in the way. Half a barrel of flatfish was taken out of the stomach of a single halibut.

This fish, though commanding good prices, does not form a Labrador export, the banking fishery being carried on by our American cousins. These come to us as early as April, sail round the south end of the ice-floe, and so reach the banks; or, if leaving in February, make straight for the south coast of Greenland and try to get north by keeping outside the two currents of drifting coast-ice. On one occasion the skipper of a Boston vessel came to a hospital before our harbour ice had all gone, and we gave him a drive round on the ice with our dog-sleigh, as he had never seen dogs travelling. The main impression on his mind seemed to be "To think we had ripe strawberries before I left home a fortnight ago!"

In Europe and America the dab (*Hippoglossoides limandoides*) flourishes in both cold and warm waters. In his youth he is a free-swimming, upright fish, but takes to lying on one side on the bottom. He shows his adaptability by causing the under eye to travel round over his nose, as this eye would be useless looking down on the ground. He has fine, shiny scales. In Dublin he is called the smeareen, and is much eaten by the poorer classes. On the New England coast he passes as the "mud dab," but on his arrival in New York he further shows his adaptability by assuming the name of the "American sole." In Labrador he is classed with the "offal" and contemptuously thrown away. The dogs, however, appreciate his qualities better, and one often in the spring sees a dog wading about looking or feeling for the dab in the mud, and then quickly diving down and bringing the struggling,

squirming fish ashore, there to be swallowed alive. The dab's hope of safety lies in escaping notice, and this he does whenever he is at rest. He flaps about till he settles in the mud; the mud which he has stirred up falls again, and covers all but his eyes and nose. At largest, the fish reaches twenty inches in length, and weighs up to two pounds. He remains all winter. As he is the first fish to be taken when our ice goes, he is speared by the boys, and, when food is short, cooked and eaten. But herring so soon follow the departure of the ice that even in this season the dab is seldom used. Visitors, however, esteem him highly whenever the native cook will condescend to prepare him for table. Probably it is the ugly face with huddled-up eyes and distorted mouth that tells here against his popularity.

The cause of his ugliness is explained elsewhere by a strange legend. It is said that when the fish were summoned to settle who should be king, the plaice was late, delaying to paint on some of his beautiful red spots. When he heard the election was already over, his mouth so twisted in disdain it never came straight again. A still older legend accounts for his being coloured only on one side. It runs that Moses, having caught one, proceeded to cook it over an oil lamp, but when one side was broiled and grilled, threw the fish into the sea.

The winter fluke (*Pseudo-pleuronectes Americanus*), the cousin of the dab, closely resembles him in size and appearance, and is found here, as he is all along the North America coast, south to Cape Cod.

The lump-fish (*Cyclopterus lumpus*) is very common with us, but is practically useless. We have been too stupid to find a use for him, except as a fertilizer. He has de-

veloped a sucker on his belly, with which, being a lazy fish, he fastens himself upside down on any moving thing, and will then drift about without the trouble of swimming.

The common sculpin, or scavenger, exists all along the coast. There are two varieties, *Cottus scorpioides* and *C. Grœnlandicus*. He really consists of a large mouth, an indefinitely distensible belly, a voracious and omnivorous appetite, and an outside coat of sharp spikes. One can scarcely credit him with feelings, for when fishing with the sharp jigger for cod, the same sculpin will run for the hook again and again, though the barb may in the earlier capture have been in almost any part of the anatomy. Sometimes a fisherman has had to oblige him by leaving him on deck in order to avoid the worry of repeatedly hauling in the line with the useless fish adhering. Our dogs, however, make nothing of his horny and thorny exterior, and eat him with great gusto, always commencing by biting off his tail. At a pinch, the sculpin would be very useful in sustaining human life.

Another fish that stands by us all the winter is the rock cod. He is much like a small cod in appearance, but darker, with partly iridescent sides. He remains about the harbours. As a matter of fact, he is "not at all bad eating," but is considered by the fishermen very inferior to the true cod, and is always rejected from those they export. He is, however, dried up with the smaller cod, which are not split, but simply salt-sprinkled. They are kept for winter use under the name of "rounders." He is also taken through the ice in winter, and has frequently shared with the lowly clam and mussel the honour of preserving the life of those in one of these scattered communities.

Hake or haddock are rarely seen in Labrador. The former fish is easily distinguishable by his silvery armoured coat, and the latter by the black marks on his shoulders, irreverently attributed to the fingers of St. Peter, who is said to have pulled him out of the water to pay taxes, with the money in the fish's mouth. Why the spots are black, tradition does not say.

It seems to surprise most people that the shark is found in Labrador, as he is always associated with tropical waters. The variety we have is the sleeper, *Somniosus microcephalus*, the little-headed, sleepy shark. He has a large body up to fifteen feet long, and fully lives up to his name. He feeds on offal thrown overside, earning the name of gurry shark; he is the most despised of our ocean fauna. He frequently gets caught in the sunken nets for seals, though not nearly as often as he deserves, for he browses along the nets, eating out the seals. In most cases his energy is not sufficient to make him push into the net. A ten-foot shark has a mouth contour of two feet, and a gullet proportional. It is said that he eats live whales, biting huge pieces out of the abdominal blubber; but I cannot believe him smart enough to do this. So sharp are his teeth that he will sculp all the fat and skin off a dead seal, without taking two bites at one piece. I have taken from his stomach nearly every bit of a seal's skin and fat in one long string the width of the shark's mouth, almost as one takes off the peel from an orange or an apple. On one occasion we found in a shark the carcass of a red dog, which we had left on a pan of ice to drift out to sea a week previously. The sleeper shark seems to have little capacity for pain. Captain Atwood reports that after driving a scythe right through one's

stomach, it came placidly back and went on feeding off the same dead whale in the same place. In large numbers these sharks haunt the ice-fields, where the sealers have left the mutilated carcasses of the young seals. I have driven a boat-hook into one bigger than myself, as it lay basking on the surface of the water, and hauled it easily out on the ice without its making any notable resistance. On one occasion, with the help of a couple of men, I hauled out five from one hole through the ice in this same way.

The only commercially important part of the sleeper is the liver, which yields fifteen to thirty gallons of very excellent oil; for the purpose of securing this oil a shark-fishery grew up on the coasts of Norway and Iceland. Our fishermen sometimes use a lump of its skin-covered flesh for scrubbing the floor. The flesh is white and nauseous, and even our dogs, voracious as they are, will scarcely eat it. This shark seems quite indifferent to man's presence, and is not a man-eater. It is almost impossible to conceive that the shark's stomach should still, by some races of human beings, be considered the gate of heaven; and that living children be offered by mothers to its rapacity that the children may enter paradise through that probably most repulsive of all forms of death.

CHAPTER XIV

THE OCEAN MAMMALS

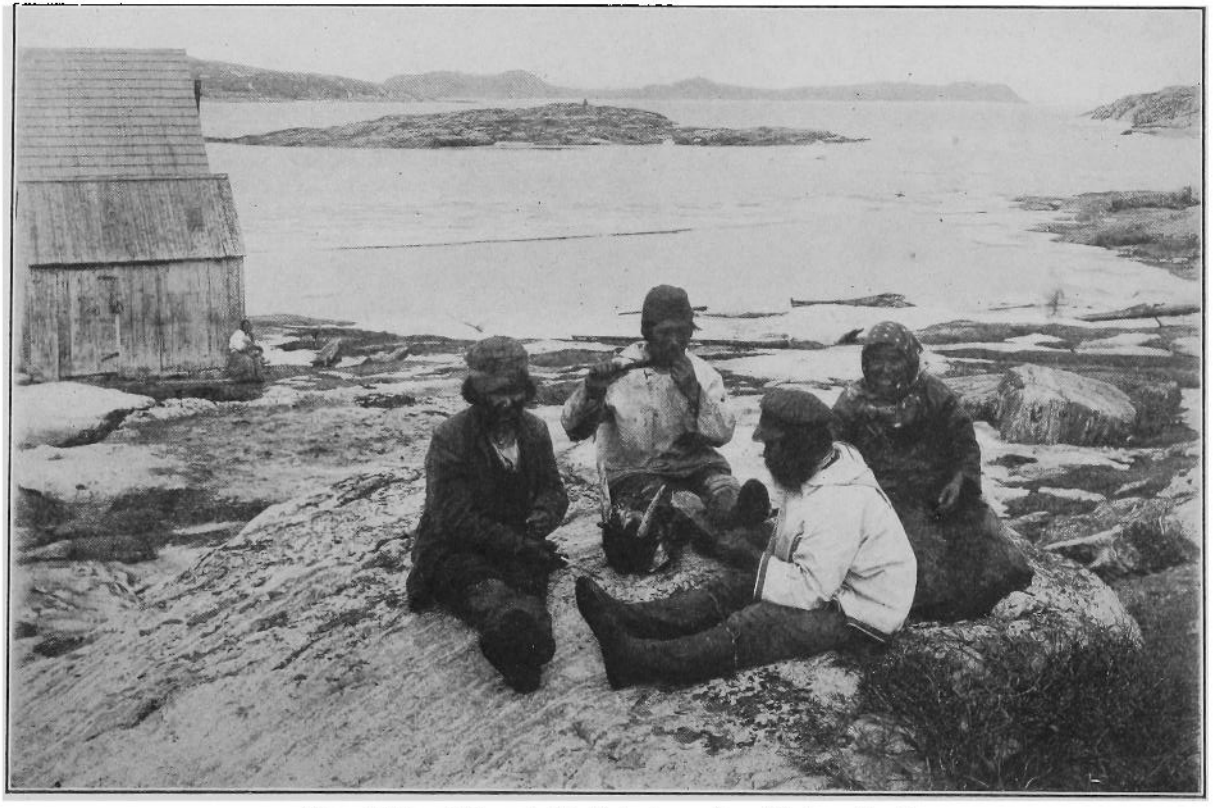
By W. T. Grenfell

To compensate the Labradormen in some small degree for the loss of herring and the depreciation of salmon, a whale-fishery has sprung up. The great success made in killing sulphur-bottom, finback, and humpback whales, in North Newfoundland, led to a hope of great things from them for Labrador. But the numbers killed have been very limited.[1] The whales themselves are, however, so intensely interesting, it is worth while referring to the various sorts one is liable to see in Labrador.

The whale is, of course, really a land animal, but he has left his native element, and taken to a roving, nautical life. Now his legs are not necessary for locomotion; hence they have become rudimentary and are enclosed in his thick, rubbery, oily skin. The arms are not used in swimming, but simply for preserving the animal's balance or for grasping the baby whale when it is in danger.

Of all the adaptations of these strange beasts to their environment, perhaps none is more remarkable than the arrangement for hearing. The whale has no need of the sense of smell, but he does need to hear the approach of an

[1] In reading the records of the Moravian Missions for the years 1780 to 1850, one is greatly struck by the number of dead whales mentioned as having been discovered, from time to time, on the coast.



King "Attanek" and His Friends, eating Walrus Head

enemy. Because of the enormous pressures which must be endured by the animal, the external opening of the ear is reduced to the diameter of a crow-quill, whereas the opening of the ear into the nose — the Eustachian tube — is very large. Deafness, following the closing of this tube by adenoid growths in children, has made most of us know of the existence of this second "ear-hole." The whale actually hears through his nose, in a way similar to that by which a person listens "open-mouthed." The eyes are very small; this is not a disadvantage, fixed as the eyes are in such positions that the animal can see well neither ahead nor astern. Sight can hardly be much used as a feeding sense; think of looking for your food when you have to catch millions of tiny creatures, like copepods, to satisfy your appetite! It has been said that a whale brought to land does not die of asphyxiation, for he can breathe an hour or two at least; that, on the other hand, he does die of starvation. He must eat incessantly or die.

On a fine morning on the Labrador coast, I have counted a dozen whales in a single school. Now and again a huge tail would emerge from the water and lash the surface with its full breadth, making a sound like the firing of a cannon, while the silence of the stillness was otherwise broken only by the noise of their blowing, as they rolled lazily along on the surface. I have seen the thresher whales making their huge prey hurl his whole immense body clear out of the water, only to fall back with the splash of a waterfall, and the noise of a thunderclap, to be stabbed by the swordfish below, or eaten alive by the fearful jaws of his enemy.

In order to remain below water so long as they do (a

full-grown male can stay down one hour), whales have a huge reservoir of blood in vessels situated in the front of the chest, like the pipes of a water-cooler. This blood he overoxygenates by repeated spoutings. A whaler can tell by the number of blows exactly how long the animal will remain below on his sounding. To aërate the blood thoroughly, a male sperm whale blows about sixty times, once every ten seconds. The females blow for about four minutes, and do not remain down so long as the males. The elastic, compressible skin is equally compressed by the water at great depths; in a marvellous manner the vital organs are relieved of dangerous pressure, while an automatic water-bag valve fills and closes the nostrils so that no water is forced in.

Six species frequent the Labrador coast, though only four kinds are still common, — the finback, humpback, sulphur-bottom, and white whale. A specimen of the largest, the sulphur-bottom, so called from the colour of his body, has been taken with a length of ninety-five feet and a circumference of thirty-nine feet. The weight of this animal was estimated to be two hundred and ninety-four thousand pounds. Think of the awful power of the tail that can not only propel this mass at fifteen knots an hour, but can actually hurl it clean out of water into the air!

In this animal the baleen, or whalebone, hanging from the roof of his mouth, weighed eight hundred pounds and reached four feet in length, or somewhat less than half the length of the "bone" in an adult right whale. There were no fewer than three hundred plates on each side. He gave one hundred and ten barrels of oil. So large is the mouth of a sulphur-bottom that a boat can row into it.

The jaw-bone may be sixteen to eighteen feet long. It took four of us a whole afternoon, with axes and swords mounted on pike handles, to cut out one bone and carry it to our steamer. One had to walk almost in the footsteps of Jonah to get at the articulation, so far back is it in the body. Yet the gullet of this whale, where full-grown, is only a few inches in diameter. In reality, his mouth is a vast trap for food, the more of which is caught the larger the mouth is developed. Their food is very simple, being almost entirely small crustaceans of the shrimp variety which they sieve out of the deep water as they swim along. Occasionally they swallow a caplin or herring, which gets in the way. No whale is ever killed in a starved condition, not even a blind one, of which several have been captured.

The finback is the commonest whale on the coast. He runs only to about sixty-five feet in length, and in proportion gives less oil than the sulphur-bottom. The humpback is, at times, scarcely worth catching, giving very little oil. He may be seventy to seventy-five feet long, and has bone up to three feet in length. When freshly killed, the young humpback affords excellent food for man. Indeed, were it not for the prejudice against them, these "mountains of meat" would be considered a most desirable food-supply. A few of us on the coast have used it, fresh, salted, and tinned. It is too hard in salt, but, tinned, is really good meat, with not enough characteristic qualities for the ordinary man to tell it from tinned beef. The tinning, as an industry, seems to be abandoned, but in a country where vegetables are absent, cattle impossible, and our wild meat supplies diminishing with the years, the immense amount of nourishing material would seem a most desirable ad-

junct to the diet of all. The poor people especially welcome this meat, for it is scarcely more expensive than the can it is put into. Preserved frozen for winter, whalefish would help to prevent the scurvy, which often affects the people in spring after the long winter of isolation.

The white whale is a slender, graceful animal about twenty feet long. His skin forms excellent leather, called "porpoise hide"; it is very impervious to water. The adult is as big as two dozen calves. He weighs about twenty-five hundred pounds, and gives one hundred gallons of oil. These whales were very common in the Gulf of St. Lawrence, and are still found there. They play in schools, jumping out of the water, enjoying life much like porpoises. They have been caught in cod-trap nets, getting tangled up in the twine, and in 1907 some sixty were caught in the big seal-nets set at Cape Chidley by the Moravian missionaries. They are voracious beasts, eating alive almost every kind of fish in the sea. They even kill and eat our seals. But the white whale is paid back in his own coin by the much more powerful threshers, who are very partial to his flesh.

The thresher, or killer whale (*Orca gladiator*), is himself only twenty feet in length, but he is the fiercest of all our sea animals, and is a perfect buccaneer and pirate. He has a back fin about six feet long which reveals his presence as he swims along near the surface. With it he is said by some to beat his prey. Many are the battles that have been described between this beast and his larger kindred. Captain Atwood tells of three attacking an enormous cow sperm whale and her huge offspring in shallow water. They killed the calf and drove off the mother, badly wounded, after which they came back and ate the baby.

The grampus, thirty feet long, and the porpoises, or herring hogs (eight to ten feet long), are allowed to pursue their way untroubled by the fishermen. Both animals have large teeth, and consume large quantities of fish. The teeth interlock so that their slippery, scaly prey cannot escape. The fish often run into nets and shallows to escape them. Porpoise and grampus are not only hard to catch, but are of very little value when taken. Like all the larger whales, they are mammals, and suckle their young swimming along on their side. The nipple is retractile, and may be drawn back into a slit or fold in the breast, so that it is scarcely visible as the animal lies on deck. Having shot a suckling mother on one occasion, we tried the milk. It was very rich, and had a somewhat fishy taste. Porpoise meat is exceedingly good for eating.

The sperm whale, or cachalot, is not now a denizen of our coast, where, however, he makes occasional visits. In 1892 a monster, some eighty feet long, ran into the rocks near Battle Harbour, and, I presume, finding them hard as his own adamantine skull, got somewhat confused; for he continued to battle with the rocks till he stranded and perished. He was towed into the harbour and flensed in an amateur way. The head was one-third as long as his body. The head contained two large tanks, called the case, and out of this the oil was pumped. One hundred and forty gallons were taken. The oil helps to float the huge jaw-bones. The lower jaw had fifty large, conical teeth of solid ivory, several inches apart. The teeth of the cachalot were at one time almost venerated in Fiji and other sea islands, and disastrous wars and many murders have resulted from disputes as to their possession. The food of

the sperm is fish, and any flesh it can catch, especially large cephalopods. It is said that out of the stomach of one cachalot, thirteen porpoises and fourteen seals were cut. Since this date several more sperm whales have been killed on our coast.

The usual food of the whale is the octopus, or giant squid, which flourishes in deep water off the Labrador. An octopus arm no less than twenty-seven feet long was reported as taken from the mouth of a captured cachalot. Even the white whale falls victim to this most masterful animal in the sea. The sperm whales travel in schools, the boys and girls in separate companies, and each in charge of one or two old folk. The big bulls maintain an absolute proprietary right to the harem until deposed by some able and aspiring youngster.

The narwhale, like all the others, is retiring steadily before the advent of the white man, and is now seldom taken on our shores, though in the north it is still occasionally killed. Its front left canine tooth grows directly forward out of its mouth, and is twisted round and round itself or its fellow-tooth, in a solid ivory tusk ten feet long.

There are now two whale factories in Labrador. One at L'Anse au Loup was closed for want of whales. One situated at Cape Charles has been running for four years. Another at Hawke's Harbour, forty miles to the north of the Strait of Belle Isle, has run for two years, and kills most fish. The whales apparently come from the northward during the season. Both of these whaling stations are now (1921) temporarily closed up.

Hunting whales is certainly a most exciting industry; and I can imagine no more thrilling moment than when the

big fish rises for the last time right under the bow, and the harpooner makes his shot. The small, fast steamers, with the harpoon gun mounted on a swivel on the fore poop deck, are still handled by Norwegians trained to the work. In rough and fine weather one sees them darting here and there and everywhere. The first puzzle to the visitor is as to how these tiny craft ever managed to steam across the great Atlantic. Two at least have been lost, — one on a reef; one disappeared on the passage. They steam about fifteen knots per hour, which is far faster than any whale swims, unless he is badly frightened. As the monster, which is as large as the steamer, blows alongside, and one holds one's breath involuntarily, the harpooner quite silently indicates with one hand to the helmsman which way to put the helm, keeping his other hand on the gun-stock. Then there is a commotion right ahead, a sensation as if the vessel were running to destruction on a huge rock, a bang, and then, — nothing but the whirr of the line as it flies out through the pulleys. It is indeed a trying time. Either there is $1500 on the end of the line or, perhaps, another tedious and fruitless search for days or weeks. No wonder that on one occasion when I witnessed what scarcely ever happens, a real old expert harpooner make a clean miss, his language burst as if from a safety-valve, and was "frequent and painful and free." By a careful and merciful arrangement, when the harpoon goes home, the start of the whale pulls a trigger which is one of the flukes of the barbed iron. This fires an explosive charge in the fish, and will more often than not kill him immediately. If, however, the harpoon strikes him in the tail, or again, if it goes through a thin portion and does not explode, there

is likely to be trouble. With the powerful engine going full speed astern, the whale will tow the steamer ahead, they say, at several knots an hour. It seems never to face the enemy voluntarily; and though one, after sounding, came up through the engine-room floor and sank the vessel, it probably did so by chance in its dying agony or "flurry."

A sunken whale can only be raised by steam power, and once it is dead, it will otherwise remain down till putrefaction sets in. Then after eight or nine days the retained gases bring it to the surface. In Iceland where the fishery, after fifty years' prosecution, has destroyed the supply of inshore whales, a sunk whale is sometimes buoyed and left for another steamer to haul home. But the smell is then so dreadful, and the oil so brown and so inferior in value, that this delay in cutting up is avoided as often as possible. Here on the Labrador the dying whale is hauled alongside and given the *coup de grace* with a long lance, or possibly a second bomb may be fired into him. A long, hollow rod is then driven in, a force-pump is attached, and the great leviathan is inflated like a foot-ball. His tail is now triced up to the rigging, the flukes, as a rule, being cut off for convenience. Thus he is carried in triumph home to the factory, or anchored off while another victim is sought for. Till late years the carcass was a waste product and was allowed to float away or rot in the neighbouring coves. There it fouled the air and water and made the very rocks greasy and offensive. Now with the excellent machinery the meat is cut up and treated with heat and acid. Almost one-third as much good oil is thus extracted as is pumped from the "case" in the head. The flesh is then passed along from the vats to be dry heated with the crushed

bones, and converted into a valuable fertilizer, which is put into sacks for exportation. Little or nothing of the carcass is wasted; the blood itself goes into fertilizer.

Even during the few years the industry has been prosecuted, it would seem as if the whales had decreased in number.

In 1904 two companies fished and killed 153 whales, valued at $73,440.

In 1905 three companies fished and killed 149 whales, valued at $42,318.

In 1906 two companies fished and killed 85 whales.

In 1907 two companies fished and killed 94 whales.

Of the 149 whales killed in 1905 there were five sulphur-bottoms, 101 finbacks, 43 humpbacks. A fall in the price of oil and the inferior quality of the catch accounted for the great drop in value from the previous year.

If codfish and salmon are essential to the white inhabitants, seals and walrus are none the less the mainstay of the aboriginal coast dwellers — the Eskimo. Alas for these people, the increasingly vigorous prosecution of the seal-fishery from Newfoundland with larger and larger steamers has already begun to tell on the numbers of the seals, and especially on the commonest and most valued, the harp seal (*Phoca Grœnlandica*). The Eskimo of Labrador are slowly being driven back and dying out before the tide of white population, and there can be no question that improved rifles, improved seal-nets, and the steam sealers have been potent factors in their downfall.[1] No one

[1] Fortunately one of the Eskimo's favourite seals, the "netsek," does not come south at all, but whelps in holes excavated by it in the solid body of the great ice pans.

more clearly recognizes this or more deeply deplores it than one of the best authorities, Dr. Fridjof Nansen. The hood-seal fishery of East Greenland, once a great industry, has long ago ceased to exist. It began in 1761, and by 1884 it was already failing, yet only one million seals had been killed. Every year the white communities in Labrador are finding it less worth while to prosecute the seal-fishery. And now the land being also denuded of its once plentiful game, many settlements have disappeared. In 1795 it was considered a poor seal year when eleven hundred were killed at Battle Harbour; one hundred and fifty seals would be a good year's catch there now. Professor Hornaday of New York declares that "every large terrestrial mammal species is being killed off faster than it breeds." The same may be said of most of the aquatic mammals.

I am safe in saying that along the whole coast of Labrador not more than fifty walrus are now killed in the year. One was killed near Cape Mekattina in the Gulf, last year (1908). I have not heard of any other having been seen in the Gulf during the sixteen years I have known it. Most are killed by the Eskimo at Okkak, Hebron, and Ramah. They are more numerous around Cape Chidley, but there are fewer people there to kill them. Great herds were said to have once existed on the Magdalene Islands. In 1641 a vessel hunting as far south as Sable Island secured as many as four hundred pair of walrus tusks. In 1750 they were very plentiful in the Gulf of St. Lawrence. Yet in 1841 so rare had they become, one was reported killed "as far south as the Gulf of St. Lawrence." It may be noted that the walrus are not migratory in habit. Even in the polar

seas it would seem they are getting scarcer, and the huge herds once so common are now seldom seen. The extinction of the walrus in Hudson Bay will mean death to many of the only class of human beings able to flourish in that environment. Nevertheless, the increasingly fatal weapons of modern civilization are being directed against the walrus for the paltry return they give the white man or for "pure sport."

