tranquille { Cordulla Breau, the daughter of Magdalene Baske, the sister of Mary Rose Baske ☞ 2 }

{ Anne Poitier, the wife of Joseph Comeau the parents of Etienne and Charlotte Comeau and grand-parents of * Thomas Comeau * Lawrence Comeau * Fabian Gotreau * Julian Ferguson Barbara, the mother of * John Oliver Gotreau { wife of Charles Tribideau, her first husband, and parents of * Amon * Judith, the wife of Joseph Savoy, and parents of * Edward + } { the children of Charlotte Comeau by her second husband Isaac Gotreau } }

Joseph Robicheau, the husband of Anasthasia Sonnier, the father of
{ * Peter * Mary, wife of Fidelle Savoy * Margaret, wife of A. Boutillier }
Victoire Robicheau, mother of * Cyril Austen + a natural child
Mary Robicheau, the wife of Lewis Gould, the parents of * Lewis Gould
Francis Robicheau, husband of M. Savoy the parents of
{ * Oliver * Israel * Tranquille + * Margaret, wife of John Baptiste Sonnier ☞ 3. }

The asterisk (*) implies that the individual has been, or is, affected with Elephantiasis. The cross (+) denotes that the person has died of the disease.

Antoine Benoit was an Acadian, and came from Annapolis, Nova Scotia. John Savoy and Anne Laundre were also Acadians, from Annapolis.

It may here be observed: ‡ "That nearly all the French (of Tracadie and thereabout), can trace relationship with one another, owing to their intermarrying, and few or no strangers coming among them since their first settlement; and this is so general in Caraquette, that few families there can intermarry without a dispensation, they being within the degrees of kindred disallowed to marry by the Catholic Church."

‡ Extract from a letter to Dr. Bayard from James Davidson, Esq.

(Signed) { H. WILSON, C.M. ROB. BAYARD, M.D. & D.C.L. } *Commissioners.*

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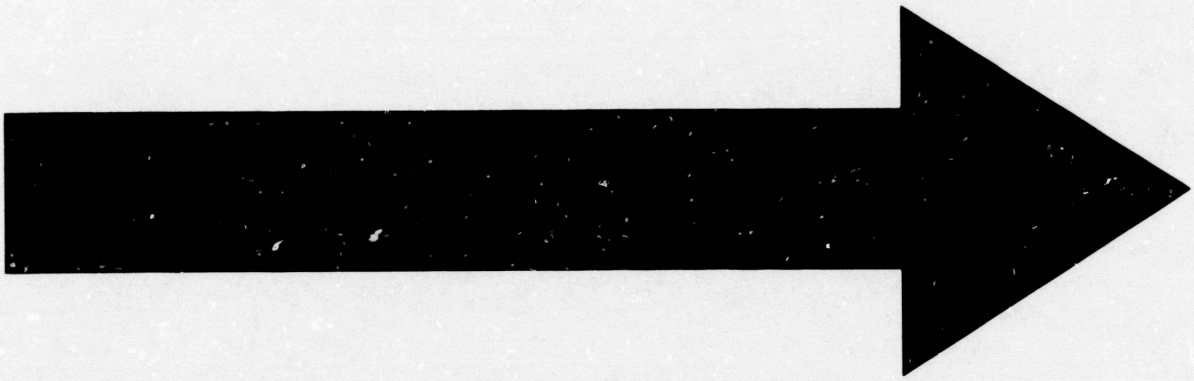
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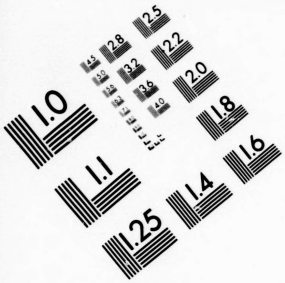
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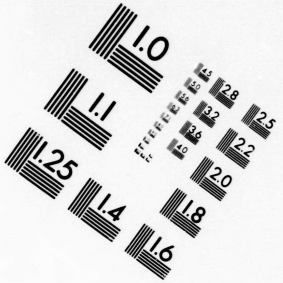
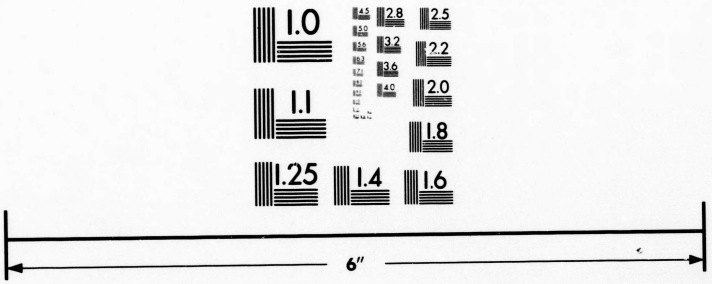
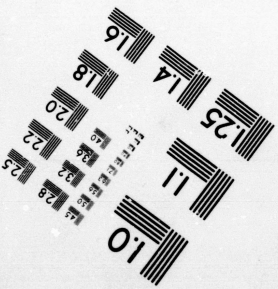
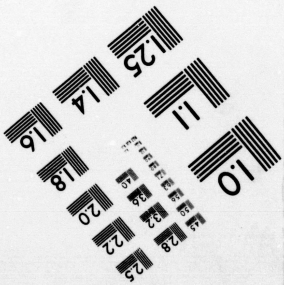


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