Surely the time has come to extend some protection to the northern people by preserving almost their sole food-supply. Professor Henry Elliot describes the absolute destitution of two villages of three hundred Eskimo, whom he knew personally and regarded as a superior race of Eskimo; their starvation, in this case, resulted from the fact that a special movement of the ice that year deprived them of walrus. A. P. Low records the death of every single soul in a Hudson Bay community from starvation because the whalers had supplied modern weapons to neighbouring Eskimo, who were then employed in destroying the only walrus (for export of the skins) available to the fated settlement. Were it in my power, I would most certainly close for "civilized" walrus hunting all the water to the west of Labrador and Baffin's Bay, and thus prevent the intentional or the unintentional robbing of another people's means of existence.

After all, the walrus catch is of no great value to the white man. The dense skin from a half inch to three inches in thickness is useful only for a few special purposes. The ivory of the tusks keeps its colour well, but is very faulty, and not large enough for the manufacture of billiard balls. It is of comparatively little value. I once bought from a

trader here a whole boxful of tusks at thirty cents a pound. The largest tusks I have had from a Labrador walrus weighed, when cleaned and dried, six and one-quarter pounds. Possibly a very extraordinary pair might weigh ten pounds.

The old male walrus would scale twenty-five hundred pounds, be about fifteen feet long, and has measured as much around the waist. They are clumsy, lethargic beasts, gregarious and monogamous. They are slow in the water, and dead slow on the land, advancing by hauling painfully along by their fore flippers, or if hurrying into the water "rolling over anyhow." Amusing accounts have been written as to how they wait for succeeding waves to heave them out on sandy beaches, rather than scramble up themselves; when thousands are together, the last comers lie on top of the earlier arrivals, simply because they are too apathetic to move on. They appear to have a fair sense of smell, but not to rely on sight or sound for protection from their enemies, among whom is the polar bear.

Professor Elliot describes how he watched a herd basking on an Alaskan beach, and before one dodged off to sleep, it poked the next one and woke it up. This grape-vine telegraph seemed to be for the purpose of having one always somewhat on the alert. They are shy and harmless, digging up clams with their tusks for food, and also browsing on some of the seaweeds. They have been known to attack a kayak, or boat, but only when wounded or when defending their young. They use their tusks for helping themselves out on an ice edge.

Though to Europeans of so little value, to an Eskimo the walrus may mean everything, — meat, clothing, light,

housing, boats, weapons, nets (from plaited bowel); everything necessary can be got from a good walrus. However, the skin of the ring seal or the bay seal is the Eskimo's usual clothing. Only the blown and dried gut, which is sewn with sinew and makes an excellent oilskin jumper, and is mostly used in kayaking, is obtained from the walrus.

The meat is black, and to us offensive. We were walking along the beach one day, and, while crossing a pebbly ridge, felt it move up and down as if it were on soft rubber. We moved a few top layers of stones, and found an immense cache of raw walrus meat left against next winter. Another cache we saw barred into the end of a sea-worn cave. This was, however, so odoriferous, we could only suppose it was in reserve for the dogs. A sick Eskimo boy that we had for twelve months as a patient would at first eat no "kablenak" food. We had to keep a supply of dried walrus meat that looked like tarred leather. This he would tear in strips with his teeth and eat raw, somewhat as men chew plug tobacco. The tusks are the greatest prize, however, for on these the Eskimo depend for their harpoon tops, the bone being heavy and curved exactly as they like it. We brought out one year a few iron harpoon tops for some northern friends. But I found they did not use them, greatly preferring the native tusk tops. These are most skilfully made; they are purposely divided into three pieces so that when the harpooned walrus puts a heavy strain on the line, the pieces come apart, leaving the barbed head inside the animal. Thus the weapon itself does not break.

The harp seal (*Phoca Grœnlandica*) is far the most abundant seal on the Labrador. In the late autumn he comes

south from Melville Sound and from even more northern waters during November to February; at this season the East Coast men set gill-nets for them. About the first of March they bring forth their young on the ice-floes off the coast, and also in the Gulf of St. Lawrence, as far as the Magdalene Islands, and even Nova Scotia. For this they herd together in tens of thousands on the floating ice, which under ordinary circumstances should afford them safety. But at this time when they are absolutely unable to escape, the Newfoundlanders hunt them in large steamers, and kill immense numbers of the babies by clubbing them. From two hundred and fifty thousand to five hundred thousand is the average number thus destroyed annually. The babies are quite white, called "white-coats," and are almost all born on the same day, and also take to the water on the same day, three weeks later. The baby fur comes off at this time. He is then called a "ragged-coat." The fur of still-born babes does not come off, and the skins are therefore more valuable and are called "cats."

During these (generally three) weeks, the ice has been drifting rapidly to the south. The mother seal has kept a blow-hole open up through the ice near where she left the baby, and through this she has been away fishing every day. She gives such rich milk that her offspring can be almost seen to grow. They are so fat that I have seen them looking, in their ice cradles, like bladders full of lard, as they lay on their backs in the hot sun, fanning themselves with their flippers. The mother at last forces the pup to take to the water, and a mysterious instinct at once teaches him to "go north, young man." This he does in leisurely fashion, and by the end of May these "beating

seals," as they are called, have mostly passed along the Labrador coast.

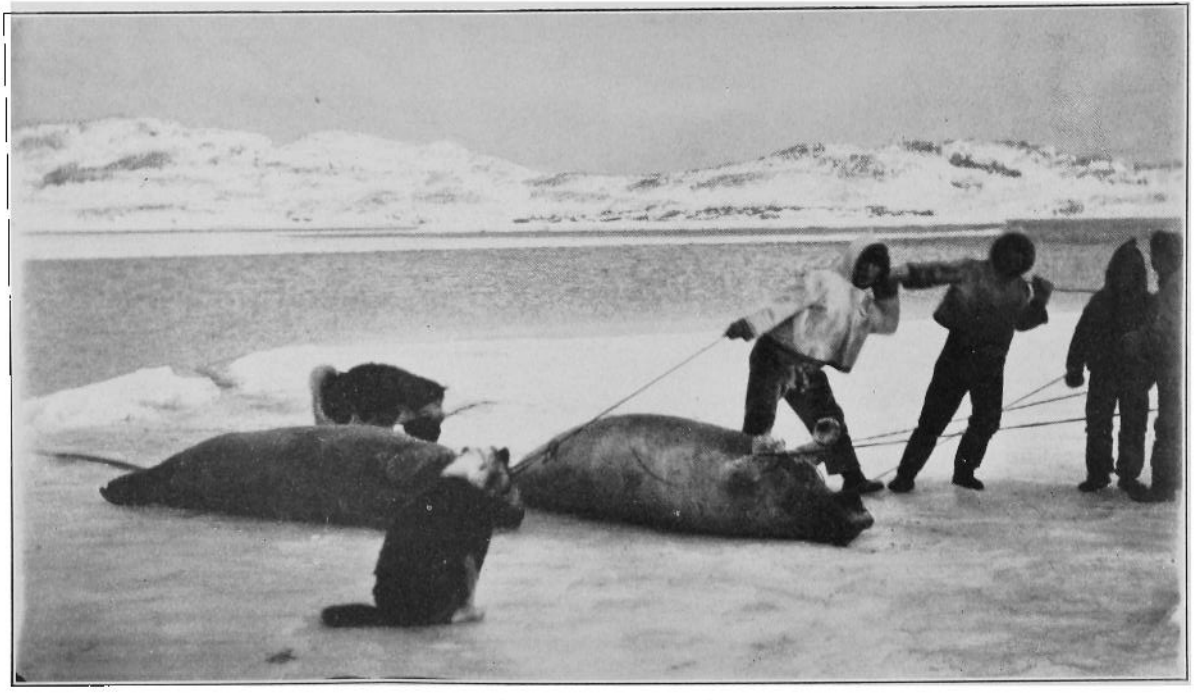
When these poor creatures are killed, the waste is terrible. I have seen three or four thousand bodies of young seals, freshly stripped of their furry jackets, left to rot, or be a prey for sharks, as the case may be. The sealing industry is a very popular one, however, in Newfoundland. The sealing masters are the great men of the fishery, and there can be no question that from the sealer's point of view, the adventure, the call for pluck and hardihood, and the gamble of it, beyond the few dollars each man may make, are great attractions. It is not true, so far as I have seen, that brutalities, such as flaying alive, are ever practised. Nor can any one, knowing the men as intimately as I do, ever believe them capable of any such abominable atrocities.

The "beater seal" returns as a "bedlamer" with his fellow-beaters left from the previous year, when the old seals come south next winter. He plays about among the floes, and returns again north in the spring, to come back a "young harp" the third winter, ready to do his share in maintaining the race. Often, however, he does not breed till the fourth year, when he assumes the dignity and name of an "old harp." The saddle, or harp, is a large, bilateral, black, wing-shaped patch across his back showing well on the lighter, drab-coloured skin of the rest of his body.

Even when the dangers of the ice-floes are over, where many old seals, as well as the young, are slaughtered, the harp is still not safe on his northern journey. In May and June, along the shores of Labrador huge frame nets are put out from a capstan on the land. The great room of net

has a doorway which, once the seals have entered the room, is raised by winding up the capstan on the land. As the seals trim the shores, and even follow round the bays on their long journey, many are caught in this way. I have known one settler's family to take nine hundred seals, while three hundred to four hundred forms a catch by no means unusual. Not nearly so many seals, however, are taken nowadays, spring or autumn, and one can see many abandoned capstans standing on rocky points. At one little Labrador settlement a trapper of the name of Jones became so rich through regular large catches of seals that he actually had a carriage and horses sent from Quebec, and a road made to drive them on; while he had a private musician hired from Canada for the whole winter to perform at his continuous feastings. I was called on awhile ago to help to supply clothing to cover the nakedness of this man's grandchildren.

Yet another mode of welcome the poor harp gets from southerners, when it leaves its northern home to visit us. That is given with buck-shot and musket, ball and rifle. The process is called swatching, and is carried on by two men in a light rodney, or punt, which is sometimes provided with runners. The seals are bound to rise in the "ponds," or fissures, between the great pans of the Arctic floe, to take breath. The plan is to "get by a likely lead of water," build a "gaze," or shelter, out of ice blocks, and "bide your time." You must be absolutely alert to get any seals. I have myself chosen a small lead and watched, lying down with rifle ready loaded, cocked, and pointed, and yet many times a great harp has noiselessly put up his head and shoulders and gone down, leaving only a ripple on the sur-



Catching Seals near Hebron

face, before I could draw a bead on him. Then for a short time he floats at this time of the year, and you must rush off your boat, or throw your many-hooked jigger over him, and haul him quickly up on to the ice, if you are strong enough to do so.

If the seals are basking on the ice as the boat approaches, the men shout and wave, and even fire under the seal, which seems to so frighten him that he remains staring into space, till they land and club him with the rifle. As the slain animal does not move, the others think there can be no danger, and will at times allow a man to land and shoot or club them every one.

Our next most important seal is the bay seal. He is a small seal, weighing only about one hundred pounds and looking rather dingy in a drab coat with faded black markings. Nor are they very numerous, never being seen in herds. Yet they will probably outlast all the others, being the most adaptable to their varied environment. They are found in the Pacific and Atlantic, in Europe, Asia, and America, and in the south seas. They can bear heat or cold. I have shot them when driving my komatik over a frozen arm of the sea, tolling them into range by lying flat down and waving my feet to represent a seal; I have also secured them in the hot summer when the mosquitoes and the heat have made the period of waiting almost unbearable. Bay seals are equally at home in salt water or fresh. Some of our rivers are almost ruined for ordinary fishing by the number of bay seals that infest their pools. This "robber of the river," to use the name of the salmon fisherman, is there shown no mercy by the fishermen, and cannot possibly escape. The seals will watch

the salmon nets so carefully, and eat the struggling captives so rapidly, that there is little wonder most fishermen are "agin them." I have known a seal haunt a net so persistently that to get any fish the owner had to watch all the while at one end of it, and even then the seal was so "well adapted to his environment" that he would almost snap off the fisherman's hand as he raced to be first to disentangle the salmon. The bay seals are captured by our people in nets anchored to the bottom. When diving, the seals become "meshed" and are soon drowned, as they cannot rise to breathe.

The seals can travel a considerable distance over land and can remain for long periods out of water. The harbour seal (*Phoca vitulina*) breeds and lives in Seal Lake, one hundred miles inland from Richmond Gulf and eight hundred feet above the sea. In winter this seal leaves for islands in the open where the sea does not freeze. The bay seals of the coast breed on the land in caves, rocks, or beaches. I have seen them many times with their young. When the baby is born, he is a dusky white, but he soon assumes a most beautiful silvery coat mottled with black, which he wears for a year. During this time he is called a "ranger," and his skin makes the most attractive clothing, sleeping-bags, pouches, etc.

At three years the ranger becomes a "doter" and is a breeding seal. The young are born in April and May in southern Labrador, and later on as one gets farther north. The young seal is able to take to the water at once. It is said that the "baby-hair" is cast inside the mother before his birth.

Clever as the modern circus "feature" shows seals to be,

they are easily decoyed in the manner above described. Once, however, the biter got bitten. For one of our Eskimo, who had hidden himself in a sealskin bag and was lying on a favourite basking rock flapping his legs, was mistaken for a seal by a passer-by on the shore, who promptly sent a bullet through him.

The large, gentle eye makes the seal's appearance exceedingly attractive, and those inclined to be sentimental have found in him a great scope for their effusions. As a matter of fact, he eats his prey alive. He will take a bit out of a fish, and leave the rest to struggle away and die slowly. They are fierce fighters, and will catch and eat birds swimming on the surface of the water. One was seen devouring a salmon alive. The seal swallowed him by inches, swimming a mile while the struggle lasted. It seemed an open question whether he would succeed or not. Another seal was seen to capture a gull on the water, but the persistent harrying he got from the rest of the birds persuaded him to let the wounded victim go.

The ringed seal, *Phoca hispida*, so dearly loved of Greenlanders, and so prized by their people for clothing, is rare in Labrador, only a few specimens being taken, and those in the extreme north.

Nor does the hooded (or hood) seal (*Cystophora cristata*) come much to the shore. Indeed, the ringed seal is a glacial seal, and the hood a pelagic and glacial seal. The hoods breed in the ice off our shores in March, a little later than the harps, and their baby, dark on the back, is called a "blue-coat." The old ones are slightly larger than the harps, and the skin is covered with black patches. The strange bag on the head, which is inflated from the nose,

is probably only an ornament like a crest. Some think it is specially provided to protect its nose from seal bats or clubs, — of course an impossible theory, for sufficient time has not yet elapsed for Nature to have evolved armour against the sealers in the ice-field, any more than she has yet provided for the ideal requirements of twentieth century foot-ball man. The hood seal has been so far exterminated in its favourite resort between Greenland and Iceland, that the fishery has had to be abandoned.

This seal displays great strength, courage, and affection in defending its young, and I have seen a whole family die together on a pan of ice not twelve yards square. Four men with wooden seal bats did the killing, but not before the male had caught one club in his mouth and cleared his enemies off the pan by swinging it from side to side. The old seal, which must have weighed fully two thousand pounds, was hoisted on board whole (or unsculped), so as not to delay the steamer. He was apparently quite dead. As, however, he came over the rail, the strap broke, and he fell back into the sea. The cold water must have revived him, for I saw him return to the same pan of ice, distinguishable by the blood stains left by the recent battle, and now some little distance astern. The edge of the pan was almost six feet above water, but he leaped clear over the edge, and landed almost in the spot where his family had met their tragic fate. The men immediately ran back and killed him with bullets. He was this time sculped, and so brought aboard.

The strength of the hood seal is also well illustrated by the fact that he can descend for food to a depth of sixty or even ninety fathoms. This is shown by the fact that a

deep-sea fish called "bergylt," which only lives between those depths, has been found in his stomach.

The last and largest of our seals is the gray seal (*Halichœrus grypus*). We measured one eleven feet long, with a girth of eight feet. No doubt, however, larger ones have been killed. These seals are practically devoid of hair, make the best possible material for covering kayaks, and for the manufacture of water-tight feet for boots. The skin of the harp seal is used for the legs and for the bottoms as well, when the boots are to be used in the coldest weather, because this skin is so much softer, and allows freer movement; but the gray sealskin is much more resistant to water. The gray seal is generally shot as he plays along the ice edges, but is occasionally meshed in sunken nets.

Professor E. Wiedlein, now director of the famous Pittsburgh Laboratories, called "The Mellon Institute," studied during two seasons the secretions of the ductless glands of our whales. He isolated a crystalline "adrenalin," that was a stable substance and gave a solution that did not decompose in contact with the air. The synthesising of this under the commercial name super rennin has, however, prevented the need for extracting it commercially. The pituitary body was as large as a man's fist — the adrenal body about a foot long.

CHAPTER XV

THE BIRDS

By Charles Wendell Townsend, M.D.

From an ornithological point of view, Labrador has an interesting past as well as present. The great Audubon testified to the wonderful interest of Labrador to the ornithologist, by visiting this country in 1833. His writings contain frequent reference to the observations he made at that time, and he states in his Labrador Journal that he executed or partly executed seventeen plates of birds during his brief sojourn of two months on these shores.

Since Audubon's times there have been sad changes in the bird life of this country. Two species have become extinct; namely, the great auk and the Labrador, or pied, duck. The former bred in great numbers on Funk Island off the near-by coast of Newfoundland, but was slaughtered mercilessly during the latter part of the eighteenth and the beginning of the nineteenth centuries. Cartwright describes the capture of one of these flightless birds, not far from the southern coast of Labrador. He says, calling the bird by its common name of "penguin": "We were about four leagues from Groais Island at sunset [Monday, August 5, 1771] when he saw a snow [sailing-vessel] standing in for Croque. During a calm in the afternoon, Shuglawina went off in his kyack in pursuit of a penguin;

he presently came within a proper distance of the bird, and struck his dart into it; but, as the weapon did not enter a mortal part, the penguin swam and dived so well, that he would have lost both the bird and the dart, had he not driven it near enough the vessel for me to shoot it." The last auk seen alive was in 1852.

The Labrador duck doubtless occurred in abundance in past times along the Labrador coast. Audubon was shown nests supposed to belong to this species, but he saw none of the birds, and there is much doubt as to the identity of the nests. Cartwright speaks in his Journal several times of shooting *pied ducks*, and there are reasons to believe that these were Labrador ducks, although the evidence is of course not absolute. That this duck is now extinct, there seems no doubt, as none has been seen or shot since about 1874.

Another bird which seems to be going the same way towards extinction, a bird which has been in times past perhaps the most characteristic bird of Labrador, is the Eskimo curlew. This bird visited the coast regions in countless multitudes every autumn on its southward migration. Professor Packard, writing of the Eskimo curlew in 1860 in Labrador, says: —

"On the 10th of August the curlews appeared in great numbers. On that day we saw a flock which may have been a mile long and nearly as broad; there must have been in that flock four or five thousand! The sum total of their notes sounded at times like the wind whistling through the ropes of a thousand-ton vessel; at others the sound seemed like the jingling of multitudes of sleigh-bells."

The birds were delicious eating. They fattened almost to bursting on the Empetrum, or curlewberry, so abundant along the coast. The fishermen kept their guns loaded, and shot into the great flocks as they wheeled by, bringing down many a fat bird. About 1888 or 1890 the curlew rapidly diminished in numbers, and at the present day perhaps a dozen or two, or possibly none at all, are seen in a season.

The rocky islands which line the Labrador coast have always been favourite breeding places for various water-birds, chief among which may be mentioned the puffin, black guillemot, the common and Brünnich's murres, razor-billed auk, great black-backed gull, glaucous gull, herring gull, Arctic tern, common and double-crested cormorants, and American and Greenland eider-ducks. These formerly bred abundantly all along the coast, and before the arrival of the white man paid a comparatively small and unimportant tribute to the greed of polar bears, Eskimos, and Indians. This natural pruning, as it might be called, had little or no influence on the numbers of the birds. White men, however, with their insatiable greed and their more systematic methods, have created havoc in the ranks of these interesting water-fowl. In Audubon's time the vile business of "egging," as it was called, was at its height, and the horrors of the business are graphically pictured by the great ornithologist. He describes a shallop with a crew of eight men: —

"There rides the filthy thing! The afternoon is half over. Her crew have thrown their boat overboard, they enter and seat themselves, each with a rusty gun. One of them sculls the skiff towards an island, for a century

past the breeding place of myriads of guillemots, which are now to be laid under contribution. At the approach of the vile thieves, clouds of birds rise from the rock and fill the air around, wheeling and screaming over their enemies. Yet thousands remain in an erect posture, each covering its single egg, the hope of both parents. The reports of several muskets loaded with heavy shot are now heard, while several dead and wounded birds fall heavily on the rock or into the water. Instantly all the sitting birds rise and fly off affrighted to their companions above, and hover in dismay over their assassins, who walk forward exultingly, with their shouts mingling oaths and execrations. Look at them! See how they crush the chick within its shell, how they trample on every egg in their way with their huge and clumsy boots. Onward they go, and when they leave the isle, not an egg that they can find is left entire. . . . The light breeze enables them to reach another harbour a few miles distant, one which like the last lies concealed from the ocean by some rocky isle. Arrived there, they react the scene of yesterday, crushing every egg they can find. For a week each night is passed in drunkenness and brawls, until, having reached the last breeding place on the coast, they return, touch at every isle in succession, shoot as many birds as they need, collect the fresh eggs, and lay in a cargo."

The days of commercial egging have long since passed and the laws against egging and shooting the nesting birds are now fairly enforced in Canadian Labrador. In Newfoundland Labrador, however, there seems to be no pretence of bird or egg protection. The inhabitants and the summer fishermen appear to consider the eggs and the breeding parents as godsends to eke out their scanty larder. Knowing every rock on the coast as these men do, they can easily keep in touch with the birds and rob them of their

treasures. When I was in Labrador in the summer of 1906, the fishermen made no concealment of the fact that they took all the eggs and killed all the birds they could. They often carried their guns with them when they visited their fish-traps. In the spring and fall great numbers of migrating ducks, and even gulls, are shot as they stream through the narrow tickles.

The Eskimo dogs are not fed in summer, and, foraging for themselves, they ransack the coast and undoubtedly destroy many eggs and young, not only of the larger water-birds, but also of other ground nesting birds, such as pipits and horned larks.

It is sincerely to be hoped that the wonderful nursery for water-birds in Labrador will not be entirely depopulated, but that sufficient protection for the breeding birds will be given, and that speedily, lest it be soon too late.

Notwithstanding these inroads on the birds, Labrador is still of great interest to the ornithologist, and it may be well to take up in turn some of the characteristic birds [1] to be found at the present day in the three faunal zones into which the Labrador peninsula may be divided, — the Arctic Zone, the Hudsonian Zone, and the Canadian Zone.

The Arctic Zone includes the barren grounds above the limit of tree growth on all the larger hills and mountains in the interior, the whole northern portion as far south as about lat. 58°, and the entire coastal strip of varying

[1] In a recent study of the birds of Labrador by Dr. Glover M. Allen and myself, we have recorded two hundred and thirteen species and subspecies of birds for the Labrador peninsula, as shown in the list in the Appendix.

width from Natashquan on the southern coast along the shore of the Straits of Belle Isle, the entire eastern coast, and the Hudson Bay coast south to about the region of the mouth of the Great Whale River.

Two characteristic Arctic birds, which the visitor along the southern and eastern coast will be most likely to see, are the American pipit and the horned lark. These are common everywhere along the coast, building their nests in the deep moss of the barren hills. Both birds are graceful walkers along the ground, and the pipit distinguishes itself by its habit of constantly wagging its tail up and down. Both birds are interesting singers, and both indulge in flight songs, each in its own peculiar manner. The pipit suddenly springs up into the air, mounting nearly vertically, but circling slightly. Up, up it goes, singing repeatedly a simple refrain, *che whée, che whée,* with a vibratory resonance on the *whée.* Attaining an eminence of perhaps two hundred feet, it checks itself and at once begins its descent. Down it goes, faster and faster, repeating its song at the same time faster and faster. Long before it reaches the ground, it sets its wings and tips from side to side to break its descent. During the performance it may emit its refrain eighty times.

The horned lark, on the other hand, mounts silently into the air in irregular circles, until it becomes a mere speck in the sky. Here it alternately flaps its wing and sails, emitting a jingling, squeaking, but not unpleasing, song. This performance continues for several minutes, during which the bird repeats its song many times. Then the song ceases, and the bird dives to the earth as silently as it rose. Occasionally the song is given from the ground. The song

resembles in kind but not in quality the famous song of the English skylark.

Another common bird in this coastal strip is one that is also a dweller farther south, an inhabitant of the eastern United States; namely, the savanna sparrow, and strangely out of place does it seem here.

In the more northern parts of the Arctic Zone of Labrador are to be found the Lapland longspur, the wheatear, possibly the white wagtail, the snow-bunting, snowy owl, rock ptarmigan, Reinhardt's ptarmigan, the white, gray, and black gyrfalcons, and the American rough-legged hawk, although these four last-named birds may be found even on the southern coast.

The American rough-legged hawk is a splendid broad-winged bird almost black in colour. It may sometimes be seen poised motionless for several minutes at a time over the brow of a hill, sustaining itself like a kite by the air currents. The gyrfalcons have more pointed wings, and the whiteness of the plumage of the white, or Iceland, species makes it very conspicuous among the dark crags where it nests.

The two ptarmigans already mentioned, as well as the willow ptarmigan, which is found in the region of tree growth of the Hudsonian Zone, resemble their compatriot, the Arctic hare, not only in becoming white in winter, but also in possessing shaggy feet at this season, — feet densely tufted with hair in one case, with feathers in the other. This tufting probably acts in the manner of snow-shoes to prevent sinking into the deep snow, and not merely to keep the feet warm. The generic name of the ptarmigan is *Lagopus*, which means rabbit-footed. In the same way

the snowy owl's feet are well padded and tufted with feathers.

The change of colour in the ptarmigan from the brown and mottled plumage of summer to the snowy white of winter is due not to any mysterious change in the feathers themselves, but to the moulting of the brown feathers and to their replacement by others of a different colour. Both plumages are wonderfully protective, and it is as difficult to see the brown bird amid its barren surroundings in summer as it is to see the white bird amid the snow and ice in winter.

While the coastal strip is under consideration, it will be well to speak of the water-birds that breed along the shore. Of the small wading birds one of the most interesting is the northern phalarope, not much larger than a "peep," that bears the name of "gale bird" on the Labrador coast, "sea-goose" on the New England coast. It has a habit of riding the water both of the sea and of the reedy pools like a miniature goose or duck. On the shores of these reedy pools along the coast, the females lay the eggs, but confide to the males, smaller and less brightly plumaged birds, the duties of incubation and caring for the young, while they go gadding in companies off at sea. Least and spotted sandpipers and semipalmated plover also breed on the Labrador coast, but most of this group go farther north to raise their young.

Of the divers, the loon and red-throated loon breed commonly near fresh-water ponds, and are to be met with in considerable numbers along the coast. The black-throated loon is occasionally found in the northern portions.

The puffin, or parroquet, as it is universally called in

Labrador, breeds at favourable spots all along the coast, but it is to be seen in greatest abundance in the Straits of Belle Isle near Bradore. Here it breeds in great numbers at Parroquet Island, a small island of crumbling red sandstone in which it burrows and lays its single egg. The puffin is a good bird to watch from a steamer, for it allows of close approach before it attempts to get out of the way. After nervously dabbing with its bill at the water a few times, it either dives or flies away. In both cases it may be said to *fly* away, for in diving it flops out its wings as it goes down, and continues to use them under water in flight. Whether swimming on the surface, or in aërial flight, the shape and appearance of puffins are characteristic. They are short and apoplectic in form, being devoid of a neck. Their large red bills and gray eye-rings, which suggest spectacles, and the dark band about the neck, give them a comical appearance.

The black guillemot, or sea pigeon, is perhaps the most ubiquitous bird along the coast. It breeds securely in deep fissures among the rocks. Its black plumage, relieved by the large white patches on its wings, makes it very conspicuous. Both the common and Brünnich's murres breed along the coast, although in sadly diminished ranks as compared with their former abundance. Each species lays a single egg on the rocky ledges. The egg varies greatly from a delicate blue or bluish green to a buffy white, and is wonderfully spotted or streaked with various shades of brown. It is pyriform in shape, so that it is less liable to roll off its precarious perch.

The razor-billed auk, or tinker, is also to be found breeding on the rocky islands, except where the greed of man has

exterminated it. Its broad, sharp bill in summer at once distinguishes it from the murre, as well as its habit of cocking up its tail as it swims. In its short neck it resembles the puffin, but it is a larger bird, and as it flies away, it shows a black line in the middle of its back between white sides, while the puffin looks black from the same point of view. The dovekie, or little auk, breeds farther north, but is found along the coast during the migrations and in winter.

Of the gull family it is possible to mention only a few here. Perhaps the most beautiful in flight are the hunters of the sea, the jaegers, who rob the other gulls and terns of their prey. A pomarine jaeger in the black phase twisting and turning in pursuit of a white kittiwake is indeed a beautiful sight. The kittiwakes breed on the high cliffs of the northern Labrador coast, but may be seen in great flocks anywhere along the shore. An assembly of several thousand of these beautiful white birds settling on the water and rising to whirl about like gusts of snow driven by the wind, is a wonderful sight. Their cries suggest the syllables *kittiwake*.

The great black-gulled gull and herring gull are such familiar birds in winter farther south that they need not be mentioned here, but one must not omit to speak of the glorious glaucous, or burgomaster, gull. This bird, as large as a great black-backed gull, breeds on the eastern coast in moderate numbers. The purity of its plumage vies with that of the Arctic ice that often surrounds it. The long feathers of the wings are spotless white, instead of being marked as in the herring gull. The adults have a gray-blue mantle on the back, while the immature birds lack this mantle and are of a universal whiteness slightly tinged with buff.

Among the tube-nosed swimmers, the greater and sooty shearwaters may sometimes be found in summer in flocks of several thousand along this rugged coast. These birds, however, do not breed here. In fact, they are spending their winter in the neighbourhood, for they breed in the Antarctic regions in their summer, our winter. Wilson's petrel also wanders here in the same way, while the stormy petrel wanders from its breeding grounds along the coast of the British Isles. Leache's petrel, however, is a true inhabitant, and breeds on the Labrador coast. Both the common and the double-crested cormorant, weird-looking birds, commonly called "shags," breed on the southern shore. A small colony of gannets also are still to be found there.

Many species of ducks migrate along the Labrador coast, seeking and returning from their breeding places farther north. Others breed on the coast or in the interior on the shores of rivers or ponds. Perhaps the most conspicuous bird in this group, one that still attempts to hide its nest from devastating man or Eskimo dog, along the shores of the sea-coast, is the American eider. In its nest it lays from five to eight large, pale greenish eggs slightly tinged with olive. These eggs it protects and keeps warm with the eider-down which it plucks from its breast. They are large birds, and generally fly in single file low over the water. The strikingly marked males, with the black bellies and white breasts, necks, and backs, are easily recognized. The female is a great brownish bird, looking very dark in some lights, and entirely lacks distinctive markings. Both sexes have, however, a characteristic way of holding the bill pointing obliquely downward at an angle, instead of straight

out before them like most ducks. The king eider, a wonderfully marked bird, breeds in scanty numbers along the coast, and the Greenland eider is a breeder in the northern parts of the country.

The three species of scoters, or sea-coots, as they are called, breed in the interior, but numbers of each species are always to be found in summer along the sea-coast. A small duck that is diminishing in numbers still breeds in the interior of Labrador along the course of streams. This is the harlequin duck, as curiously variegated in colours as is the individual for which it is named. After the breeding season, this bird resorts to the salt water.

Of the geese, the Canada goose alone breeds commonly in the interior of Labrador, and is often caught by the natives during its helpless moulting period.

The heron and rail family are represented in Labrador by but few species, and those mostly stragglers.

The upper limit of the Hudsonian Zone coincides with the upper limit of the tree growth. The lower limit cannot be accurately placed, for it glides imperceptibly into the Canadian Zone. There are frequently offshoots and islands of the Canadian Zone in favourable localities in the Hudsonian Zone, just as there are offshoots and islands of the Hudsonian Zone in the Arctic Zone. The most characteristic Hudsonian bird and one that clings closely to the outskirts of the Arctic Zone, often indeed invading its territory, is the white-crowned sparrow, well called the aristocrat of its family. A most distinguished-looking individual he is, with his snow-white crown and white bars over the eyes. The area of the white crown is enlarged when he erects it in pride or passion, or when the wind blows it up. This is

the familiar dooryard bird of the bleak Labrador coast. He sings from the roof of the turf-covered tilt, or from the cross-stays of the fishing schooner in the narrow tickle. He contentedly picks up crumbs and insects about the houses and makes his nest in the thickets of spruces or firs that are unable to struggle more than two or three feet above the earth. His call note is characteristic and easily recognized, a metallic *chink*. He also has a sharp, chipping alarm note. His song is pleasing, although it has not the familiar charm of his cousin, the Peabody bird, or the power and brilliancy of that of the fox sparrow. It sounds something like *more wet-wetter-wet-chezee*. There is a long and somewhat mournful stress laid on the first note, and a buzz not easily expressed in words comes near the end.

Another Hudsonian bird that frequents the stunted trees and bushes on the borders of the Arctic Zone is the tree sparrow. The chestnut crown and large black spot on the otherwise spotless breast make it easily recognized. His song is simple and easily memorized, *seet-seet, — sit-iter — sweet-sweet*.

Two other sparrows are common and characteristic of this zone. The Lincoln's sparrow, discovered by Audubon in Labrador and named by him after his young friend Tom Lincoln, resembles closely the song sparrow of more southern regions. Its disposition, however, is very different, for it is a most retiring bird, skulking out of sight in the bushes if it but suspects that it is an object of interest. Instead of mounting to a conspicuous post to sing like its cousin, the song sparrow, it is apt to select the interior of a fir bush for this performance, and the listener often looks in vain for the songster. The song is varied, but partakes at times

of the warbling character of the song of the purple finch and of the wren. It is wild and mournful, and well fits its surroundings.

Of a different type is the fox sparrow. A large, handsome, rather showily dressed bird is he, one that does not hide his light under a bushel. As a musician he takes first rank. He is a performer of high merit. His clear and flutelike notes ring out with great purity, yet his song has not the charm of some simpler bird melodies.

The redpoll belongs also in this zone, although it hardly appears to have a local habitation, such a restlessly wandering bird is it. Its *chug chug* as it flies recalls the white-winged crossbill's call note, and its sweet *dee-ar* resembles closely the similar note of its cousin goldfinch. Frequently in the breeding season it waxes melodious in its own way, and flies about in irregular circles, alternately *chug chugging*, and emitting a finely drawn rattle or trill.

The Tennessee warbler and the Wilson's warbler are both found in this zone, the former a very plain, inconspicuous bird, the latter bright yellow with a glossy black cap. The Tennessee warbler is as inconspicuous in its habits as in its plumage, and retires to the depths of thickets when the observer endeavours to learn its secrets. The Wilson's warbler, on the other hand, does not hesitate to display its charms at close range, and sings its simple little song.

Two other birds, both fine singers, may be mentioned here, for they belong in this Hudsonian Zone; namely, the ruby-crowned kinglet and Alice's thrush. That the diminutive kinglet can produce such a loud and wonderfully clear and varied song is always a surprise and delight. The Alice's thrush is a common bird in the scrubby woods

on the edge of the Arctic Zone. Its call note resembles at times the call of the night-hawk, at times the call of the veery. Its song, which may be heard in the long summer twilight of Labrador even after nine o'clock, is interesting and beautiful. It begins with a single or double note, followed by a long veery-like vibration, sweet yet mournful.

The Canadian Zone includes the wooded region of southern Labrador. Its limits cannot be accurately defined, and the birds of this and the Hudsonian Zone intermingle. Sheltered valleys often enable the Canadian birds to extend far north into the region of the Hudsonian class.

It is impossible in the space of this chapter to do more than mention a few of the characteristic birds. The spruce grouse and the Canadian ruffed grouse here take the place of the willow ptarmigan of the Hudsonian Zone and the rock ptarmigan of the Arctic Zone. The spruce grouse is so tame or so stupid that it is often caught by a noose on a short stick. The Labrador jay is a subspecies of the Canada jay, and resembles its cousin closely in its pilfering habits and in the variety and weirdness of its call or conversational notes. The young of the year are dark plumbeous in colour, and resemble large cat-birds. Pine grosbeaks, white-winged and American crossbills, and pine siskins are all to be found here on the borders of the Hudsonian and Canadian zones. They are all dependent for their food-supply on the cone crop of the spruces and firs. When the crop fails, they wander widely in winter and visit more southern localities. The common warbler, whose range extends throughout the wooded area even to the edge of the Arctic Zone, is the black-poll warbler, whose simple song can often be heard in little islands of

struggling spruces among the barren rocks. The Hudsonian chickadee is also found here.

Still more southern and more Canadian in their distribution are the olive-sided and yellow-bellied flycatchers, the white-throated sparrow, and purple finch. The well-known Peabody song of the white-throated sparrow recalls the pastures of Maine. This song has a charm and beauty unsurpassed even by the songs of more power and complexity. The magnolia, myrtle, bay-breasted, yellow-palm, black-throated green, and Canadian warblers, and northern water-thrush are also found in these more southern regions. The winter wren, golden-crowned kinglet, black-capped chickadee, olive-backed thrush, and hermit thrush also occur here. The divine song of the hermit thrush heard in the wilds of Labrador is indeed an inspiration.

There remain to be added a few wide-ranging birds that have not been included in these classes. The northern raven may be mentioned first. While the American crow is rarely found in Labrador, and then only in the southern part, the raven takes its place throughout the country, especially on the sea-coast. Here they build their nests in inaccessible recesses in the rocky cliffs. No need have they when snow covers the ground of a change like the ptarmigan to white plumage for protective purposes. Their wits alone are sufficient. Their harsh *cra-ak* or *cru-uk* at once distinguishes them from the crow with its familiar *caw*. Their larger size cannot be depended upon as a distinguishing mark, for in vast surroundings one can with difficulty judge of size. The rounded tail of the raven is a good field mark, for the tail of the crow is nearly even.

Of the four species of swallows found in northern New

England, all but the eave-swallow have been observed in Labrador. The strong flying robin abounds in various parts of Labrador, pushing its way even to the very edge of the Arctic Zone. It is a strange experience to hear the familiar morning chorus of the robin in bleak Labrador, and to find it building its nest on an Eskimo hut.

CHAPTER XVI

THE FLORA

By E. B. Delabarre

The writer of this chapter is unwilling to allow it a place in this book, unless his readers will be truly indulgent and permit him to preface it with a brief note of personal apology. It must be read only with the clear understanding that it is written not by an expert in botany, but by one who, with the limited skill of an amateur, studied the plants of Labrador during a long summer's visit, and since then has read with eager interest all that he could find bearing on the subject. Such a person naturally lacks the technical knowledge and trained judgment of a botanist by profession, especially in matters of nomenclature, of important but not easily observed detail, of good insight into real causes and conditions. So the present writer would gladly have persuaded a more competent person to take his place. Some day the real experts will correct a large number of inadequacies in this description. But until they are ready, it seems inevitable that a chapter like this must be contributed by one who is merely a general observer and ardent lover of nature, and who happens to have been on the field, even though he lack an equipment sufficient to guard him

from making many errors.[1] There is need, then, of indul-

[1] In a previous chapter on this subject, in a "Report of an Expedition to Labrador in 1900," published as a Bulletin of the Philadelphia Geographical Society, I unfortunately allowed a number of errors to occur, especially in exact nomenclature. I welcome this opportunity to atone for them as well as is now possible. I stated there that I had myself attempted only the more easy identifications, lying well within the capacity of the amateur; that, aside from a few special kinds, I had submitted my collection to Professor Bailey of Brown University for the correct naming of specimens; and that he had submitted all doubtful cases to Professors Robinson and Fernald of Harvard University for approval or revision. In making these statements, I seemed to involve all these eminent authorities in responsibility for the errors that were included. But, through no fault of others, I received a mistaken impression as to the finality of many of Professor Bailey's identifications, failing sometimes to distinguish between his confident namings and his mere suggestions, and as to the extent to which they had received verification from the professors at Harvard. I now feel it a pleasure and a duty to apologize to these three men, who cannot be held accountable in any degree for mistakes that were due wholly to my own misunderstandings. This case is an illustration of the difficulty met with by an amateur who wishes to describe strange and interesting places that he has seen, in guarding himself against error, and especially in attaching correct names to the objects he has observed.

Since then Professor Fernald has kindly revised my collection, and tells me: "The plants are now correctly named, I think, with the exception of a few upon which I dare not venture a determination." Space is lacking here to indicate all the changes that are necessary in my published list. Some new names are secured, some individual numbers of plants must be credited elsewhere than as given. But mistaken conclusions in using the list may be largely guarded against by realizing that the following names are apparently all that need to be omitted entirely, or altered to another variety or species, or given a more modern nomenclature: *Dicentra Canadensis, Draba nivalis, Lychnis apetala, Sagina procumbens, Dryas octopetala, Saxifraga Hirculus, Epilobium alpinum*, var. *majus, Archangelica, Aster radula, Taraxacum dens-leonis, Andromeda polifolia, Ledum latifolium, Pyrola rotundifolia* et var., *Vaccinium Canadense, V. Vitis-Idaea, Primula*

gence from the readers of this account. But if this be generously extended, the writer permits himself to hope that, however inadequate his description may be and however subject to later correction, it may serve largely to increase the enjoyment of visitors to this fascinating country, by enabling them to understand more fully the great interest and attractiveness of its plant life.

Some few visitors to Labrador return with an impression that it is a bleak and forbidding country, rude, cruel, unattractive, bare of vegetation. But to many others it seems full of beauty, of attractiveness, and even of a rich and appealing fertility. The latter is the truer view, for it is the one gained by those who observe with more seeing eyes. Really, the wealth and variety and brilliancy of the Labrador growths and flowers are very striking to one who can see them at all understandingly. Very little knowledge of botany and love of plants are needed to realize this fact. An added ability to recognize and name the more common forms naturally increases enormously one's appreciation and satisfaction, and is not difficult to acquire. It is as important for real enjoyment and profit as to possess a similar outline knowledge of the geological forms of the land and of the causes that have moulded its scenic features. It will not cost a great amount of additional labour to gain an even more intimate understanding of the plants, — of

Misstassinica, Gentiana propinqua, Pedicularis flammea, Polyganum littorale, Betula nana, Luzula arcuata, L. hyperborea, Eriophorum alpinum, Poa laxa, Lycopodium lucidulum; omit also, but leave the synonym given with it: *Comarum palustre, Potentilla rubens.* In a majority of cases these corrections do not imply that the plants thus called in this and earlier lists do not exist in Labrador, but that it is now possible to give them more accurate names.

some of their special means of adaptation to their environment, of causes of the particular kinds and particular structures that occur, of their relation to food-supply, soil and climate, and to insect life. If the observer start with some ability to make analyses of flowers, and with a simple equipment of books[1] to aid in the identification of specimens, he will soon gain acquaintance with all the more commonly occurring plants. If, in addition to this, he be expert in botany, or will make a carefully selected and annotated collection and submit it to some capable botanist at home for identification, he may possibly be rewarded by the discovery of species and varieties hitherto unknown in

[1] Of books, among the most useful will be: —

1. As aids to analysis: —

Britton, Manual of the Flora of the Northern States and Canada.

Britton and Brown, Illustrated Flora of the Northern States and Canada.

Gray: Synoptical Flora of North America (incomplete).

Gray: New Manual of Botany, 7th ed., rearranged and revised by B. L. Robinson and M. L. Fernald, 1908.

2. For an understanding of forms and distribution: —

Schimper: Plant Geography upon a Physiological Basis. Oxford, 1904.

Dawson: The Geological History of Plants.

Hooker: Distribution of Arctic Plants.

3. For lists of plants already reported from Labrador: —

See lists of books in Delabarre's Report of Expedition to Labrador (Philadelphia Geographical Society, 1902), pp. 172, 194, 197. But for their inadequacy, see previous footnote.

Professor Fernald, our most expert authority on far northern plants, informs me that nearly all the published lists of Labrador plants contain many errors. Recent studies have given a much more intimate acquaintance with the northern flora, and thus all the old lists need critical revision. It is impossible, therefore, to give an accurate list of all plants thus far observed as occurring in Labrador, under their correct names. The whole matter must be decided finally by competent authorities

that region, which still offers large opportunities for botanical as well as for other kinds of exploration.

Few localities will better repay the amateur or even the professional botanist than this, either in æsthetic gratification or in opportunity for scientific research. Labrador is one of the most southerly of all countries that have a predominantly Arctic vegetation. It is sufficiently far to the south to show transitional belts between the temperate and Arctic zones, as well as those more strictly Arctic. Like all far northern lands, it presents an amazing wealth of strikingly coloured flowers, so thickly sown as in many places to resemble a cultivated garden. Add to this the exceedingly great picturesqueness of its scenery, its unexplored lofty mountains, higher perhaps than any others on the Atlantic side of the Americas, its fairly easy accessibility, and the decidedly tolerable nature of its brief summers; then its attractiveness and charm to those who know it will be easy of comprehension.

Botanically, Labrador may be considered best by dividing it into two regions of markedly different aspect, — the interior and the coast. Of the former but little is known, except that it is covered with trees of good growth, extending almost to the northern extreme of the country. These interior portions possess essentially a cold temperate, not an Arctic, type of flora. Our knowledge of their plants is derived mainly from journeys across it in several directions by Dr. Low of the Canadian Geological Survey, and from the visit of Mr. Bryant to the Grand Falls.[1] Its

[1] For these descriptions, see *Ann. Rep. Geol. Survey of Canada*, Part L, Vol. VIII, 1896; and Bulletin of *Philadelphia Geographical Club*, March, 1904. Other earlier expeditions through the interior,

wealth in accessible timber is considerable, and already large mills have been established near the head of Hamilton Inlet.

The coastal region, with which all the rest of this chapter will be concerned, presents a vegetation of a decidedly Arctic type. A cold ocean current from the north bathes its shores, bringing with it ice-floes until the last of July, and icebergs throughout the rest of the summer. Innumerable snow-drifts linger from winter back again to winter in favourable places on the land. Yet for two months of summer, at least, the days are long, and the temperature does not fall to the freezing-point even at night. Picturesque hills in the south, and in the north towering, untrodden mountains rise directly out of the sea and expose their flanks and summits to the unbroken force of the winds. The soil is thin, and through it the bare rock frequently protrudes. There is usually no lack of moisture in soil or air, and many places, especially in the relatively lower elevations of the south, are decidedly boggy.

The characteristic features of an Arctic flora are usually attributed to the need it has for struggle and protection against severe cold. Schimper has shown that this factor itself has almost no direct influence. The greatest cold known anywhere is in Siberia, in a region where forests still flourish. No special protective devices against cold are known; if any exist, they consist probably in the internal structure of the protoplasm itself, not in any observable external modifications. The observable peculiarities of

and the more recent ones of Hubbard, Wallace, and Mrs. Hubbard, while adding largely to knowledge of the country, have contributed little to botanical information.

the vegetation are protections not against cold, but against dryness. Even with an abundance of moisture in the soil, it may not be readily available for the plant. The soil is cold, the bogs are rich in humous acids, the water of the shores is full of soluble salts. All these conditions, which are the prevailing ones throughout the northern country, are unfavourable to the ready absorption of water by the plant, and hence lead to physiological dryness. This is further increased by the lack of protection against drying winds, which tend to produce strong transpiration. A plant whose water supply is limited, whether in wet or in dry soil, must guard against too great transpiration, especially under conditions where this tends to be large. It hence assumes a xerophilous structure, or one fitted to contend with physiological dryness. In this respect the flora of Arctic climates, of alpine heights, of bogs, of sea-shore, and of deserts will closely resemble one another, though the particular devices adopted may vary with different conditions.

Except in the rarer situations of sheltered valleys or sunny slopes, with relatively warmer soil, water free from acids, and protection from wind, the flora of Labrador may be considered as universally adopting one form or another of the various means fitted to protect it from too great dryness. It becomes an absorbingly interesting study to observe the different ways in which this object is accomplished. The most evident devices are the following:—

1. A well-developed system of roots for the absorption of nutrient materials and of water.

2. A low and often stunted growth. This characteristic, as a special modification, applies of course to plants that

are usually shrubs or trees rather than to those of a naturally low, herbaceous type. The former are of very few species, mostly willows, alder, and birch, and a few evergreens. The height of these will vary much, and will be determined largely by the degree of their protection from drying winds, whether by the conformation of the land or by a winter covering of snow. In very exposed situations they will be lacking, or will lie close to the ground, or will have become modified into a special low-growing species, such as the interesting and widely spread willow, *Salix herbacea*, each plant of which bears but two or three leaves on a single unbranching stem, attaining only a fraction of an inch in height.[1]

3. Reduction in surface of leaves. These tend to be small and thick (*Empetrum*, *Ericaceæ*) or, if thin, either long and narrow (*Cruciferæ*, *Caryophyllaceæ*, *Salicaceæ*, evergreens, grasses, etc.), or deeply lobed (*Pedicularis*, some *Rosaceæ*), or much wrinkled with strong veins (*Rubus arcticus*, *R. Chamæmorus*), or pinnately divided (*Leguminosæ*, *Filices*). The latter form gives them an increased surface without disadvantage, because of their special mobility,

[1] Townsend (in *Along the Labrador Coast*, 1907) gives a few measured examples of these stunted growths. He found, for example, a larch 9 inches high and ⅜ inch in diameter, that was 32 years old; in another case, a balsam fir 13 inches high, 2 inches diameter, with 27 inches spread, 54 years old. These remind me of the pasture apple trees of New England, in whose case the stunting agent is not drying winds, but browsing cows. Much the same effect is produced, — a lower, thicker, stockier growth, even at great age. I measured one in western Massachusetts, for instance, that proved to be 40 years old, yet was less than 5 feet in height, with an average diameter of 2 inches a little above a much thickened base, and a total spread of about 7 feet.

whereby the leaflets may open out in moderate illumination and close together under conditions where transpiration tends to be excessive, in strong wind or hot sun. Another device consists in folding back the edges of the leaves underneath (*Cassiope tetragona, Ledum, Pinguicula*); and still another, in crowding them thickly together (*Cassiope, Bryanthus*). All of these many modifications have the one object of securing a reduced or reducible transpiring surface, and almost all the plants of Labrador adopt one or another of these methods of accomplishing it. The examples given are only illustrative, and might be increased many fold under almost every heading.

4. Increase in thickness of the leaf and of its cuticle. Many leaves are tough and leathery (*Ericaceæ, Empetrum*); or have thick, strong cuticle (grasses and sedges); or develop a waxy, resinous, or varnished coating on the under side or on both (*Andromeda, Vaccinium Vitis-Idæa, Pyrola,* some *Salices,* evergreens).

5. Development of water-storing cells in stem or leaves, the latter becoming thick and succulent. This is not of very common occurrence. It is found, however, for example, in saxifrages, *Sedum,* and *Sphagnum.*

6. Protection of the stomata from the influences that tend to cause evaporation through them. This may be secured by (1) turning away the under side of the leaf from sun and wind, as in the pinnately divided leaves mentioned already; (2) sinking the stomata in the leaf-surface (*Andromeda, Empetrum*); (3) covering the under side of the leaf and sometimes also its upper side and the stem with a protecting layer of hairs or tomentum, which may vary greatly in length and thickness, from a mere silvery or

bronzed dust, or a short, thick fuzz, or tomentum, to a felted growth of longer hairs (most *Ericaceæ* and *Salices, Draba,* some *Potentillæ, Cerastium, Dryas, Papaver, Antennaria,* and many others.

7. Development of a tendency to grow a thick rosette of leaves at the base (*Arabis, Draba, Antennaria, Lychnis, Pinguicula,* many saxifrages), or to mass themselves in close, thick clumps or cushions (*Diapensia, Silene, Sedum,* saxifrages). These tendencies are similar to the one already mentioned of crowding the leaves closely together on the stem. They may develop in species which in more favourable locations grow apart from one another, and have their leaves more evenly distributed along the stem.

8. An occasional tendency, in case of difficulty in absorbing nutriment from the soil, to develop devices for trapping and absorbing insects. Insects are not numerous in Labrador, with the exception of mosquitoes and flies, but a few plants there are partially carnivorous (*Drosera, Pinguicula, Sarracenia*). They appear to be confined almost wholly to the marshes of the more southerly part of the country.

9. While physiological dryness is extremely unfavourable to vegetable growth, and necessitates special devices for the absorption and conservation of moisture, it is, on the other hand, very favourable to the reproductive functions. Accordingly, the number of flowers is large, and appears the larger on account of the crowding of all varieties into one short season, and by contrast with the lack of luxuriance in vegetative shoots and foliage. Many of the flowers are large and brilliant in colouring, and nowhere is there any lack of them in abundance, unless in situations most severely open to the winds or destitute of soil.

Such are the main characteristics of xerophytes. They constitute the great bulk of the flora of Labrador, since almost all its physical conditions — bog, sea-shore, thin soil, cold ground, drying winds — are such as to exert a xerophilous influence. Hygrophytes (reaching their extreme in Aquatics), adapted to conditions of easily available moisture, and Tropophytes, adapted to alternating seasons of moisture and of dryness, are of much rarer occurrence. The former are characterized by weakly developed roots, more luxuriant vegetal growth, great expansion of the transpiring surfaces. Tropophytes are hygrophilous during the summer, the season of moisture, and xerophilous during the winter, which is physiologically dry. They secure this change either by shedding their hygrophilous leaves; or by dying down to the ground as a whole; or, as in evergreens, by developing shoots which are hygrophilous only when young, turning xerophilous as they mature.

Thus a relative lack of available moisture is one of the chief features determining the general appearance of the vegetable covering of the Labrador landscape. Other factors, such as cold, wind, and physical nature of the soil, derive their influence mainly from their tendency to limit the supply of available water, or to increase transpiration. Each of them, however, has some direct influence besides. Thus it is said that cold tends to make leaves broader and shorter, with bent margins and loss of irregularity in margin (mosses, *Ericaceæ*), and is favourable to the development of sexual organs; though the real influence even here may be perhaps not cold directly, but dryness and the shortness of the season of growth. Wind not only favours trans-

piration, but directly increases the tendency to low, shrubby growth, and favours anemophilous adaptations (*i.e.* those using the agency of the wind) for pollination and for dissemination of fruits. Differences in the nature of the soil in Labrador would seem to be not great, and to derive their importance mainly from their ability to conserve moisture, free from admixture with growth-hindering acids and salts.

There are, however, some further direct and important influences. One of them, not often mentioned but very evident, is the scarcity of insects that aid in pollination. The proportion of flowers that are anemophilous, or wind fertilized, as compared with those that solicit insect aid, is considerable, as might be anticipated from the fact that flower-haunting insects are rare. Yet there are many flowers of the latter type, though mainly of species that do not absolutely depend upon insects for the fertility of their seeds.

Another positive influence is the relatively protracted illumination during the period of growth. This, like many other influences operative here, has been shown to have a tendency to diminish herbaceous growth, affecting the size both of the plant and of its leaves; and to favour reproduction. The devices that protect against too great transpiration often serve at the same time to secure protection against excessive and prolonged illumination.

Finally, the shortness of the season of growth is of large importance. It is this which forces a large proportion of the plants that are to survive under the conditions which Labrador supplies, to develop in a previous season the embryonic preparations for the leaves and flowers that are to appear the following summer. Hence is derived the

magical rapidity of appearance of vegetation and of flowers, almost coincident with the disappearance of the snows. Hardly does the ground become clear of snow before flowers are there in its place. Not only is there barely any transition between winter and spring, but all kinds of flowers follow upon one another so quickly that spring, summer, and autumn are all rolled into one quickly coming and quickly disappearing, brief, brilliant, and glorious summer season. This is the main factor that introduces a difference into the floral character of different latitudes. In all of them the same conditions are present otherwise, — the exposure to winds, the coldness of the soil, and other influences that conduce to physiological dryness, — but the season grows shorter as one advances farther north, and high latitude will thus conserve more and more the plants of the spring-blooming type, that prepare their blossoms and growths a season beforehand, and tend to exterminate those that come more slowly to maturity. In some places plants relatively unfitted will survive, but will lose some of their characteristics as the season of growth becomes shorter. Thus, *Rubus Chamæmorus* and *Rubus arcticus*, which are abundant and fertile in Newfoundland, the writer found to be much more rarely fertile in Labrador and to increase in rarity toward its northern extreme; and it is said that *R. Chamæmorus* survives, but is without flowers, at its most northern station. In some cases the length of the season suffices for flowers, but not for fruits and seeds. In such cases it would seem to be, not the temperature itself, as Schimper puts it, but the length of time during which the warmer temperatures persist, that determines the surviving species and their reproductiveness.

All of these influences together, the most important of which are evidently the amount of available moisture and the length of the season of temperatures favourable to growth, determine the characteristics of vegetation on the coast of Labrador. The prominent features that result have most of them been already described. A few others, however, still remain to be considered. One of them is the great variability of the flowers. I observed it myself markedly in several species. In *Rubus Chamæmorus* and *R. arcticus*, the petals and calyx lobes ranged in number almost indiscriminately between four and six; and in the former the ends of the calyx lobes were sometimes single-pointed and sometimes toothed, the number of teeth varying, and its leaves were often spotted or even entirely coloured with deep purple. In *Ledum palustre*, var. *dilatatum*, flowers of the same cluster showed no constancy in the number of their stamens, any number from five to eleven being present. *Sedum Rhodiola* is very variable. In flowers of the same plant I found petals ranging in number from three to seven, sepals from three to five, scales from two to four, stamens from five to thirteen, and pistils from two to nine. In *Cornus Canadensis*, I noticed one variety with six upper leaves arranged in a whorl, with each side of the four-sided stem grooved, and with greenish white flowers; another with three pairs of opposite leaves, only two of the sides grooved, and flowers dark purple or maroon, both calyx and corolla; and a third with characteristics between these two. *Pedicularis* also, to my inexpert botanical eye, seemed to present a greater variability than could be accounted for by the number of already reported species.

Of fruits, the most common are such as depend on dissemination by wind or by birds and other animals. A few species depend on other methods mainly, as in case of the large easily floating bladders or pods of *Oxytropis* and other legumes, or of large seeds that rarely find their way far from the parent plant. But the families best represented in individuals, and largely also in species, are such as bear small berries (*Ericaceæ*, *Empetrum*) attractive to animals, or numerous small light seeds, or spores, easily spread abroad by the wind (mosses, grasses, *Cruciferæ*, *Caryophyllaceæ*, *Compositæ*).

The regions of Arctic vegetation possess relatively fewer species and varieties than more favoured localities, and most of these are the same as those growing in the colder temperate zones. As Hooker[1] points out, uniformity in physical characters and absence of those changing conditions which we assume to be stimulants to variation (different combinations of conditions of heat, light, moisture, and mineral characters) give uniformity in vegetation. Hooker gives the total number of flowering species in Arctic Europe as 616, in Arctic East America as 379, in Greenland as 207. On the other hand, he estimates that 5800 species exist in temperate Australia. Gray's *New Manual of Botany* (7th ed., 1908) enumerates about 4000 species of flowering plants and ferns, belonging to over 150 families, from the central and northeastern United States and Canada. But in Greenland, according to Schimper, there are only 386 species of vascular plants, belonging to 53 families. Labrador shows similarly a

[1] Joseph D. Hooker, *Distribution of Arctic Plants*. Trans. Linnean Society, 1862, Vol. XXIII, p. 251.

relatively low number of species and families. It is impossible to give exact figures. We have already noticed both that all these northern lands are still insufficiently explored, and that the nomenclature of their known plants needs careful revision. The figures quoted from Hooker and Schimper cannot be regarded as accurate. Yet with all the revision to which they may be subject, the large difference existing between Arctic and temperate regions remains strikingly true, and its degree is probably fairly well indicated by the figures given. The writer has attempted a calculation for Labrador, based on all the reports, reliable or otherwise, known to him in January, 1905; but its results, for the foregoing reasons, must not be regarded as very exact. According to it, there occur in Labrador not far from 425 species of vascular plants, belonging to 50 families. In addition to these there are about 300 species of bryophytes and fungi so far discovered. The number of species in the orders best represented is as follows: *Compositæ* 36, *Ericaceæ* 31, *Cruciferæ* 30, *Roseaceæ* 29, *Cyperaceæ* 28, *Gramineæ* 27, *Caryophyllaceæ* 26, *Salicaceæ* 19, *Saxifragaceæ* 19, *Ranunculaceæ* 19, *Scrophulariaceæ* 14. The number of species in the genera best represented is: *Carex* 21, *Salix* 17, *Potentilla* 11, *Saxifraga* 11, *Draba* 11, *Ranunculus* 10, *Arenaria* 9, *Epilobium* 9, *Vaccinium* 7, *Pedicularis* 7, *Lycopodium* 7, *Stellaria* 6, *Poa* 6.

Having now studied the main influences affecting the flora of Labrador, and the characteristic features of its plants resulting therefrom, we are in a position to consider the general appearance of the Labrador landscape near the coast, so far as it is determined by vegetable life. It will be necessary to distinguish several different regions or

typical situations, each with its own peculiar aspect. We may conveniently divide these into the areas of forest, of sea-shore, and of the tundra, and the latter again into several subdivisions.

1. The forest region is best described by Low.[1] He says:

"The southern half of the Labrador Peninsula is included in the subarctic forest belt, as described by Professor Macoun. Nine species of trees may be said to constitute the whole arborescent flora of this region. These species are: *Betula papyrifera* Michx., *Populus tremuloides* Michx., *Populus balsamifera* Linn., *Thuya occidentalis* Linn., *Pinus banksiana* Lam., *Picea alba* Link., *Picea nigra* Link., *Abies balsamea* Marsh, and *Larix Americana* Michx. The distribution of the forest areas and the range of the various trees depend on several factors, among which may be mentioned, position as regards latitude, height above sea-level, distance from sea-coast, and character of the soil, all of which are important. The forest is continuous over the southern part of the peninsula to between latitudes 52° and 54°, the only exceptions being the summits of rocky hills and the outer islands of the Atlantic coast. To the northward of latitude 53°, the higher hills are treeless and the size and number of the barren areas rapidly increase. In latitude 55°, more than half the country is treeless, woods being only found about the margins of small lakes and in the valleys of the rivers. Trees also decrease in size, until, on the southern shores of Ungava Bay, they disappear altogether. . . . The tree line skirts the southern shore of Ungava Bay and comes close to the mouth of the George River, from which it turns south-southeast, skirting the western foot-hills of the Atlantic coast range, which is quite treeless, southward to the neighbourhood of Hebron, in latitude 58°, where trees

[1] A. P. Low, Report on Explorations in the Labrador Peninsula, *Ann. Rep. Geol. Survey of Canada*, 1896, Part L, Vol. VIII, pp. 30 ff.

are again found in protected valleys at the heads of the inner bays of the coast. At Davis Inlet, in latitude 56°, trees grow on the coast and high up on the hills, the barren grounds being confined to the islands and headlands, which remain treeless to the southward of the mouth of Hamilton Inlet. These barren islands and bare headlands of the outer coast, along with the small size of the trees on the lowlands, have caused a false impression to be held regarding much of the Atlantic coast, which from Hamilton Inlet southward is well timbered about the heads of the larger bays and on lowlands of the small river-valleys. . . . *Picea nigra* is the most abundant tree of Labrador and probably constitutes over ninety per cent of the forest. . . . *Larix Americana* is probably the hardiest tree of the subarctic forest belt; it grows everywhere throughout the Labrador Peninsula, and is probably next in abundance to the black spruce. . . . Throughout the forest belt, the lowlands fringing the streams and lakes are covered with thickets of willows and alders. As the semi-barrens are approached, the areas covered by these shrubs become more extensive, and they not only form wide margins along the rivers and shores of the lakes, but with dwarf birches occupy much of the open glades. The willows and birches grow on the sides of the hills, above the tree line, where they form low thickets exceedingly difficult to pass through. Beyond the limits of the true forest, similar thickets of Arctic willows and birches are found on the low grounds, but on the more elevated lands they grow only a few inches above the surface. In the southern region, the undergrowth in the wooded areas is chiefly Labrador tea (*Ledum latifolium*) and laurel (*Kalmia glauca*), which grow in tangled masses, from two to four feet high, and are very difficult to travel through. In the semi-barrens this undergrowth dies out, and travel across country is much easier in consequence. In the southern regions the ground is usually

covered to a considerable depth with sphagnum, which northward of 51° is gradually replaced by the white lichens or reindeer mosses (*Cladonia*), which grow freely everywhere throughout the semi-barren and barren regions."

The traveller along the coast, who penetrates but a short distance into the interior, will find little evidence of this forest area, except in sheltered places at the heads of bays. Of the trees and shrubs mentioned by Low, I found only *Abies* (no farther north than Hamilton Inlet), *Larix*, *Picea*, — and none of these evergreens were seen north of Hebron, — and, mainly in dwarf forms, *Alnus*, *Betula*, and *Salix*. Nowhere did I find thickets of undergrowth that offered any obstacle to travel.

2. The most common plants characteristic of the sea-shore are seaside sandwort (*Arenaria peploides*), sea-lungwort or ice-plant (*Mertensia maritima*), *Potentilla anserina* and *tridentata*, a few large *Umbelliferæ* (*Cœlopleurum actæifolium*, *Conioselinum Canadense*, *Ligusticum Scoticum*), and one or two species of *Plantago*. *Iris* and *Lathyrus maritimus* also are not unusual in the more southerly regions. Besides these, almost all of the more common plants of the tundra may occur close to the sea-shore. On sandy places, which are rather rare in Labrador, and which are exposed preëminently to the effect of high winds and scanty water, the number is more limited. For example, on one low sand-dune which I studied at Pottle's Cove, close by the entrance to Hamilton Inlet, in latitude 54°, I found only the plants enumerated below, though many others grew on the rocky heights in the near vicinity. The more abundant are italicized, the rest were rarer.

a. In the more exposed situations exclusively: *Arctos-*

taphylos alpina, Betula glandulosa, *Empetrum nigrum*, Abies balsamea, *Juniperus communis*, *Picea nigra*, Boletus.

b. In the more sunny and protected situations exclusively: *Rubus arcticus*, Potentilla tridentata, Taraxacum, Polyganum viviparum.

c. In both, but mainly in the more exposed: Cerastium alpinum, *Vaccinium Vitis-Idæa*, var. *minus*, Rhinanthus Crista-galli, *Salix Brownii*.

d. In both, but mainly in the more protected: *Draba incana*, Cœlopleurum actæifolium, *Cornus Canadensis*, Achillea millefolium, *Solidago macrophylla*, a fine thin unknown grass.

e. In both about equally: Stellaria longipes, Lathyrus maritimus, Sedum Rhodiola, Elymus arenaria, Poa pratensis, var. domestica, Barbula ruralis, *Brachythecium*, Hylocomium splendens.

At Ford Harbour, a little farther north (56°), the following additional species (some but not all of the above being present also) were found in a similar situation: *Arenaria Grœnlandica*, *Silene acaulis*, *Astragalus alpinus*, *Oxytropis*, *Saxifraga Grœnlandica*, *Epilobium latifolium*, *E. spicatum*, *Antennaria*, *Solidago multiradiata*, var. *scopularum*, *Taraxacum officinale*, var. *palustre*, *Pyrola grandiflora*, *Vaccinium uliginosum*, *Polyganum Islandicum*, *Salix herbacea*, *S. Uva-ursi*, *Polytricum commune*, *Lycoperdon*, *Festuca rubra*, *Hierochloe alpina*, *Carex rigida*.

3. The open country uncovered by forest, whose highest growths are low shrubs or shrubby, stunted forms of trees, and which are more or less continuously carpeted with Arctic plants of many kinds, is called the *tundra*. It is the formation that will be most often met with by the voy-

ager along the coast; and since Labrador, as at present geographically limited, and as it must always be known to the great majority of visitors, is but little more than a coast-line, the tundra is the characteristic Labrador formation. "Beyond the last stunted trees," says Schimper,[1] "so far as ice does not cover the ground, the frigid desert, or *tundra*, almost alone dominates Arctic mainlands and islands. Only in the less cold and therefore chiefly southern tracts in the Arctic zone, in more favourable localities a few less insignificant formations exist; for instance, willow-bushes and small meadows on river-banks and in fiords, or even formations of dwarf shrubs, which consist of a denser growth of the same evergreen, small-leaved, shrubby species as appear singly in the tundra between mosses and lichens. Dwarfed growth, a distinctly xerophilous character, the predominance of mosses and lichens, the incomplete covering of the ground, — these features are everywhere characteristic of the tundra. . . . In the less cold tundra districts, more soil is occupied by vegetation than unoccupied; even wide tracts can have a continuous carpet of lichens. Where the climate is most rigorous, the vegetation forms only widely separated patches on the bare, usually stony soil."

Conditions in Labrador are such as to make possible the close continuous growth almost everywhere. It is interrupted only by the occasional intrusion of unfavourable or improved surroundings. These are of four types: the summits of the higher mountains; protruding areas of sparsely covered rocks and gravels; collections of water in

[1] A. F. W. Schimper, *Plant Geography upon a Physiological Basis*, p. 685. Oxford, 1904.

low depressions, forming moors; and well-watered, sunny slopes. The first three of these are emphasized forms of the tundra; the last departs from the tundra type, forming oases in it.

(*a*) The alpine conditions of the higher mountains, which are confined almost wholly to the northern half of the country, are unfavourable to any form of life. The summits consist of broken masses of rock, a *Felsenmeer* of rough and continuous boulders of various size. Among these, only scattered clumps of struggling plants can find footing and the essential conditions for living. The number of individuals, even among the mosses and lichens, is small, and the species are few. On one summit (Mt. Faunce, 4400 feet, latitude 59°) I found above 3300 feet only the following: *Cerastium alpinum*, *Draba fladnitzensis*, *Saxifraga cæspitosa*, *S. rivularis*, *S. nivalis*, *Papaver nudicaule*, *Sedum ?*, *Luzula confusa*, mosses (*Andreæa petrophila*, *Bryum ?*, *Pogonatum alpinum* or *urnigerum*, *P. capillare*, *Racomitrium lanuginosum*), and lichens (*Alectoria divergens*, *A. nigricans*, *Cetraria arctica*, *C. cuculata*, *Sphærophoron coralloides*, *Stereocaulon denudatum*, *S. tomentosum*, *Theloschistes polycarpus*, *Umbilicaria proboscidea*).

(*b*) On protruding rocks but few plants grow, in low, flat, spreading cushions. Areas of gravel are also but little hospitable to plants, and their covering is consequently scanty. The plants that find it possible to survive there are to some extent identical with those already described as growing well in sand. They are pioneers among plants, such as can take root and nourish themselves on the bare rock-grains and moisture; and their decay makes richer soil for others to grow in. The species of most common

occurrence which I found in such situations are: *Oxytropis campestris* (rare), *Arctostaphylos alpina*, *Loiseleuria procumbens* (rare), *Vaccinium uliginosum*, *V. Vitis-Idæa*, var. *minus*, *Diapensia Lapponica* (growing in little rounded mounds on its own previous growth, very branchy, showing yearly additions outward and upward, — one specimen I examined was three inches in diameter and one and a half inches high in the centre); willows, *Empetrum nigrum*, *Carex rigida* (rare), *Festuca brevifolia* (rare); three mosses (*Dicranum*, *Polytricum strictum*, *Racomitrium lanuginosum*), and a lichen (*Umbilicaria*). Dead roots and branches, especially of the willows and *Ericaceæ*, were frequent, and on them grew other varieties of moss. Labrador tea and grasses flourished on the edges of these bare patches, where some soil had already been formed.

(*c*) "Shallow depressions of the tundra, where the water of melted snow and ice accumulates in the soil, become swamps in the form of *tundra-moor*, and there a scanty peat bears a thin layer of *sphagnum* with a few small phanerogams. Such places correspond physically but not physiologically to the oases of the dry desert" (Schimper). The moor presents many features that are unfavourable to the life of plants. Humous acids are abundant and prevent the easy absorption of moisture; mineral substances are hard to obtain, "owing to the great distance of the vegetation from the mineral substratum and to the absorptive influence of humus, rendering it difficult for the plants to obtain soluble salts"; nitrogen is abundant, but in such form that the moor is among the poorest of soils in easily assimilable nitrogenous substances. Sphagnum is the characteristic and most abundant plant in such situations.

"Its spongy, water-absorbing cushions," which "keep even the highest parts of the moor permanently saturated with water. . . gradually grow in height, while the lower parts pass over into sphagnum peat" (Schimper). The following list of other plants growing in moors is that given by Schimper, with those of known occurrence in Labrador italicized. Some are characteristic of high-moor: Viola palustris, *Vaccinium oxycoccus*, *Andromeda polifolia*, Betula nana. Others are preëminently meadow-moor species: *Epilobium palustre*, E. tetragonum, Senecio aquaticus, S. paludosus, Gentiana pneumonanthe, several species of *Carex*. Many others that are essentially moor plants occur also in dry stations without peat: *Vaccinium Vitis-Idæa;* or on meadow moors: *Drosera rotundifolia*, *Comarum palustre*, Pedicularis palustris, Salix repens, species of *Eriophorum*, many species of *Carex*. Many moor plants compensate for their disadvantages by becoming carnivorous: *Drosera*, *Pinguicula vulgaris*, *Sarracenia purpurea*.

(*d*) By far the most favourable and fertile situations in the whole country are the sunny slopes, exposed to the south, which are abundantly fed by water from melting snow-drifts, on which the water, not becoming stagnant, has no opportunity to accumulate humous acids. Schimper describes them thus: —

"The physiological analogues in the tundras of the desert oasis are *Heat-oases* — sunny slopes protected from the drying winds — upon which the sunbeams fall almost perpendicularly, and thus warm the water in the soil so that plants can obtain it in actual abundance. Such stations frequently resemble the flower-beds of a garden. According to Nathorst: —

"'The plants of the slopes are in many respects the most interesting. The majority of them occur as strongly developed individuals, which here appear to thrive perfectly, and apparently can ripen their seeds annually. This naturally is true of the good localities, namely, of the slopes that soon become free from snow. Here one has an opportunity of being able to observe the remarkable influence of the sun's rays. Slopes, that a short time before were covered with snow, a few days later are adorned with several flowers; the development of these can proceed so rapidly that one soon finds fruit as well, as in the case of *Draba*. Here one sees sometimes quite blue mats of *Polemonium pulchellum*, or red ones of *Saxifraga oppositifolia*, with a varied mixture of other tints, yellow, white, green. . . . When the plants of the slopes occur in the plains, they are not usually so well developed as on the slopes, but the difference in this respect is much greater in some plants than in others.'"

The plants growing on these slopes are for the most part more flourishing individuals of the same species that are found on the surrounding tundra. I myself noticed only a few that seemed confined to these or similar situations: *Ranunculus pygmæus*, *R. hyperboreus*, *Linnæa borealis*, *Gentiana nivalis*. Many others might probably yet be discovered by careful attention to the influence of this particular situation.

Such aspects of the vegetable growths of Labrador as have thus far been described may be considered as exceptional. The predominant form of vegetation on or near the coast is that of the true tundra itself. Its appearance as it occurs throughout Labrador I cannot better describe than in words which I have already used:[1]—

[1] Report of the Brown-Harvard Expedition to Labrador, Geographical Society, Philadelphia, 1902, pp. 129 ff., 168 ff.

"The interior is said to be well wooded and far from barren, even almost to the northern extremity. But near the coast one rarely sees trees of any notable size. At Hopedale and Nain there are small groves near the mission stations; but elsewhere we met them only deep in the bays and in sheltered valleys a considerable distance — five or ten miles at least — inland. Thus, when not entirely lacking, they form an unobtrusive feature in the usual landscape. The low vegetation that predominates clothes the country with a close green mantle, but leaves its shape and natural outline unconcealed. Inorganic nature reveals herself in her own primeval character, leaving all the strength and charm and variety that she can assume naked to observation. There is little of softness, little of the attraction that vigorous organic life can add; though the green of the low plants, the grays, reds, and browns of mosses and lichens, the blues and whites and pinks and yellows of the flowers, add a suggestion of this, yet in a way that never interferes with the stern grandeur of the lifeless masses.

"The more northern landscapes differ from those thus far described mainly in the facts that the greater heights attained lead to grander impressions of massiveness and strength, and involve greater ruggedness and variety of form; and that the softening influences of soil, water, and vegetation are present to a far less degree. . . . Plant life is still abundant on the lower levels, but finds little hospitality on the bleak higher slopes. . . .

"The great mass of the vegetation of Labrador consists of low forms. It grows so thickly and vigorously in the thin soil, however, that the country never gives the impression of being lifeless and barren. In the far south, especially on moist lowlands, sphagnum is often a prevailing growth. But aside from its rather rare supremacy, almost everywhere we went we found the curlewberry (*Empetrum nigrum*) and the so-called caribou-moss (*Cladonia*, really a

white lichen) together forming an almost continuous green and gray sward, touched with red in the autumn. The berries of the curlew are exceedingly numerous, and those of the previous season still cling thickly to the vine among the green new ones, and even until the latter begin to ripen in the middle of August. In the midst of this continuous curlew and moss grow occasional clumps of grasses of many kinds, and a great variety of flowering plants. Perhaps the most common of the latter are the *Ericaceæ*. Some of them are berry-bearing, with inconspicuous flowers, particularly the blueberry (*Vaccinium Pennsylvanicum* and *V. uliginosum*), the mountain cranberry (*V. Vitis-Idæa*), and the bearberry (*Arctostaphylos alpina*). Others have more prominent flowers, such as the omnipresent Labrador tea (*Ledum*), together with the somewhat less universal *Loiseleuria* and *Bryanthus*. These are all exceedingly abundant in the southern half of the peninsula, but extend variously far to the north. The white clusters of the *Ledum* and the purple umbels of the *Bryanthus* are very conspicuous. In the autumn, the red-turning leaves of the *Arctostaphylos* are the most attractive of the season's colourings. There is also a large number of other plants that are constantly met with, though few of them are so nearly omnipresent and continuous as are most of those already mentioned. The bake-apple, or cloudberry (*Rubus Chamæmorus*) grows thickly as far north as Hebron, but very thinly beyond. We could find but very few of its ripe berries in Labrador, though in Newfoundland they seem to be common. Associated with its single white flowers are frequently seen the showy, rose-coloured ones of the Arctic raspberry (*Rubus arcticus*). This also, so far as our experience could determine, had about the same limits and was equally rare in fruit. Bunch-berry (*Cornus Canadensis*) is likewise very common, especially in the south, and grows in thick groups. Dense tufts of the white-flowered *Diapensia Lapponica* and of the beautiful mosslike pink

Silene acaulis greet the eye continually. *Astragalus* and *Oxytropis*, *Dryas*, a great variety of saxifrages, *Sedum*, *Pedicularis*, the violetlike *Pinguicula*, and many inconspicuous *Cruciferæ* and *Caryophyllaceæ* complete the list of forms more universally present in the early part of the season.

"After the beginning of August, when we had reached a higher latitude, the character of the vegetation changed considerably. Caribou-moss, curlewberry, blueberry, and *Arctostaphylos* still remained the most continuous growths. But the flowers began to change to more autumnal forms. The Arctic goldenrod (*Solidago Virga-aurea* and *S. macrophylla*) appeared abundantly. The large showy pink flowers of the *Epilobium* and the thick pink heads of *Lychnis* were very prominent. Yellow *Arnica alpina* and delicate blue harebells (*Campanula*) were common. A yellow poppy (*Papaver nudicaule*), with early deciduous petals, was not infrequent on the hilltops. A strikingly beautiful flower, though a rare one, was the small twinflower (*Linnæa borealis*). Fungi, including *Boleti*, *Russulæ*, and various agaries, also became very abundant toward the close of the summer; they were fairly numerous in the north, and the moist woods about Nain and Hopedale were full of them."

Thus far we have considered what are the main types and characteristics of the plant forms that occur in Labrador and the causes that make these predominant; and what are the main features and less frequent varieties of its landscape, in so far as they are supplied by its floral covering. If now we consider the affinities of the plants of this region with those in other parts of the world, a number of curious and unexpected facts present themselves. Who, for instance, would anticipate that the northern parts of America possess many more plants like those of Arctic

Europe than Greenland does? Or that there are many plants here identical with those growing on the southern slopes of the Alps, which are altogether lacking in northern Europe? Or, still more strangely, that one must seek in the Arctic regions of America, and not in Europe, for the closest resemblances to the plants that flourished in the far distant Miocene age in central Europe? Yet so we are assured by competent authorities. To these facts we may add the following statements from Hooker:—

The polar regions have relatively fewer species and varieties than have other regions. The flora of all its parts is largely identical or closely similar, but is unequally distributed. Of all Arctic regions, Greenland exhibits the greatest poverty in number of species. Many Scandinavian plants have found their way westward to Greenland, but have stopped short on its west coast, without crossing to America; many American types terminate as abruptly on the west coast of Baffin's Bay, not crossing to Greenland and Europe; Greenland contains actually much fewer species of European plants than have found their way eastwards from Lapland by Asia into Western and Eastern Arctic America; the Scandinavian vegetation has in every longitude migrated across the tropics of Asia and America, while plants typical of these continents which have found their way into the Arctic regions have remained restricted to their own meridians.

These facts, at first seemingly inexplicable, and actually so under existing conditions of sea, land, and temperature, naturally have their explanation in the evolutionary and geological history of our globe. Most of them will be understood clearly from the following account given by

Hooker,[1] which in all essential points agrees with the theories advanced in the latest edition (10th) of the Encyclopædia Britannica:—

"It appears to me difficult to account for these facts, unless we admit Mr. Darwin's hypotheses, first, that the existing Scandinavian flora is of great antiquity, and that previous to the glacial epoch it was more uniformly distributed over the polar zone than it is now; secondly, that during the advent of the glacial period this Scandinavian vegetation was driven southward in every longitude, and even across the tropics into the south temperate zone; and that on the succeeding warmth of the present epoch, those species that survived both ascended the mountains of the warmer zones, and also returned northward, accompanied by aborigines of the countries they had invaded during their southern migration. . . . If it be granted that the polar area was once occupied by the Scandinavian flora, and that the cold of the glacial epoch did drive this vegetation southwards, it is evident that the Greenland individuals, from being confined to a peninsula, would be exposed to very different conditions to those of the great continents. In Greenland many species would, as it were, be driven into the sea, that is, exterminated; and the survivors would be confined to the southern portion of the peninsula, and not being there brought into competition with other types, there could be no struggle for life amongst their progeny, and consequently no selection of better-adapted varieties. On the return of heat, these survivors would simply travel northwards, unaccompanied by the plants of any other country. In Arctic America and Asia, on the other hand, where there was a free southern extension and dilatation of land for the same Scandinavian plants to occupy, these would multiply enormously in individuals, branching off into varieties and

[1] *Distribution of Arctic Plants*, pp. 253 f.

subspecies, and occupy a larger area the farther south they were driven. . . . Hence, on the return of warmth, many more Scandinavian species would return to Arctic America and Asia than survived in Greenland; some would be changed in form, because only the favoured varieties could have survived the struggle."

The summer visitor to Labrador, whether scientist or pleasure-seeker, may naturally be expected to have an interest not only in the scientific aspects of its flora, but also in the possibilities it presents of making additions to his food-supplies. These are meagre, but, so far as they go, of a very satisfactory nature. Garden vegetables, berry-bearing plants, and fungi nearly exhaust the list of commonly known plants that is available for this purpose. The former are raised sparingly in the fishing villages of the southern portion of the coast, and by the missionaries at the Moravian stations as far north as Nain. Edible berries are exceedingly abundant, especially blueberries, Arctic cranberries, and curlewberries. The last two kinds require cooking to make them palatable, but then are delicious. The cloudberry, or bake-apple (*Rubus Chamæmorus*) is abundant in some few parts of the country, and is much esteemed by the natives. Raspberries also are found in some localities.

The fungi of Labrador have as yet received but little study. The most common kinds, both of which are easily identified by any one with a very slight knowledge of fungi, are apparently various species of Boletus and of Russula. These grow in considerable numbers almost everywhere. Several other kinds of fungi are obtainable in smaller quantities. They need much further investigation, and

their study offers a problem for further research, attractive for both economic and scientific reasons.

Mention may also well be made of certain growths which, while not ordinarily attractive as foods, may yet serve in emergency to sustain life for an indefinite period. A list and description of a number of such "emergency foods," easily available at any season of the year, has recently been given by Ernest Thompson-Seton (*Country Life in America*, September, 1904, Vol. VI, p. 438). After enumerating several small forms of animal life that may serve in this way, he describes and pictures the plants. Among them are several abundant lichens (*Cetraria* or Iceland moss, *Cladonia* or reindeer moss, *Umbilicaria* or rock-tripe), the outer and inner (but not the middle) bark and the buds of aspen (*Populus tremuloides*), the shoots of spruce and tamarack, the inner bark of willows and birch. Most of these need to be well dried at first, and then either roasted or boiled for a long time. It is evident that a knowledge of these plants and of their nutritious qualities might on occasion prove of the utmost value to the traveller in these regions. The party of Sir John Franklin lived almost exclusively on such diet for over three months. "Lowly in the scale of diet as they are in the scale of organic nature," says Mr. Seton, "the rock-tripes are yet reliable friends of man, and no one should travel in these vast inhospitable regions without a knowledge of their appearance, their qualities, and the best methods of preparing them for human food." [1]

[1] Some of the edible plants here mentioned are of very common occurrence in all these northern lands. The list here mentioned could doubtless be largely extended.

A great deal of work is yet to be done by careful observers before the full nature of the Labrador flora can be satisfactorily known. As yet only its more superficial aspects have been reported. Hardly any attempt has been made to determine the influence of different types of situations, and to enumerate the plants that flourish in each. It is but a rough preliminary survey that has thus far been accomplished. There must, moreover, still remain many species of plants undiscovered. Every new visit to the country results in fresh finds. A large number of species has been found in near-by regions as yet unknown in Labrador, but probably occurring there. A striking instance of this probability seems to be presented by the *Cyperaceæ*. According to methods of calculation already explained, which cannot be very exact, forty-seven of them seem to have been reported from adjacent localities, and only twenty-eight from Labrador. Other instances of similar importance will probably be found. Especially large rewards may probably be expected from further investigations of the mosses, lichens, hepatics, and fungi. A considerable number of those brought back by the writer in 1900 seemed to be new for that locality, so far as previous records showed.

Labrador is no longer the inaccessible land of mystery it was a few years ago. Its marvellous scenery and varied charm are sure to attract more and more visitors year by year. Many will go for technical study, and will find a rich field for its pursuit. Most will be drawn by the love of an outdoor life, by the desire for adventure or for serviceableness in the Mission, by the opportunity for seeing and enjoying a strange and fascinating country. It is

for these latter mainly that this chapter has been written. The more they can understand and observe of the great wild garden that, if really seen and intimately known, makes impossible any thought of barrenness, the larger will be their pleasure. However small the knowledge with which he starts, no one need be deterred from attempting to gain a larger comprehension of these matters, so significant for the correct interpretation of the true nature of a country. If these be its features in which he is most interested, he will at least add enormously to his own satisfaction and insight. By making a carefully selected and well-annotated collection of plants, he may also, on submitting it to reliable experts, make some extension to the list of recorded varieties and species that occur there. If he will prepare himself as well as possible beforehand and then make some special study of still unsettled points, such as the edibility of various plants, the particular features of certain especially variable species and of the conditions under which they occur, the influence of particular situations, soils, and conditions, he may well hope to make contributions to new knowledge. Plenty of such opportunities are still open to the amateur. In spite of his own unfortunate experience in admitting errors into his published description, the writer still does not hesitate to encourage amateurs in endeavouring to make really new additions to knowledge in this far from fully explored field. The mistakes of an amateur may well be forgiven and gradually corrected, if he does not pretend to be anything more; and confession of the difficulties met with by one of them may help to eliminate similar troubles in the future, and to render only real discoveries liable to pub-

lication. To make this more certain, the amateur must always know the authorities to whom he may surely appeal for final verification, and must leave to the professional and expert botanist all the more delicate questions of identification and the critical settlement of problems concerning structure, influence, and conditions.

CHAPTER XVII

ANIMAL LIFE IN LABRADOR

By Wilfred T. Grenfell

The struggle for life among the Labrador mammals is well worthy the title. The state of the soil, climate, temperature, with the resulting conditions especially of the Flora, make it possible for only well-adapted and vigorous animals to live at all. The difficulty of survival is increased by the constant warfare among themselves, many having to live by preying on the others. The squirrel is never safe from the lynx, the caribou from the wolf, the rabbit from the fox. The snow betrays every movement, and in winter the weaker run a constant risk of extinction. Even our birds force upon us the fact that the dire conditions of life induce in them no sentimental feelings of mercy. On one occasion my retriever brought me too fat auks which he had caught on the frozen bay, long after most birds have left us. It was Sunday morning, and to spare the prejudices of the people I was visiting, I forebore to carry them into the village. On the ground, however, the tracks of fox and lynx warned me that the birds were not safe. Accordingly I hung them high up in a tree. On returning a little later I found nothing but bones and feathers — an owl had probably visited my cache. Another time, having done the same thing with three fat partridges, we caught the robbers *flagrante delicto*. They proved to be two small Canada jays. One very cold day, the sea being covered with young

ice, I noticed a belated dovekie cheerfully diving after food among the slob, while the waters froze to our oars as we rowed. His pluck and contentment in such a lonely place made us feel very warmly toward him. As we watched he rose to wing, apparently to follow his friends to their more southern home. He had not risen a hundred yards, however, when a hawk swooped on him like lightning from the cliff, and returned leisurely to his eyry with the struggling little fellow, there to tear to pieces alive our poor little friend.

Moreover, now, man, their main enemy, is increasing in numbers. Besides his accumulated experience and his new destructive methods and weapons, he is continually encroaching more and more on their territory. Every single animal lives in terror of man, yet none ever attacks him if there be any other alternative, unless it be his own half-fed dogs. All their efforts are directed towards escape. To afford themselves protection some of the weaker, such as the caribou, hare, partridge, and ermine, change the colour of their coat with the seasons. Nearly all grow longer hair and put on their best fur against the terrible cold of winter. The fat in the skins of the out-of-season fur is due to this effort, and is so sure a sign of poaching out of season that pelts showing fat on the inside are not allowed by law to be sold or to pass customs. Our seals and birds acquire corresponding coats of fat, so that the former will float when killed. They are able to enjoy the bitterest weather diving under the ice — while the birds have energy enough stored in that form to enable them to accomplish their long journeys to South America, the Antilles, and even to Asia and Europe, without needing to stop to replenish their

stock. Black bear and woodchuck use this fat as food to enable them to sleep through the discomforts of winter.

Most of the mammals have their special senses developed to an extraordinary degree. The wild goose and the eagle can both see better than we can even with the aid of a telescope, while huge owls prefer the dark for clear vision. A wolf or a beaver can tell the scent of an old trail of a man who has only passed once, and that hours before. A fox will hear the feeble chirrup of a mouse all across a marsh. Strangely enough, none of the mammals rely on sight for protection. Scent is no use down wind and very little over water. Hearing is an exceedingly unreliable guide as to direction, while sight would appear to be valuable under all circumstances. A seal often loses its life through its inability to know what it is looking at. It will put its head and shoulders out of water every minute to try and make out a man, and will come close up to him. I shall never forget my first caribou, and the "buck fever" which made me fire nine times at him. I was lying in a perfectly open marsh, and the animal, which was looking straight at me, simply stood and sniffed the air and stared helplessly. The powder was, of course, smokeless. A friend, kneeling also in a perfectly exposed marsh, by simply staying still, tolled a fox so close to him, that when he eventually fired, the shot, going like a bullet, nearly spoiled a valuable pelt. But foxes differ — all are not so foolish. A beaver will look at you down wind from only a few yards away, and yet not distinguish anything unusual. As shy an animal as a marten will show no fear so long as you keep still. Slow, steady movement or stillness always inspires confidence.

Speed is, of course, one invaluable safeguard to our animals, but dogged endurance is nearly always too much for them. A wolf cannot catch a caribou on a straight run, nor a fox a rabbit, but once they get a really fresh trail they are pretty sure to kill. I have seen the tracks of the chase of a fox by a lynx. Round and round the lake they went, the huge leaps of the lynx giving him an enormous advantage over the pitter patter of the fox — which was evidently speedier. But we found the trace of the final act: a bit of fur and a few tracks of blood.

None of our animals live very long, except the whales, some of which are said to live a thousand years. Judging by the immense barnacles which grow upon their skins, it is easy to believe it of some of the hoary monsters which the whalers tow into our factories. We consider that a fox or a caribou of fifteen, or a wolf of twenty years, are in their dotage. I remember one old black-beaked gull which has been in captivity thirty-two years. Solemnly each year she makes half a dozen nests in different places, finally laying three unfertilized eggs in one, with the regularity of clockwork.

The numbers of animals killed by man each year vary greatly. Thus in 1910 and 1911 large numbers of foxes were killed, while in 1911–1912 scarcely a fox was caught and all fur was scarce. The reasons attributed were that in 1910 the mice and leamings were very few and the foxes had to come to the outer trapping grounds, hunting food nearer the land-wash, and their hunger made them readily take bait. In 1911 mice were again very plentiful, and some foxes certainly went farther inland for them. Some were caught, but probably too large a toll of breeders had been taken the year previous.

Canis occidentalis. — The timber wolf of Labrador seems to be deficient in the noble qualities allotted to him elsewhere. I can find no account of his having courage to attack even an unarmed man, though on several occasions men have been followed by small packs of wolves almost to their doors. I heard of one boy who was attacked by a wolf, but he fired his gun in its face and ran away without waiting to see what happened. It seems certain that they kill defenceless animals merely for the pleasure of killing them. Settlers have many times described to me how they have found carcasses of freshly killed deer within a short distance of one another, only the tongues having been eaten and the windpipe torn out. This method of killing may account for the tongue being eaten, owing to its attachment to the larynx. The wolves have frequently come out and mixed with the Eskimo dogs, killing and eating them. This has been used to their destruction by pegging out sluts, and so attracting the wolves within range. One trapper while tailing his traps noticed that he was being followed by three wolves. On his return to the spot where he had left a bag of flour he found that the wolves had been circling round it, but had been afraid to touch it. On stooping to pick it up he heard a growl close to him, and a single wolf stood facing him snarling. With considerable coolness he stood still and took time to load his muzzle-loading gun. The wolf meanwhile was walking around. The other two wolves did not show up out of the thicket. When he was ready he shot and killed the one in sight, whereupon the other two dashed out of the thicket and fled. This man has had a very large experience with our wild animals. The wolf in question was far advanced in

starvation, and only the pangs of hunger gave the poor beast the courage to face a man. I have in my collection the skull of a large wolf which had killed itself by eating sticks. A piece the exact width of the mouth, cut off by the two large lateral teeth, had sprung across the mouth like a bow, and the pressure on each end had absorbed the alveolus of the jaw, so that the stick was right through on both sides above the teeth. The pressure had also absorbed the bone above it, and eaten a long hole the size of the stick through the base of the skull, and so probably infected the brain. The stick is still *in situ* in the skull.

The method by which the wolves destroy the caribou was hotly debated some time ago. I append two detailed descriptions from eye-witnesses. Mr. Flowers of Hamilton Inlet, hunting with his brother, noticed a full-grown caribou flying at top speed across the barrens. From the hill on which they were they watched it through their field glasses, and noticed it mount a neighbouring steep ascent at the same matchless pace, and then suddenly stop and lie down. Very shortly a large timber wolf came flying by. As soon as it sighted the caribou it turned off and ran to leeward, making a long circle as if afraid to go near. Probably it had had experiences before. Soon after two more wolves came along, and one of these also started to circle round. The other, however, went straight at the deer from behind, while its attention was drawn the other way. It ran right in under the forelegs and grabbed the deer high in the throat. The deer, a fine old stag, reared up on his hind legs, the wolf still holding on. The deer then went down and tried to knee the wolf to pieces against the hard ground. Just at that moment one of the party shot the

deer, with the result that all three wolves got safely away. The deer would certainly have been killed anyhow.

In the second case, the deer, a doe, took to the water and swam off to a small islet. The wolf, a single one, only followed after a long delay, and did not seem very anxious for the fight when he first landed. However, when he did begin, the deer succeeded in knocking him down three times by rising on her hind legs. But the wolf got hold by the throat, and the caribou would probably have been quickly killed, even if a shot had not at that moment ended her life. In other cases I have known them to be hamstrung, or disabled, by the wolf biting the small of the back.

Rangifer arcticus, or Rangifer caribou (Caribou). — The young are easily tamed and very affectionate. One which I had as a companion on our steamer would always bleat after me as I left the side in a boat, would follow me wherever I went on the land, and would swim off after me again when I left the shore. If it was in the field and heard my voice it would at once rush to me, and would stand up on its hind legs and batter the palings in its attempts to accompany me when I left. They have also been tamed and used for traction in Newfoundland, in isolated instances. Only the woodland variety are commonly found in the south of Labrador, and these have not noticeably diminished. Their paths suggest that for ages they have been there in great numbers — just as they still are on the barren lands to the west of the Bay. The almost extravagant supply of their food which now goes unused in Labrador would insure protected herds great abundance and permanence of food.

Lutra Canadensis (Canada Otter). — These animals are

among our most reliable furs. They do not seem to have appreciably decreased. They make rude lairs under the snow near some open running water. They seem able to catch fish whenever they wish to do so, summer or winter, but whether they merely outswim, or simply pounce on their prey like a hawk, is doubtful. They never seem to starve like wolves and foxes, being almost always in good condition. No water at all adheres to their coats, so, unlike a dog, they appear not to "freeze up." They are among our most enduring animals. A friend described how he had seen a fox on one occasion sight an otter, and at once attack it. The otter, however, turned on his assailant and damaged him so badly that he was glad to escape with his pelt in a woful condition for the fur market. Their characteristic "rub" is so evident on the snow that they are easily marked down, and by waiting quietly can readily be shot in the water.

I had a similar story told me of an otter and a lynx. The lynx, waiting in hiding, pounced on the otter as he came out of a pond with a fish. But the otter gave such a good account of himself that the cat fled.

Ursus Americanus. — The black bear is one of our commonest furs. As he is large and his flesh excellent eating, he is, unfortunately, always shot at sight, though his skin in summer is practically valueless. The meat is like dark mutton. He is a most harmless creature, and I can get no record of even a mother with her family (generally two) having been dangerous to man. A trapper on snowshoes in the spring came on a bear just out of his cave. He gave chase, and, owing to the deep, soft snow, the bear had no chance of getting away. Seeing that it was fight or

die, the bear attacked, only to learn, however, that against modern guns he had no chance. The poor beast's attack was entirely due to his inability to avoid death. Apropos of caves, the black bear is, of all our mammals, the one which looks out most for his personal comfort. With us they "cave up" and sleep for about six months to avoid the cold of winter. I once purchased a young cub taken from its dead mother soon after its birth. When October came, we placed a barrel in the bear's run to see if he would know how to make a nest, not having had any opportunity of a "school of the woods." He took to it, however, with apparent zest, and no less efficiently for lack of education. He lined the barrel with grass and moss, and padded it all tight and solid with his paws, almost as a man would do.

On one occasion a trapper on his fur path found a convenient hole into a cave under a cliff. He crept in, lighted a small lantern which he carried, and, after having his supper, lay down to sleep. In the night a noise, as of some visitor, awakened him, and he turned up his lantern to find a large bear, standing as high as the roof. He promptly shot the bear and got outside, where, by waiting, he got two others.

Their fondness for sweets, and especially molasses, occasionally gets them into trouble. One time a trapper hauled over $200 worth of food to one of the huts on his fur path. When he came back he found a big hole through the roof and most of his food spoilt. He nailed up the hole twice as strong and headed up the barrel of molasses. On his next visit he found that bears had again got in, broken the top of his barrel, and eaten all his molasses.

These bears also eat fish along the land-wash, as well as

berries, and will occasionally catch fish in the ponds and pools. Many attempts have been made to keep them as pets, and I did succeed in keeping two for quite a long period. The general experience is, however, that they remain bears, and are not to be trusted. They have a habit of playfully hitting with their paws, and their long nails inflict very nasty scratches. I have had more than one experience of this.

Gulo luscus L. — The wolverine is considered by all our trappers as the wiliest of our wood folk. He will reach under a trap and turn it over so that it will go off safely, almost every time. Rather than go into a lynx house by the open door, which is of course guarded by a leg trap, he will dig down under the back of it, and come up inside, and thus get what he wants, viz. the bait. He is far the most persistent trap robber. Not satisfied with having eaten all he needs, he will take a marten out of a trap and bury it, and then following the man's trail all along the fur path, he will rob any and all of the other traps as he passes. The Indians have a tradition that the wolverine never eats a marten, but simply steals them out of wantonness and buries them. I have known of one of these beasts stealing fourteen marten at one time, and these were suspended in a tilt. In the same way he will climb a tree and rob a scaffolded cache of food. Their endurance is perfectly remarkable. An old wolverine was caught by the fore leg in a steel "jumper" trap at Paradise; fourteen days later he was sighted and shot at Dove Brook, a good twenty-five miles away. The steel trap and chain were still on the poor beast's leg, which was not frozen. When first seen he was carrying the trap in his mouth, and quite a large

ball of ice had formed on it, apparently where the saliva had made it sticky and the snow had balled on it; yet the poor brute was marching along on his journey. A wolverine taken in a trap shows fierce fight and endurance. From the latter fact have arisen some of the stories of his cunning. Thus, a wolverine in a trap was hit over the head by a hunter, and "killed." But as soon as the trapper stooped to pick him up, he jumped up and bit him. On another occasion a wolverine lay "dead" while the trap was taken off his leg, whereupon he immediately leaped up and ran away.

The red squirrels are very numerous and very tame. One frequently finds their caches of food in holes in the ground or in stumps. They will also make their way into houses and stores, appropriating biscuits, bread, and other provisions. At Rigolet, the Hudson's Bay Company's agents have twice found collections of biscuits amounting to nearly a barrelful, which the little fellows had carried off and stored for winter. Their skins are of little value, but the animals are not bad eating when proteid food is scarce.

Castor Canadensis. — The Labrador beaver has been absolutely protected by law for many years, and in some of the rivers near the East Coast, which are only hunted by single settlers, has become quite numerous. The hunters are most law-abiding, for it is very easy to sell the skins, and there is practically no one in Labrador to enforce the law. Their sturdy honesty, however, has not permanently saved the beaver. The roaming Indians found the animals extending farther up the rivers on to their own more central hunting grounds, and followed them down-stream to the coast, killing every animal which they met with as they went

along. Being short of food, as they always are, and the meat of the beaver being most succulent, there was a double incentive, for they would carry the skins away and sell them on the Gulf Shore, where these Indians go for supplies and for their religious ceremonies. Meanwhile, they not only kill beavers, but all the other fur which the white settlers depend upon for their living. We have had more than once to take refuge under the fact that, though we are magistrates, we are not policemen.

The beaver is the gentlest of our wood folk, strong, heavy, and active. He is entirely devoted to peace; even when caught when coming out of his house by a man's hand, he will not turn and bite, but will allow himself to be lifted out of the water and then dealt with at leisure. The humble muskrat is often caught lodging in the house of his larger congener, who appears not to mind this intrusion on his family circle. Otters, also, have been seen to enter occupied beaver houses, and though it seems unworthy of them, they have been found guilty of killing their hosts.

One trapper told me that he was watching a beaver house, waiting to stake the last door as soon as the owner of the house returned. The ice was quite clear, but four or five feet thick. Hearing some animal crackling and creaking along the bank, he lay and watched. Presently he saw a pair of otters swim out under the ice and enter the still open door of the beaver house.

On his logging brook, Mr. Harry Crowe had dammed the brook in order to raise the level for log floating. This happened to interfere with a beaver whose house was just above, so he had to build the house higher and higher till it was like an Eiffel Tower. But one night he came down-

stream to see what the matter was. Finding the dam, he coolly pulled out the mud and caulking, and lowered the level again to suit his pleasure. When, however, the loggers rebuilt the dam, the beaver very philosophically moved house and rebuilt in a pool much higher up-stream.

Erethizon dorsatum picinum. The porcupine is not very common, but is considered by our settlers as the best eating of any of the animals. The flavor differs with the season, and it is best in summer and fall, when he lives mostly on berries. In the spring he is apt to be "spruey," as at that time he lives in the trees, and eats practically nothing but bark. As he prefers the soft bark, he often kills the trees, but though he destroys our small firs, often as many as a hundred in a winter, he is not so numerous as to be a serious economic danger. Perhaps it is as well that our herbivorous mammals choose different ways of meeting the winter. Thus, the bears sleep, the rabbits eat young birch, the squirrel stores food, the porcupine keeps to conifers. In spite of his succulency he has little to fear from his enemies — except man. His short thick quills are barbed as well as sharp, and many a dog, wolf, or fox has attempted his life at the cost of their own. Once a quill gets well set in, every movement drives it on, so that festering sores are caused all over the body. Dogs get them in their tongues, and I have seen a fox skin spoiled by big sores left from the wounds of the quills.

Thalarctus maritimus. — Most specimens of the polar bear which are taken now have come south on the floe ice in pursuit of the seal herds which have their young on it at about the latitude of North Newfoundland. They are our greatest travellers. I have found no instances of their

attacking man; yet a large one will stand six to seven feet high, on his hind legs, and weigh about 1200 pounds. After having been carried south on the ice they are sagacious enough to find their way north again, even if they have to take to the land to do so. Every year a ragged line of straggling polar bears lands somewhere between St. John's and Cape Chidley, and all immediately seem to start on their long trip to the north. I have followed their trail over barren land and thick woods to the edge of the Straits of Belle Isle. The bear went straight north all the while, swimming over to Labrador. It seems to us that they must have some magnetic sense, as no one ever heard of one going south by mistake. They will loiter on the outer islands, eating the eggs of the numerous sea birds as they travel. It would seem that they are conscious of having one black spot, their nose. In approaching a seal on the ice, they have been seen to hide it in the snow, and in swimming after ducks they sink their whole body under water, and leave only their black nose out, so as to toll the birds nearer.

I have myself seen a polar bear swimming at least three miles out from land, in the open sea, and with no ice about. He too was bound north. When shot he floated fairly high in the water, so we judged he could remain swimming as long as he liked. They are not fleet or agile enough to escape from dogs, and many times the Komatik dogs have run them down, and, on one occasion at least, killed the bear without any assistance from man. In the water they have been killed frequently by the fishermen, with an axe, or even blows from an oar, or seal bat. They do not swim fast, but they dive well. We lost one this

way in rough water, the white foam making it impossible to distinguish him when he came up. I have known a large bear to get at the seal oil in a headed-up hard wood puncheon, and actually break the staves, presumably with blows from his paw. Their flesh has a fishy flavor, but the natives value the meat very highly.

Phoca Greenlandica.—The seal was once almost innumerable, but is now getting scarce, owing to the pelagic fishing during the breeding season. They are of immense value to the residents for the skin, fat, and meat. They seem to share the magnetic sense of the bears and birds. A baby seal six weeks old is called a "beater," and goes straight north almost at once. That he does not permanently lose his way as he wanders off into the mouths of our big bays is a difficult fact to explain otherwise.

Odobenus rosmarus.—A walrus was killed at St. Anthony on the northeast coast of Newfoundland in the spring of 1910. They are still occasionally taken along the east coast of Labrador, but are gradually being driven north.

Lynx Canadensis.—The lynx is getting decidedly scarcer. His size and strength puts him with us among our most destructive animals. His skin has risen to about ten times the value it had twenty years ago. A trapper told me a story of two lynx who regularly hunted and rounded up a fox. I myself have seen where one had run down a fox and killed him. Another trapper described seeing two lynx attack an otter, which, however, got away safely.

Putorius vison.—The mink has the habits of the otter and preys on fish.

Arctorus ignavus.—Our woodchucks hibernate in the winter like bears. Our people have to leave their houses in

the bays and come to the outer islands to fish in the summer. They plant their gardens before leaving, and more than one woodchuck, burrowing in under a paling, has lived happily all summer at the expense of the family who are fishing.

Vulpes rubricosa.—The fox has pups of varying colors from red to black. The silver and black coloured ones are now being bred in many places for their pelts, especially in Nova Scotia. They have now got a law in Labrador prohibiting the export of live wild foxes, in order to encourage the fox farming industry, which has just begun in 1912. A single pair of the animals alive has fetched as much as $10,000, while 1100 pounds sterling is said to have been paid by the late King Edward for a single skin for his Queen. Two silvers bred together will throw silver pups for certain after three generations. At present they breed only once a year, but it is supposed that in case and domesticity they may be induced to breed oftener, like their conquerors, the dogs. They are exceedingly sly. I made an attempt to propagate foxes for several seasons before the movement became general, but my animals always lost or destroyed their young. This presumably was due to the fact that we failed to prevent streams of visitors from getting access to the pens. The silvers are always more sly than the reds. I had a red and a patch fox which would scream with joy whenever they saw me approaching the pen, and run to me like a dog. The adult is apparently not so clever as he is supposed to be; though there are many stories of foxes tolling geese and shell birds to shore by either walking up and down and showing only their tail, or lying quietly down and waving it. As I have seen the same result occur

when my retriever has been running up and down quite visibly on the bank, it is possible that the manœuvre really needs no supposition of especial cunning to explain it.

A hunter in spring, on soft snow, will easily tire a fox out and run him down. Unlike most animals, foxes will eat one another.

CHAPTER XVIII

CONSERVATION AND EXPLORATION IN LABRADOR

By Wilfred T. Grenfell

It is patent to the most casual observer that coincident with the increase of population in any country the weaker creatures must inevitably go to the wall. This is as true of the aboriginal inhabitants as it is of the lower animal kingdom. Before men, armed with modern weapons of destruction, and with ever increasing means of transport, almost all the barriers behind which weaker Nature shelters herself are disappearing. In the Northwest the buffalo and the elk lands had to give way before cultivation, the prairies almost to the Arctic Circle are submitting to the taming hand of man, and the entrance of roads and railway tracks and growing townships ultimately make it practically impossible and even inadvisable to protect and preserve the wild creatures in their natural habitat. It is true that some animals can be domesticated and properly propagated in captivity, and so saved from extinction; but many others must be lost to mankind unless large areas can be found where natural conditions make it easy and economically wise to assign sanctuaries for them. Unfortunately there seems to be a low level limit beyond which it is impossible for a particular species to recuperate, and this is especially the case with birds. On the other hand it has been shown that instinct teaches animals, and birds in particular, the districts in which they are safe, however small

those regions may be. Note the gulls in our large harbours, and the ducks and other sea birds which are safe in the middle of a city like San Francisco and feed fearlessly in huge numbers in the lake at Oakland, while a mile or two away, where gunners lie in wait for them, they are shy and unapproachable unless deceived by decoys.

Nowhere in the world could be found a better natural reserve than Labrador. The impenetrable ice barrier which shuts it in in winter has, so far at least, defied the entrance of rapid transit and its vast area of over half a million square miles, except for its fringe of population along the seaboard, and its now roaming Indians, is still practically uninhabited.

Its vast barrens, its enormous superficial fresh-water area, and its almost bare mountain sides seem to foretell that, however scientific are men's methods of farming, huge tracts must always in all probability be unoccupied by man. Of course in these days, when faith in the unity of elements is receiving currency, there is a possibility that if the elements are transmutable, in some way Laurentian gneisses may be turned into gold, or even butter. No one can deny possibilities! But except for the likely establishment of some few mines, geology seems to tell the same story as regards Labrador — that large areas of it will long be unprofitable for man's occupation.

As a consequence, Labrador is still practically a land of pirates on Nature, or, as Hesketh Pritchard, in his delightful book, *Through Trackless Labrador*, puts it, we are "a purely predatory people on a barren but luxuriant coast."

The end can only be what might be expected when the golden goose is killed — those who lived off its eggs will

starve. So true is this that Professor W. A. Stearns, ornithologist, who wintered on our coast, described Labrador as "a long barren coast, the miserable home of half-starved humanity."

Any one who was to judge of the future of Labrador by such a category as follows might have some excuse for pessimism: —

All natives, both Eskimo on the seacoast and Indians in the interior, are decreasing in numbers, and even the white settlers are scarcely holding their own. About one hundred Indians who came out only last winter had to live on the charity of the Hudson's Bay Post at Davis Inlet till May or starve.

Walrus, practically gone.

Whales, seriously diminished.

Codfish, shoals scarcer and far more uncertain than formerly.

Capelin, not nearly so abundant.

Seals, so seriously diminished that the lack of food and clothing which they formerly provided is one chief cause of the depopulation of the country.

Herring, once world famous, now no longer fished at all.

Salmon, spasmodic, but greatly diminished.

Trout, never a serious industry, but not at all what it was.

White bear, only very occasionally seen now.

Black bear, and all other fur-bearing animals, so much scarcer that in spite of trappers covering the country from as far in as Lake Petitsikapau and thence to the coast of St. Augustine, the total catch is getting annually smaller.

Great auk, Labrador duck, oyster catcher, — extinct.

Eskimo curlew, in thousands twenty years ago, now practically extinct. (I got four in September, 1912.)

Eider duck, much scarcer, once they lived on every island. Now very few nest on the coast at all.

Canada goose, still plentiful.

Black duck, widgeon, teal, and pintail, markedly fewer.

Willow grouse, so variable that it is hard to gauge their numbers.

Spruce grouse, scarcer.

Puffins, guillemots, auk, noticeably less.

Woodland caribou, scarcer.

Barren Land caribou, uncertainly met with. Mrs. Hubbard and Mr. Pritchard think still plentiful.

At best it is a disheartening list, especially when we have to add that in a country so hard to reforest vast areas of the excellent pulp timber have been destroyed by fire.

On the other hand, the fact remains that these waters are ideal for shoals of fish which are more valuable now than ever; that seals can flourish in immense herds on the coast, and still pay a reasonable tax without serious results, while aviation and motoring is making their pelts exceedingly valuable.

For long-haired and dark furs this environment cannot be excelled, and every year the price of good pelts advances. They average more than 100 per cent more on this coast than they did twenty years ago. Moreover, the country can support enormous numbers of deer, and thus yield a huge quantity of proteid food which is increasingly needed by the outside world. This is clearly shown both by experiment and by Nature. Again, its numerous rivers and

estuaries, if properly guarded, can afford a supply of salmon and trout far superior in quality to the warm water fibrous fish of the North Pacific.

Mr. Hesketh Pritchard and other writers have claimed that for travellers Labrador will one day be the Norway of North America, when once the means for comfortable transport along its magnificent seaboard is obtainable. But if its wild life is all destroyed, and as it has no historical monuments to boast of, it must lose a great deal of its attractive possibilities, just for want of scientific attention and capital. One other lamentable feature which cannot help striking the intelligent observer is the immense waste of Labrador. There is as yet no cold storage to improve the value of exports. All offal of cod and all coarse fish are wasted. Capelin and herring are put to no commercial value. Norway last year showed a record of: —

Waste herring ground to flour	$709,412
Extracted herring oil	258,376
Guano made from cods' heads	336,211
Cod roes	312,543
	$1,616,542

Germany now does an immense business in converting fish offal into feed for poultry. By not using fatty fish, like herring, no taste is given to either eggs or meat. At Gloucester, Mass., the same work is carried on, and immense supplies of glue made from the skin and bones.

Our innumerable berries rot where they grow. There has been no attempt whatever at the adaptation of plants or animals. Immense water powers and vast pulp lands are yet entirely undeveloped. Our coast is poorly lighted

and charted; yachts are practically unable to visit us. Nothing is done with fresh-water pearls, mussels, kelp, and other possible sources of revenue. Some advance, however, has been made. In summer there are wireless telegraph stations nearly halfway down our coast, and a small steamer has been detailed to visit along the northern two hundred miles as far as Cape Chidley. This northern part is much the most picturesque section of Labrador. But the vessel is still sadly inadequate for tourist traffic. The British Government has at last detailed a vessel for improving the surveys of the Labrador coast, and Dr. Louis King of Ottawa has done some excellent work on detecting the presence of icebergs in thick weather. The Hudson Bay Route is also approaching a working basis. It has been suggested also that steamers making the round trip from the Bay to the Gulf of St. Lawrence call at Labrador ports on the way.

Personally I feel convinced that a winter port at Cape Charles in the Straits of Belle Isle could be made accessible all the year round.

Many prospectors and timber cruisers have been ranging Labrador, and the universal decision has been that valuable pulp areas exist. A rush on land followed, and every acre, including barrens and lakes, was applied for and granted. Companies were formed and attempts made to sell stock on the London and New York markets. Each year we have been informed that some area would certainly be worked. Plans with the minutest details have been sent in, and we had a request from one company to find them a doctor. But nothing has yet begun, though it cannot be doubted that the logs are there in

abundance. The difficulties of shipping, the long winter, and the lack of either roads, railways, or telegraphs has militated sorely against such plans materializing. Now, however, it does seem that a large syndicate, with a three-million-dollar capital, is to start in the spring, and if it does, it may be one more plea for a Labrador railway. A second large lumber concern has also given us notice that they intend to commence operating this winter. But the snow is on the hills, and the ice making, and there are as yet no arrivals. This company with orders for 7,000,000 tons of pulp annually for 36 New York newspapers had everything ready, having engaged engineers and managers, when they were warned that owing to the boundary dispute neither Canada nor Newfoundland could give them a valid title, and after an outlay in survey and other expenses of about $50,000, it was prevented from proceeding. But in spite of all statements to the contrary the pulp production of the world for paper is far below the requirements, and Labrador's vast pulp forests must sooner or later be exploited.

Our reindeer experiment has advanced considerably. Next spring a herd goes to North Labrador in charge of some herders from that section, who have been trained at St. Anthony. Only a small number of people, and consequently few dogs are there, and these latter are the greatest menace to the success of the reindeer. A herd of fifty, with three of our herders, left in 1911 for Athabasca and a small herd of six has been privately purchased for the Indians of lower Quebec. We have had some trouble with the people killing our reindeer while hunting for caribou. But the Newfoundland Government has not yet been

willing to create the north end of the island as a national preserve for the herd. We have found out that the same reindeer can no more be expected to be ranched for meat, to be milked for dairy purposes, and to haul and drive successfully, than can cattle or any other animals. Formerly we expected too much from them. For packing in summer they are all right, and in deep snow in early winter better for driving than dogs. The herd for ranching must be separate from the dairy animals, and the latter must be taken from their fawns. Only the ox deer are used by us for hauling, which they do most excellently, though they are slow for driving. With only a very small sum for upkeep the herd must support itself, and so dairy experiments on any large scale have had to be postponed.

In the fall of 1911 the first shipment of carcasses for the market from the Alaskan reindeer herds was permitted. One hundred and twenty-five carcasses were sent up in cold storage, and realized from twenty-five to seventy-five cents a pound.

We have now one thousand deer, having sold fifty, killed over one hundred for meat for hospital, and lost one hundred and fifty through straying, illegal killing, and accidents. We have now given an option on four hundred of the animals to a company that is proposing to start in ranching on a commercial basis for the London and New York markets. This is one of the ends which we most desire, as it will give the industry that lasting hold on the country which will ensure its permanence and extension, without which, and the government backing such as is given in Alaska, it must remain on a very

small scale as a mission enterprise. The experiment needs more money to make it mature quickly, otherwise it must attain its final results very slowly. It is impossible to replace the dogs till there are enough deer to take their place. Commercializing at once part of the scheme seems anyhow to us to be absolutely essential unless more money can be placed behind it in some other way.

One exceedingly helpful circumstance is the advent to Labrador of a large fur-farming concern. The great success made of fox farming in Nova Scotia and Maine has encouraged this enterprise, and there is every prospect of its becoming a great success. Small receiving stations have been established all along the coast, and Mr. Clarence Birdseye, the manager in charge, is creating a central farm. He is a trained naturalist of proved ability, having done three years' service in the field, under the Federal Government at Washington. With characteristic energy he has already succeeded in getting two laws passed to prevent the exportation of live wild foxes, and also of digging and destroying their burrows in summer. He anticipates that in future he may add mink, marten, and even otter and beaver breeding to his work.

Enthusiastic prospectors continue to seek for the gold that the finds in the similar belt of rocks in the middle and far Northwest have suggested. Gold discoveries in Baffin Land sent four expeditions flying down there this summer.

In short, everything seems to point to the fact that Labrador will come to her own in the not very distant future.

APPENDICES

I

INSECTS OF LABRADOR

The Insects, excluding the Beetles

By Charles W. Johnson

Our knowledge of the insects of Labrador is based largely on the various papers by Alpheus S. Packard. The lists of the species recorded in these papers were later brought together and published in his work, *The Labrador Coast.* In this work about two hundred and twenty species are mentioned. A few additional species from the interior are listed in A. P. Low's *Report on Explorations in the Labrador Peninsula.*[1] These, with a few scattered species, make the total number about two hundred and fifty. This is a small number if we consider the whole Labrador peninsula, but a large number when we take into account the limited amount of entomological work which has been done and the small area covered.

A. P. Low defines the southern boundary of the Labrador peninsula as a straight line extending nearly east from the south end of James Bay, near lat. 51°, to the Gulf of St. Lawrence near Seven Islands, in lat. 50°. This gives a clearly defined geographical area, which, bordered by Arctic seas, and a more elevated interior, gives quite uniform climatic conditions, and would make it possible to study the insect fauna to better advantage than if it were limited by political boundaries.

The section from which nearly all the insects have been collected (the immediate coast-line) is in that portion of the boreal region which has been designated as Arctic, the flora and fauna of which are largely governed by the effect of the winds from the cold Arctic seas. On the other hand, a short distance inland, we enter the subarctic forest belt, or Hudsonian Zone, with a much richer insect fauna than could exist on the bleak, storm-swept coast.

[1] *Am. Rep. Geol. Survey of Canada,* Vol. VIII, 1895.

The close proximity of the wooded section in the more southern portion and the narrowness of the so-called Arctic Zone causes it to be inhabited during the summer by many species from the strictly Hudsonian area to the west and south, even though conditions are not favourable for their permanent existence. Botanically the two zones are quite clearly defined, but from an entomological standpoint it would be difficult to draw the line.

Taking the country as a whole, the two hundred and forty recorded species probably represent less than thirty-five per cent of the insects which will be found to inhabit this region. It is somewhat difficult to make an estimate of the number of species in the more northern latitudes, where the tendency is toward vast numbers of individuals and few species, and where the insects with incomplete metamorphosis are poorly represented. There are, however, many reasons for considering that our knowledge of the insects of Labrador is very imperfect. The country with its comparatively rich flora (over five hundred species) presents quite favourable conditions for insect life, a fact which is shown by the large number of species recorded from the so-called Hudson Bay region, and the tendency of species in northern latitudes to extend entirely across the continent. There has been an almost total neglect of the Diptera, or flies, the order most prevalent in boreal regions, only fifteen species being recorded, while from Alaska, for example, two hundred and seventy-six species representing one hundred and thirty-eight genera and thirty-six families were obtained by Professor Trevor Kincaid of the Harriman expedition during the summer of 1899.

Under each order will be given a brief account of our present knowledge of the insects of this region, with notes on their habits, distribution, and other features of general interest.

I am indebted to Mr. H. H. Newcomb for the loan of some butterflies, to Mr. J. A. Cushman for photographs, and to Miss L. R. Martin for drawings illustrating this article.

The Diptera, or two-winged insects, comprise what are popularly known as flies, midges, gnats, and mosquitoes. I have stated that this is a very much neglected order, but I am told that they never neglect the visitor; in fact we would probably know more about the flies of Labrador if they were not quite so attentive. They constitute the most annoying, and at times an almost unbearable, feature of the short summer, nature seeming to strive to make up in individuals what it lacks in species. It seems remarkable that insects can increase in such numbers in so short a time, and under conditions apparently so unfavourable, but cold does not seem to hinder the development of certain species. Professor John B. Smith, in his work on the mosquitoes of New

Jersey, has positively proved that during the early days of February, in water just above the freezing temperature, the larva of *Culex canadensis* hatches from the egg. A wingless snow gnat (*Chionea valga*) is found only during the winter in the northern United States and Canada, crawling on the snow with the thermometer as low as 15° above zero. There are many other insects which seem to thrive under similar conditions.

Another feature which enables Diptera to withstand most unfavourable climatic conditions is their diversity of habit; aquatic, parasitic, herbivorous, and carnivorous, they feed upon almost everything from living tissue to the most putrid and decayed animal and vegetable matter, and are thus liable to be widely distributed through commerce. Many of the blood-thirsty species breed in water, the larva of the mosquito living in swamps and stagnant pools, while those of the black-fly frequent the rapidly running streams. These conditions, existing to so great an extent throughout the interior, present very favourable breeding places for these insects, and render some districts practically uninhabitable by man.

A great similarity prevails throughout the whole dipterous fauna of the more northern regions. Many are circumpolar in their distribution, others differ so slightly that it is almost impossible to determine them from descriptions, and comparison with European specimens is necessary. That they have not become more differentiated is probably due to the uniform climatic conditions under which they have existed. In numbers the Diptera extend farther into the Arctic region than any other order of insects, therefore presenting one of the best groups for tracing boreal distribution.

The flies include most of the many species of insects which infest mammals and birds. Of these parasites some may be external, others internal. Their generally small size and the indifference of trappers and most collectors of animals and birds to their existence, is one of the principal reasons for our lack of knowledge of these forms, especially from more northern latitudes. It is doubtful if there is an animal or bird which is entirely free from a parasite. While these are probably less numerous in the colder region, the conditions are quite favourable, and they are undoubtedly more abundant than is generally supposed.

There are two species of flies of which we know but little, but which we do know infest the caribou. They belong to the family Œstridæ, popularly known as bot-flies. The habits of one of the species are apparently similar to those of the sheep bot-fly. A description, therefore, of what is known of the latter species may aid in studying the life history of the one infesting the caribou.

The fly of the sheep-bot is about one-half of an inch in length,

very rapid in its actions, and consequently not readily seen when flying. Its small size and obscure colouring would also prevent its detection when at rest in protected places during cold, wet days, for it only flies during the dry, warmer days, at which time the female attempts to deposit its young larvæ in the nostrils of the sheep. The eggs of the sheep bot-fly are retained until hatched in the oviduct, and emerge as young larvæ or maggots. The appearance of one of these flies among a flock of sheep causes considerable alarm, and they try various ways to prevent it from depositing its young larvæ. They huddle together, lie down and bury their noses in the dirt, and even raise a cloud of dust to deceive their enemy. When deposited in the nose of the sheep, the young maggot, by means of small hooks and spines, begins its migrations upward through the nostrils to the frontal sinuses. The movement of the larva, as it increases in size, greatly irritates the poor victim, and it makes many attempts, by sneezing and snorting, to rid itself of the parasite. This is rarely accomplished, however, until the larva reaches maturity, when it detaches itself from the mucous membrane, reaches the nose, and is expelled by the violent snorting of its host.

The grub remains about ten months in the nasal cavity of the sheep. After leaving the sheep it pupates and remains in that state from four to six weeks, when the adult fly makes its appearance.

Dr. Grenfell informs me that in all of the heads of the caribou that he has examined, he has found parasitic larvæ, usually just below the ethmoid. The injury done the caribou by this parasite is not known, nor do we know the species, as neither the larva nor fly has been secured. It probably belongs to the genus Cephalomyia. To work out its life history and determine the species would prove an interesting subject for investigation.

The second species infesting the caribou is a subcutaneous parasite, which may prove to be the same as the reindeer bot-fly (*Œdemagena tarandi*). If not, it is a closely related species, with a life history probably similar to that of the ox bot-fly, or warble (*Hypoderma*). The eggs are deposited on and fastened to the hairs in a similar manner to those of the horse bot-fly, and always in a position within reach of the animal's mouth, as on the fore legs and sides. In licking itself the animal transfers these eggs to the mouth, the saliva rapidly dissolves the hard egg cases, and the young larvæ already formed within are liberated. These young spiny larvæ pass by way of the œsophagus through the tissues of the animal to the subcutaneous tissue along the back, forming large tumours or swellings before reaching maturity. When the larva has attained its full size, it bores its way out and drops

to the ground, into which it enters and pupates. It remains in this dormant stage about four weeks, when the fly emerges, soon to lay another lot of eggs. The larval period lasts about ten months, the presence of the larvæ causing inflammation, loss of flesh, and injury to the skin. Dr. Grenfell says that he has seen a skin so perforated that it was practically impossible to cut from it a pair of moccasins. Mr. Owen Bryant informs me that the caribou of Newfoundland are infested by what is apparently the same fly. The reindeer bot-fly is found in Alaska.

The birds and mammals of Labrador would indicate the presence of other families of insects. In the Diptera should be found members of the family Hipposcidæ, popularly called the louse-fly, from their habits of living parasitically upon birds and animals. They have flattened bodies adapted for moving readily between the feathers and hairs. Some species have wings, while in others the wings are obsolete or wanting. The term Pupipara is applied to this group on account of its remarkable mode of reproduction. The eggs hatch within the body of the parent, the larva being retained and nourished until full grown and ready to change to the pupa. These flies are most commonly observed on the hawks and owls, although many other birds are infested. The owl-fly (*Olfersia americana*) lives upon the great-horned owl. The *Pseudolfersia maculata* Coq. (= *fumipennis*) infests the osprey and loon, while on blackbirds and other small birds are frequently found the more common bird-fly, *Ornithomyia pallida*. Many species of the Mallophaga, or bird-lice, are probably present on various species of birds.

The horse-flies, or gad-flies, are represented by the two most prominent genera — Chrysops, or deer-flies, and Tabanus, or true horse-flies. Both are at times very annoying, especially in the woods, swarming about in great numbers and frequently giving sharp bites. Packard, in referring to these flies, says: "Half a dozen frightful horse-flies of gigantic stature hovered about. Now and then, when we are not watching, they will settle down on our hands and bite terribly, making a wound which does not heal for days." I am told the natives call them "waps," probably a corruption of "wasps." They are not as active on a cloudy day, and a strong breeze will usually disperse them.

FIG. 4.
Larva of the Horse-fly.

The three species of Chrysops are all black forms with the usual broad black band on the centre of the wing. *Chrysops excitans* (Pl., Fig. 1) has two of the basal segments of the abdomen

yellowish on the sides with a large gray triangle on the second segment. *Chrysops mitis* has the abdomen entirely black, with faint triangles of grayish hairs. *Chrysops sordidus* is distinguished by having the first and second segments of the abdomen marked with yellow on the sides, and the posterior margins of all the segments narrowly bordered with gray, and a dorsal row of small triangles. The species are all of about the same size, a little less than a half inch in length, *C. excitans* as a rule being a little larger than the other two.

The larger horse-flies are represented by at least six species, all belonging to the group with hairy eyes. These were formerly separated from the genus Tabanus and placed in the genus Therioplectes, but they are now united, the character used in separating them being probably only of subgeneric value. The two most prominent species are *Tabanus flavipes*, or the yellow-footed horse-fly, and *Tabanus zonalis*, or banded horse-fly (Pl., Fig. 2). They are nearly three-quarters of an inch in length, with wings spreading an inch and a quarter; black, with the posterior margins of the abdominal segments bordered with a band of golden-yellow hair; the wings are brownish, tinged with yellow toward the base. The two species closely resemble each other, but can be readily separated by the latter's having the tubercle in front of the base of the wing reddish, and the yellow bands of the abdomen broader, with slight anterior projections on the second and third segments. The *Tabanus auripilus* of northern Europe is closely related to *flavipes*. Another species of about the same size is *Tabanus affinis* (Pl., Fig. 3); it is a dark brownish black, with the sides of the abdomen red. The little-headed horse-fly, *Tabanus microcephalus*, is about one-half inch in length; the head is comparatively small, not exceeding the width of the thorax; the abdomen is marked with three rows of conspicuous grayish triangles. The northern horse-fly, *Tabanus septentrionalis*, is similar in general appearance, but with a larger head and less prominent abdominal markings. The sixth species, *Tabanus illotus*, is distinguished from the preceding one by the broad, distinctly excised, third antennal joint, and faint brown clouding on the cross-veins.

The larvæ of the horse-flies (Fig. 4) are aquatic or subaquatic, living either in the mud in streams and swamps, or in wet earth adjacent to springs. The eggs are placed on plants overhanging the water or in very wet situations. The eggs hatch in about a week, and the young larvæ drop into the water or mud. The larvæ are carnivorous, feeding upon other insects and snails, and probably repaying to some extent their annoyance when adult. They are cylindrical, tapering gradually toward the end, and usually translucent, whitish, and in some of the larger species

FIG. 1. Chrysops excitans (enlarged)

FIG. 2. Tabanus zonalis

FIG. 3. Tabanus affinis

FIG. 5. Tipula tesselata

FIG. 8. Sirex flavicornis

FIG. 9. Brenthus frigga

frequently banded with brown or black. They possess great extensile and retractile powers, which enable them to move quite rapidly through the mud and decaying vegetable matter. When captured they are restless and active; if held carelessly in the closed hand they use their mandibles freely, puncturing the skin and causing severe pain.

The family Tipulidæ, or the crane-flies, as they are popularly called in reference to their long, slender legs, constitute a very conspicuous group of flies which extends well into the Arctic region. Six species have been recorded from Labrador, but there are probably four or five times this number. The large tessellated crane-fly, *Tipula tessellata* (Pl., Fig. 5), is over an inch in length, with spotted wings and dark body covered with a grayish pollen. The northern crane-fly, *Tipula septentrionalis*, is a smaller species, with darker wings marked with white and black. The larvæ of this group live either in damp, decaying vegetation, or in wet earth and water.

Of the mosquitoes of Labrador we only know that they are abundant and constitute a very annoying feature, but from a systematic standpoint we know very little. Specimens collected by Dr. C. W. Townsend and Dr. G. M. Allen were submitted to Dr. H. G. Dyer, who says: "I have looked over your specimens, and find that they unfortunately belong to that group of Ædes which cannot be determined with any certainty without the larvæ. I have been able to separate most of the species from regions collected over, but as these come from Labrador, it is possible that they represent new species, which would have differential larvæ, but be very close as adults. These are some of the early spring species, which in Labrador are doubtless the dominant, if not the only occurring, species."

Closely related to the Culicidæ, or mosquitoes, are the Chironomidæ, or midges. Four or five species of this family have been collected, but among them are no representatives of the biting forms. To the genus Ceratopogon belong the "punkies," or "biting gnats," which the Indians call the "no-see-um." These very minute but annoying insects are sometimes abundant in northern Maine, and especially noticeable just after sunset when there is no wind. They may possibly extend into southern Labrador.

The black-fly, *Simulium* (Fig. 6), is an even more formidable pest than the mosquito, for, unlike the latter, it makes its appearance only on the bright sunny days and disappears during the cloudy weather. In describing their attacks, Packard says: "The armies of black-flies were supported by light brigades of mosquitoes. They fly into our faces; they do not bite hard, like the mosquitoes, but the vampires suck long and deep, leaving great clots of blood.

No wonder that these entomological pests are a perfect barrier to inland travel, and that few people live during the summer away from the sweep of the high winds and dwell on the exposed shores of the coast to escape these torments." The larva of the black-fly (Fig. 7) lives in the swiftly flowing streams, while those of the mosquito are found in stagnant water, and as "one-third of the area is given up to ponds and streams," conditions are very favourable for their increase.

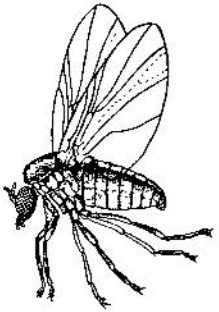


FIG. 6.
The Black-fly.

There are many other species of flies, fully as interesting as the biters. The little Dolichopodidæ and Empididæ are each represented by four or five species; the bright-coloured Syrphidæ, by about twelve species, including such forms as *Syrphus contumax*, *S. diversipes*, *Melanosto mamellinum*, *Eristalis bastardi*, and *Helophilus glacialis;* the Tachinidæ, or parasitic flies, by the large *Echinomyia florum;* the Muscidæ, or house-flies, by the "blow-fly" (*Calliphora vomitoria*), the blue flesh-fly (*Cynomyia cadaverina*), the common green carrion-fly (*Lucilia cæsar*), and the dark blue (*Phormia terræ novæ*). Hosts of Anthomyidæ are yet to be determined, while the Scatophagidæ are represented by the widely distributed *Scatophaga stercoria*, *furcata*, and *islandica*.

The order Hymenoptera includes the bees, wasps, ants, saw-flies, etc. Notwithstanding their diversity of habit, it is one of the orders which diminishes greatly in numbers as we approach the more Arctic regions. Only twenty-six species have been recorded from Labrador. Further research will, however, increase this number, especially in the Ichneumonidæ, or parasitic species.

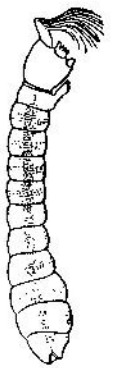


FIG. 7.
Larva of the Black-fly

The large percentage of Phyllophaga, or leaf-eaters, is very marked, eleven of the above numbers representing this group. They belong to the family Tenthredinidæ, popularly known as saw-flies, a term derived from a peculiar structure on the under side of the last abdominal segment of the female, consisting of a pair of chitinous, sawlike pieces with which she cuts little pockets in the leaves in which to deposit her eggs.

Many of the saw-flies are injurious to the spruce, larch, willow, birch, and other trees and plants, often completely defoliating them. The larvæ resemble some of those of the butterflies and moths, but can be quite readily distinguished by having from twelve to sixteen prolegs, or abdominal feet, while the true caterpillars have as a rule only ten. Various species of the genus Ne-

matus infest the spruce, willow, and birch. *Euura orbitalis* makes a gall on the willow.

Closely allied to the saw-flies are the Xylophaga, or wood-eating Hymenoptera, comprising the family Siricidæ, or horntails, the females being provided with a long, hornlike ovipositor adapted for boring, as the eggs are laid in solid wood on which the larvæ feed. Two species are recorded from Labrador. The large and beautiful *Sirex flavicornis* (Pl., Fig. 8), with its handsome livery of deep black and orange-yellow, seems to be quite common. The male is smaller and darker than the female, the yellow being confined to the four middle segments of the abdomen, at the end of which there is only a short triangular projection. It differs so much from the female that for a long time it masqueraded under the name of *Sirex abdominalis*. In more southern localities this insect infests the white pine, but in this region it probably lives in the spruce. *Sirex cyaneus*, a dark blue species, has been recorded from Hopedale. We should naturally expect to find one of the large ichneumon flies (Thalessa or Rhyssa) with very long ovipositors, which parasitizes the horntails farther south.

There are a large number of parasitic species belonging to the family Ichneumonidæ. Packard collected about twenty-five species, only five of which have been determined. He also records two or three species of Chalcidæ. Both of these groups are probably mostly parasitic, as the various species of moth.

Two species of ants are recorded, — the large *Campanotus herculeanus*, or black carpenter ant, which builds extensive nests in logs and stumps and even living trees, and *Formica sanguinea*, or the "slave makers." It would be interesting to note the habits of this species in the more northern latitudes. The white-faced hornet, or paper-making wasp (*Vespa maculata*), has been recorded from the more southern portions of the peninsula, and *Vespa norvegica* from Caribou Island. Five species of bumblebees (Bombus) have been collected, some of which have a wide band of dark orange-red pile on the abdomen. There are probably a number of the smaller bees, such as *Andrena* and *Halictus*, several species of which often appear very early in the spring in more southern latitudes.

The order Lepidoptera, or the butterflies and moths, is not only very well represented, but includes many rare and interesting species. Upwards of one hundred and fifteen have been recorded, of which number eighteen are butterflies. Among the latter are four species of the smaller Fritillaries, — *Brenthus frigga* (Pl., Fig. 9), *B. polaris*, *B. triclaris*, and *B. chariclea*. They are similar in appearance, the upper surface of the wings being reddish, marked with black, while the under side of the hind wings bears a series of

whitish spots or markings. A larger species, *Argynnis atlantis*, the "mountain silver-spot," has been recorded from the interior of the peninsula. It may prove to be only an accidental visitor, although two species of violets, the food plant of the Fritillaries, are recorded as far north as Hopedale. *Papilio turnus*, the yellow swallow-tail, has also been recorded from the interior.

The northern white butterfly (*Pontia napi*, variety *frigida*) varies greatly in different localities, and consequently has received many varietal names. The wings are white, with the veins on the under side more or less broadly marked with gray, with the tip of the fore wings and the hind wings pale yellow. The larvæ feed on various species of the Cruciferous plants, especially turnip and mustard.

The smaller yellow, or sulphur, butterflies are represented by three or four species, — *Eurymus palæno*, *nastes*, and *pelidne* or *labradorensis*. The large "white-j butterfly," *Eugonia j-album* (Pl., Fig. 10), is marked with dull yellow and reddish brown, irregularly maculated with black, with a spot of white near the tip of the wing, and the outer margin with a double crenulated line; the hind wing is reddish brown, black along the anterior margin, with a central patch of white; the under side consists of various shades of grayish brown, giving a woody or mossy effect, and when the insect is at rest presenting an interesting example of protective coloration. The larvæ feed on birch. It has been taken as far north as Okkak.

The barren-ground butterfly, or Arctic satyr, *Œneis jutta* (Pl., Fig. 11), is circumpolar, being found in the more northern parts of both the eastern and western continents. The colour of the fore wings is a dark brown, with six yellowish spots of varying sizes near the outer margin and somewhat blending into the brown, spots with or without central points of black; the hind wing has four yellowish patches, the anal one with a small black spot; the under side is brownish, the hind wings being mottled with gray and closely resembling the moss-covered ground and rocks. A closely related species, the "White Mountain butterfly" (*Œneis norma*, variety *semidea*), is very similar in colour, and its habits have been so nicely described by Mr. A. H. Scudder that I quote the following: —

"As soon as one alights it tumbles upon one side with a sudden fall, but not quite to the surface, exposing the under side of the wings with their marbled markings next the gray rocks mottled with brown and yellow lichens, so that the ordinary passer-by would look at them without observing their presence: it is an obvious case of protective resemblance. The surface is generally exposed so as to receive the fullest rays of the sun, or else the creature falls so as to let the wind sweep over it, its base to the windward."

The larva of the Arctic satyr feeds on carax. It has been found at Nain, Hopedale, and Square Island Harbour during the months of June and July. *Œneis norma*, varieties *semidea* (*æno*) and *bore*, are recorded from Strawberry Harbour and Hopedale, collected August 3.

The little "Arctic bluet," *Agriades aquilo* (*Polyommatus franklinii* Curtis), which Packard refers to as "half skipping and half flying over the lichened boulders," has been taken at Sloop Harbour, Henley Harbour, and Hopedale, July 19 to August 15. In the interior of the peninsula, one of the varieties of the "Spring Azure" — *Lycæna* (*Cyaniris*) *ladon*, variety *lucia* — has been collected. Its colour is a pale violet, the wings having a broad blackish border in the female; under side of the wings is light gray, flecked with brownish black. The wings expand about one inch. It feeds on a great variety of plants, especially *Cornus*.

Two species of the Hesperidæ, or skippers, are recorded. The *Pamphila comma*, representing the variety "*catena* Stand.," is also found in northern Scandinavia and Lapland. The other species is *Hesperia centaureæ* Ramb.

The family Arctiidæ is represented by only four species. One of the tiger-moths (*Apantesis quenseli*), a small black species with the fore wings tessellated with white, is also found throughout Arctic America, Europe, and Asia, and on Mount Washington, New Hampshire, and the Swiss Alps. The great tiger-moth, *Arctia caia*, has dark brown fore wings marked with white, and bright red hind wings spotted with black. It is also circumpolar in its distribution. The large and beautiful "St. Lawrence tiger-moth," *Hyphoraia parthenos* (Pl., Fig. 12), with its bright reddish brown fore wings spotted with yellow, and bright yellow hind wings banded with black, is recorded from the Moravian stations.

The Noctuidæ, or owlet-moths, number about forty species, and form a very interesting group worthy of a great deal of study. Professor Packard refers to those boreal forms as follows: —

"The moths were all Arctic species, and when at rest so harmonized in colour with the lichens and other vegetation in which they nestled as to entirely deceive me. And yet what was the use of practising, even unconsciously to themselves, this deception? The answer was not far off — there was a shore lark, or some such bird, flitting about and running over the rocks, busily searching for just such moths as these, and the only hope of safety for the insects from their sharp eyes was in their resemblance to the lichens."

The forty species are divided among some fourteen genera according to the more modern classification, the more prominent of these being *Mamestra, Pachnobia, Hadena, Semiophora, Anarta*

(Pl., Fig. 13), *Noctua*, and *Syngrapha*. To this family belong the cutworms and many other injurious species. The larvæ vary considerably in appearance, and feed upon a great variety of plants.

The Geometridæ, or measuring-worms, are so named from the peculiar looping gait of the larvæ, as if measuring the surface over which they move. There have been recorded about twenty species. The family Lipariidæ is represented by *Gynæphora rossii;* and the Hepialidæ, or ghost-moths, by *Hepialus hyperboreus* and *mustelinus*.

The family Pyralidæ, numbering about eight species; the Crambidæ, or "close wings," some six species; the Tortricidæ, or leaf-rollers, — a term derived from the habit of many of the larvæ, — with about twenty species; and the Tineidæ, which contains the clothes-moths and a number of the leaf-miners, and represented by some ten species, comprise the smaller species, and constitute in part what are commonly classed as the Microlepidoptera.

The caddis-flies constitute one of the most interesting groups of aquatic insects. They belong to the order Trichoptera, or hairy-winged insects. At first sight many of these resemble a moth, but with a closer acquaintance no one need confuse the two. The peculiar habits of the larvæ of the various species form one of the most interesting studies of insect life. A bundle of little sticks, or a tube made of coarse grains of sand, moving mysteriously about the bottom of a stream or spring is apt to attract the attention of the most casual observer, but how few know what these are. They are the cases of the caddis-worms, the larvæ of the caddis-flies, built to protect their soft bodies from their enemies. What adds so much to their interest is that each species has a very different method of house building, some preferring wood, others stone, but the caddis carpenters and masons do not always build in the same manner. Some place the sticks crosswise, while others arrange them longitudinally; some have the curious habit of decorating by fastening shells, etc., to the outside of their houses; others make a case largely composed of pieces of leaves. The numerous masons seem to be very particular about the size of the stones and the shape and position of their domiciles. One will make a beautiful tube of sand, unattached, in which it wanders to all parts of the stream; another will make a spiral tube so closely resembling a snail-shell as to lead a conchologist to describe it as a mollusk. One, commonly observed in running streams, is made of a few small pebbles attached to a large stone. Some of the dwellers in these rude homes are also fishermen and construct a funnel-shaped net at their doors, with the opening upstream. Their nets are made of silken threads, such as are used in fastening

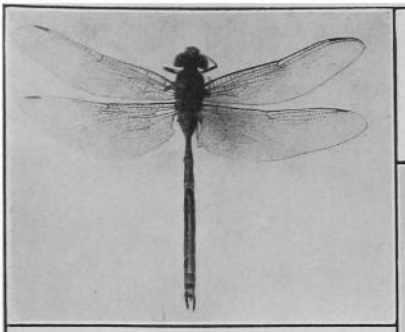


FIG. 15. Æshna constricta

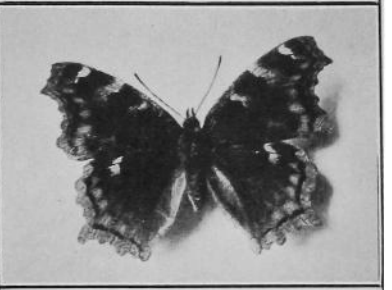


FIG. 10. Eugonia j-album

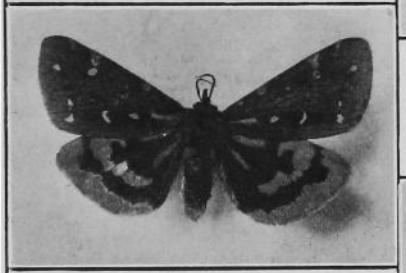


FIG. 12. Hyphoraia parthenos

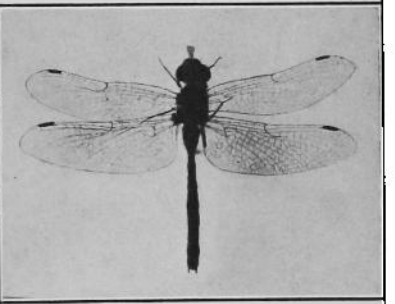


FIG. 16. Leucorhina hudsonica

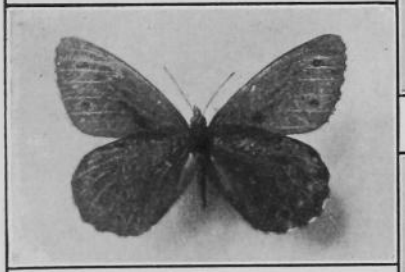


FIG. 11. Œneis jutta

FIG. 13. Anarta

together the stones and sticks. In some species the entire case is made of silk. Some five or six species have been recorded from Labrador. *Limnophilus subpunctatus* is a common species which is also found in Lapland. *Desmataulius planifrons* is recorded by Professor Packard from Okkak.

The Hemiptera, or true bugs, are poorly represented, — two leaf-hoppers, including *Deltocephalus debilis;* a small bug, *Trigonotylus ruficornis;* and one of the "water-boat-man," *Corisa,* are all that have been discovered. Equally scarce are the Orthoptera, only one species of grasshopper, *Melanoplus,* having been recorded.

The Odonata, or dragon-flies, are among the most active and swift-flying of insects, darting back and forth over the ponds and streams and turning suddenly as they seize any unfortunate midge that comes within their reach; or alighting on the tip of a dead stick or reed from which vantage-point they can swoop like hawks upon their prey. Thus they are in many sections of the country known by the popular name of mosquito hawks.

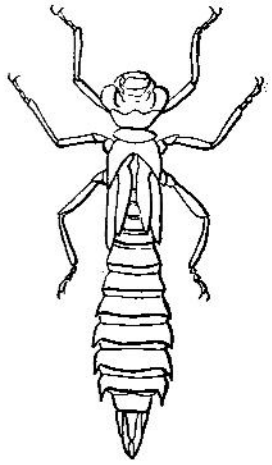


FIG. 14.
Nymph of the Dragon-fly.

The dragon-fly lays her eggs in the water, where the young or nymphal stages are passed. The nymph (Fig. 14) is a clumsy, awkward creature, crawling over the mud and among decaying vegetation, where it will lie partly concealed until its unsuspecting victim comes within reach of its extensible lower lip, which is armed with a pair of jawlike hooks. They are voracious feeders and not at all particular, for young fish are frequent victims. They are, however, to be classed among the beneficial insects, for they undoubtedly destroy great numbers of the pestiferous gnats, mosquitoes, and flies.

After moulting several times, the nymph, when it attains its full size, crawls out upon some stick or plant, the skin splits longitudinally along the back, and the adult dragon-fly emerges. The life of the adult is from twenty to forty days, depending on climatic conditions, the more northern latitudes being unfavourable. About three hundred species are known from the whole of North America, of which only eight have thus far been collected in Labrador, including such large and widely distributed species as *Æshna constricta* (Pl., Fig. 15), *Æ. crenata, Æ. septentrionalis,* the type of which was from Labrador, four species of the genus *Somato-*

chlora, two of which were originally described from this region, and *Leucorhina hudsonica* (Pl., Fig. 16).

The May-flies, or day-flies, belong to the order Ephemerida, an application which refers to the short lives of the imagoes. They represent one of the more primitive groups, with mouth-parts rudimentary or almost wanting in the adult, as they do not feed during their few hours of existence as winged insects. The wings are delicate, with a fine network of veins; the hind wings are much smaller than the fore wings, or sometimes wanting; the abdomen bears two or three long, many-jointed, bristlelike appendages, while the antennæ are very short. In the nymph or the wingless aquatic stage their life is a long one, in some species often extending to two or three years. The nymphs are interesting objects of the streams and lakes, clinging to the under sides of stones and sticks and feeding on the smaller animal and plant life. They are readily recognized by having their sides fringed with tracheal gills, two or three caudal appendages, and feet with single claws. When the nymph attains its full size, it rises to the surface, the cuticle along the back suddenly splits, and a frail-winged creature appears, but this is not the true imago; it is what is known as the subimago stage. In a short time another moulting takes place, and we have the adult day-fly. This subimago stage is unknown in any other order of insects. *Potamanthus marginatus*, the only species recorded from Labrador, also occurs in northern Europe.

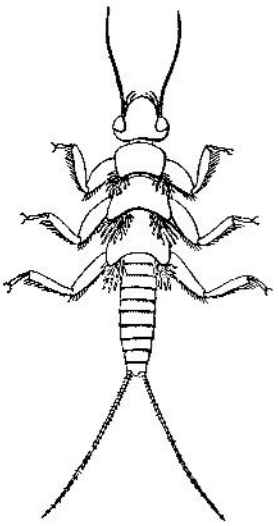


FIG. 17.
Nymph of the Stone-fly.

Somewhat resembling the nymphs of the day-flies are those of the stone-flies, belonging to the order Plecoptera, or plaited-winged insects. These can, however, be easily separated, the gills being in the form of tufts of short hairs on the thorax and behind each leg, and not on the sides of the abdomen. The feet have two claws, the legs being usually fringed with hairs, and there are two caudal processes. They are found in streams which are quite rapid, as they require more aërated water than the nymphs of the day-flies. Reaching its full size, the nymph (Fig. 17) crawls out upon the rocks or trees, the skin splits along the back, and the adult appears.

The full-grown stone-fly (Fig. 18) is, however, very different in

appearance from the day-fly. The body is flattened, the antennæ are quite long, the fore wings narrow, and noticeably smaller than the hind wings. Some of the smaller species appear very early in the spring, long before the snow has melted. Three species have been recorded from this region, — the large *Pteronarcys regalis*, *Perla* sp., and one of the small green *Chloroperla*.

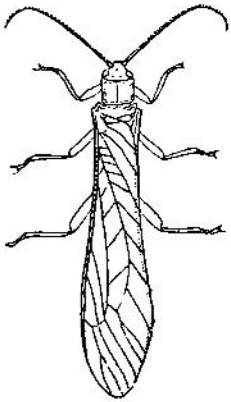


FIG. 18.
The Stone-fly.

The Thysanura, popularly known as the bristle-tails or spring-tails, constitute the most primitive group of insects. Although not recorded from Labrador, there is little doubt that the order is represented, for they seem to thrive under very unfavourable conditions. The snow-flea (*Achorutes nivicola*), a minute, blue-black insect, is exceedingly abundant in the snow in New England and Canada, and undoubtedly extends northward. A closely allied species, *Podura humicola*, is found in Greenland.

While the spiders do not belong to the true insects, but constitute a separate class known as Arachnida, they are very frequently referred to in connection with insects. Spiders are distinguished by having four pairs of legs, the head and thorax united, forming the cephalothorax and an unsegmented abdomen. Eleven species have been recorded, including several of the genus Lycosa, or running spiders, two of the "orb-weavers" (*Epiera*), and a "tube-weaver" (*Clubiona*). A Myriopoda (*Millepede*) is recorded from Square Island.

The Beetles

BY JOHN D. SHERMAN, JR.

A LIST of the beetles and other insects of Labrador was published as long ago as the summer of 1888 by the late A. S. Packard of Brown University, and reprinted in his book, *The Labrador Coast*. This list included about sixty different kinds of beetles collected at various places along the coast, many of them gathered by himself in 1860 when he made his first trip to Labrador, and most of the others by Dr. Robert Bell. Even before Packard's visit to Labrador, several insects from the Hudson Bay region had been mentioned and described by the well-known British entomologist, Kirby. This was in 1837.

During the last two or three years the writer, through the kind assistance of Dr. Grenfell, has had the good fortune to receive a

large number of Labrador beetles from correspondents living at the following points: West St. Modest (Ernest Doane), Red Bay (W. Y. Pike), Cape Charles (Albert Pye), Nain (Chesley Ford), Nachvak (George Ford), and Fort Chimo (Duncan Matheson).

These men, without any previous experience in insect collecting, succeeded in finding seven or eight thousand beetles representing over eighty distinct species, some of them less than one-sixteenth of an inch long. Their success in this occupation of hunting beetles — an unusual one to say the least — seems truly remarkable, and the men selected by Dr. Grenfell certainly lived up to his opinion of their cleverness and very much more than fulfilled my own expectations.

A very large percentage of the beetles sent to me from Labrador have been feebly developed, and I have noticed the same condition in collecting beetles, particularly water-beetles, above the tree line in the White Mountains. So it would seem that insect life in these cold countries does not attain the average and normal full development found in our warmer climates.

Beetles are at once separated from all other insects by their hard shell and elytra, two horny wing covers meeting on the back in a straight line and covering the real wings, which, like those of flies and wasps, are formed of delicate membranes. In some beetles these real wings are only feebly developed, being but little used, and a few species have no true wings at all, but only the hard wing covers.

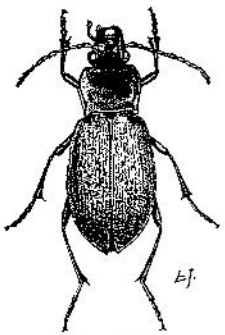


FIG. 19.
Carabus chamissonis.

More than one-third of all the known Labrador beetles belong to one family (Carabidæ). The species of this family are carnivorous, feeding on other forms of animal life, and are commonly called ground beetles, as they are usually found upon the surface of the ground, under stones, logs, or dead leaves, or around the roots of plants, in moss, and in similar places. The Labrador forms are all of dark colours, though a few have a metallic lustre, and nearly all are of graceful form.

A typical Labrador beetle of this family is shown in Figure 19. It is an opaque black insect a little over half an inch long, and it is known to scientists as *Carabus chamissonis* Fisch. This beetle, like a great many others of the Labrador species, is found in Alaska, and above the tree line on Mount Washington. It occurs also in Greenland.

A large number of the beetles of Labrador are generally distrib-

uted throughout the northern part of America, occurring throughout Canada, on the shores of Lake Superior, and on our high mountains, both the White Mountains and the Rockies. Several of them are found in the Arctic regions of Europe and Asia as well. It is not strange that forms of life sufficiently hardy and sturdy to live in these far northern countries have been vigorous enough to spread over such a large territory.

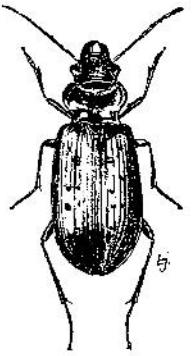


FIG. 20.
Pelophila ulkei.

The insect represented in Figure 20 (*Pelophila ulkei* Horn), on the other hand, is, so far as known, peculiar to the Labrador country and the Hudson Bay region, though a closely allied form is found in Alaska. The Labrador species is about three-eighths of an inch long, and, though entirely black, is of peculiarly graceful form. It is quite flat, and slender and very shining, and has several distinct punctures and tubercles upon the wing covers. Another beetle of the same genus (*Pelophila rudis* Lec.) is also found in Labrador, though it is very rare. It is about the same size as the former species, but the outer border of the wing cases is dark red. The mere difference of colour does not, of course, make it a different species, but these two beetles can easily be separated in this way, without recourse to more scientific distinctions.

Several of the Labrador Carabidæ belong to the genera Pterostichus and Amara, and are proportionately more elongate and narrower than the two beetles illustrated. Most of these species are of blackish colours, but there is one kind (*Amara similis* Kirby) which is often metallic green or purple on the upper side of the body, with reddish legs. *Amara similis* is another one of the Labrador forms found in Mount Washington, and it has recently been found in the Green Mountains of Vermont.

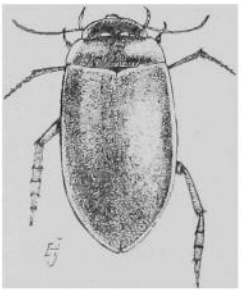


FIG. 21.
Agabus arcticus.

In a region where there are so many pools and ponds and so much water, we find that water-beetles are very common indeed. These belong mostly to the family Dytiscidæ, and are, like the ground-beetles, carnivorous, feeding on tadpoles, aquatic insects, and small fish. My desire to obtain two particular members of this family was what first interested me in Labrador insects.

One of these beetles (*Agabus arcticus* Payk) is shown in Figure 21.

It was first described from Lapland, and is very common in Labrador, but occurs nowhere else in America. It is a narrow, slender insect one-quarter of an inch long, yellowish brown, with the head and a band across the thorax (or middle portion of the body) black. The wing cases are quite rough and uneven.

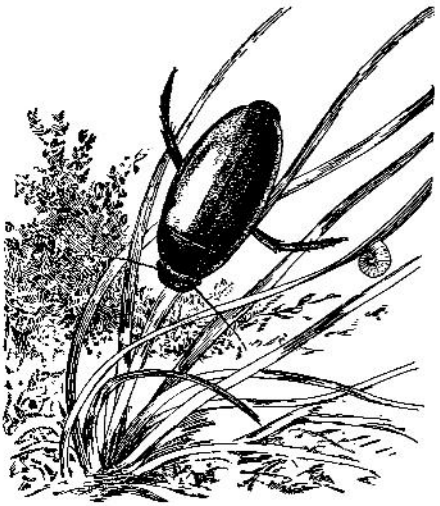


FIG. 22.
Dytiscus dauricus.

The other beetle which I sought in the beginning from my Labrador friends (*Agabus infuscatus* Aube) is apparently even more common there than the one in the illustration. It has been recorded from Mount Washington and Lake Superior, but it is certainly not common at either of these points. It is shorter and more robust than *Agabus arcticus;* the wing covers are brown, the head and thorax black.

The large water-beetle shown in the next figure (No. 22 *Dytiscus dauricus* Gebl) is one of the largest of the Labrador beetles, being an inch and a quarter long. It is greenish black, with the borders of the thorax and of the wing covers yellow. The under side of the body is yellow, with several black lines and markings. The beetles of the genus Dytiscus are probably the most highly developed of all beetles. The males have the three basal joints of the front tarsi (the last segment of the leg) enormously dilated and enlarged into a large circular disk, the under side of which is covered with a large number of palettes, some large, some small. The middle legs are similarly modified, but to a less degree. These disks are of use in enabling the beetle to cling to objects, and are probably also very sensitive organs. The females do not have these disks at all, but, on the other hand, they often have deep grooves or furrows extending longitudinally halfway or more along the wing covers.

While speaking of water-beetles, it is interesting to note that they all possess real wings and are capable of flying great distances. In countries where there are artificial lights, the beetles are often attracted to them and are sometimes found many miles away from any water.

The next beetle which is shown (*Silpha lapponica* Hbst., Fig. 23) belongs to a family whose members are scavengers feeding on decaying animal matter. This beetle is very common in Labrador, living, no doubt, on dead fish. As seen in the illustration, it is rather a square-shaped beetle, black, covered with a yellowish pubescence. It is about five-eighths of an inch long. The wing cases are covered with very prominent small tubercles arranged in rows; the antennæ, or feelers, are thickened at the end as in other allied forms. *Silpha lapponica* occurs nearly everywhere in North America except in the southeastern states. It is an inhabitant of Europe also, but there it is confined to the Arctic regions.

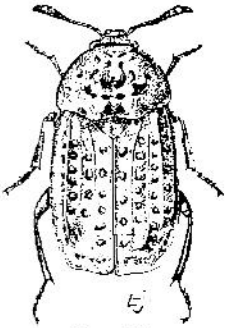


FIG. 23.
Silpha lapponica.

In general the Arctic species are more inclined to extend toward the temperate climates to the south, here in America, than in Europe. The northerly and southerly direction of our American mountain ranges enables the insect forms of the two climates to maintain a geographical connection and specific identity. In Europe, the mountains running from east to west have tended to form a definite boundary for both Arctic and southern species, so that there the allied forms of the two regions have either remained distinct or become so, through separation from one another. This interesting fact was pointed out by Mr. Schwarz some years ago.

Another Labrador beetle quite generally distributed in Europe, Asia, and America, through commerce, is the "bacon beetle" (*Dermestes lardarius* Linn., Fig. 24). The beetle is about one-third of an inch long and brownish black, with a yellow band extending across the front of the wing cases. Its larva lives on preserved animal food products, such as hams, bacon, old cheese, and in dried skins, hair, etc.

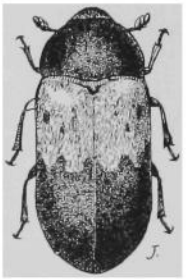


FIG. 24.
Dermestes lardarius.

The last two of Mr. Joutel's figures represent two members of the family Cerambycidæ. Both of these beetles are quite large, and have very long antennæ, or feelers, like the other species of this family.

Criocephalus agrestis Kirby (Fig. 25) is a long, narrow, brownish beetle varying considerably in size, with two or three curious depressions in the thorax, and two longitudinal ridges extending along each wing case. The species is found generally in the northern

parts of our continent from the Atlantic to the Pacific. Its larva feeds on the wood of living pine trees, boring its way out to the surface.

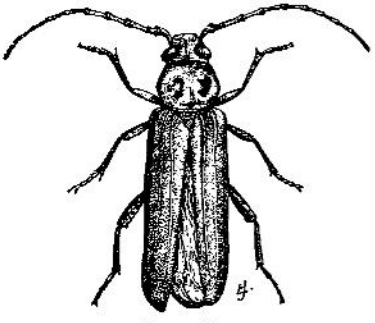


FIG. 25.
Criocephalus agrestis.

Pachyta liturata Kirby (Fig. 26) is not so common as the preceding, but is found over practically the same wide territory. It is much shorter, being only three-quarters of an inch long, and the sides of the body are not parallel, as in that species. The wing cases are light yellow, faintly marked with black, and when folded the insect is very much wider and thicker at the middle of the body than at either extremity. On each side margin of the thorax is a small spine.

Beetles belonging to several other families besides those I have mentioned are found in Labrador. *Byrrhus Americanus* Lec., a small, convex, silky, greenish black beetle was taken by Professor Packard on the stems of the "Labrador tea," and several specimens of this and another smaller, closely allied kind have been sent to me. The beetles of the family Byrrhidæ are common in northern climates, living in mossy places, around the roots of plants, etc.

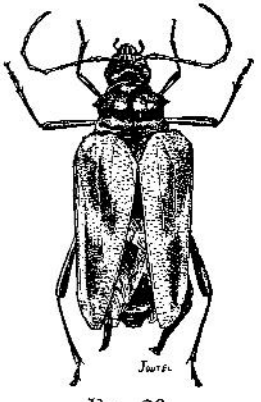


FIG. 26.
Pachyta liturata.

Then there are some small snapping beetles of the family Elateridæ, and some Buprestidæ (whose larvæ are wood-borers). Also some species of weevils which are bark-borers, and a few beetles which we might expect to find upon the blossoms of plants. The regular leaf and plant beetles, however, are conspicuous by their absence, though very likely some of them may be found in Labrador. None were found by Dr. Packard, and I have not received any.

There is no doubt that there are many species of Labrador beetles besides those already known. The additions made to former records by Dr. Grenfell's friends show this clearly enough, and if these men continue the search, we can probably look for many more important captures from this very interesting region.

II

THE MARINE CRUSTACEA

By Mary J. Rathbun

Crustacea are the most conspicuous invertebrate animals on the coast of Labrador by reason of their vast numbers, brilliant colours, swift movements, and diversity of form. The shallow water fauna is most abundant on the northern and southern shores, especially in Ungava Bay and from Hamilton Inlet southward and westward, where the harbours are enriched by the silt of numerous rivers and the land slopes gradually into the sea. Various kinds of Amphipods and other small forms swarm under the rocks and in masses of algæ or in pools of water. Along most of the Atlantic coast, however, the bays are barren and rocky, with little seaweed, and there are few large streams carrying down sediment to form muddy and sandy bottoms; the rocks at the water's edge are precipitous, supporting a narrow line of *Fucus*, which gives shelter only to the common sand-flea. In quiet eddies in the passages between the islands which fringe the coast, conditions are more favourable for the development of life. Here the dredge rewards the collector with spidery crabs and darting shrimps.[1]

The species found in Labrador are not numerous, nor are they peculiar to the peninsula, but in general range from Cape Cod to Greenland, while many extend to Europe or are Arctic in distribution, in not a few cases reaching into Bering Sea and the North Pacific Ocean.

The common shore-crab, or rock-crab (*Cancer irroratus*), of the New England coast is also the shore-crab of Labrador, but has not been found north of Hamilton Inlet. It occurs frequently under stones in the Strait of Belle Isle. Occasionally it is caught and eaten by the natives. The shell is broadly oval, with nine sawteeth on each side, and is speckled with fine red or brown dots; the claws are stout and similar in size and shape, and there are four pairs of smooth, flattened walking feet.

Three other crabs inhabit the coasts of Labrador, but live offshore in depths varying from a few fathoms to fifty or more. They belong to the group popularly known as spider-crabs, on account of their relatively long and slender legs, but differ widely from the

[1] Cf. Packard, *The Labrador Coast.*

common round-bodied spider-crabs of the eastern coast of the United States. The largest (*Chionœcetes opilio*) has a rough, flattened back, semicircular behind and narrowed in front, with a short bifid beak and very long, flat legs armed with small spines. This crab attains a large size, sometimes having a span of over two and a half feet, with the shell itself five inches in width. The smaller species are much alike, and are known as toad-crabs, from a fancied resemblance to that batrachian; their shells are two or three inches long, shield-shaped, one having lateral wings on the forward half (*Hyas coarctatus*), while the other has not (*Hyas araneus*); the beak is short and broad, and split through the middle. Like most of the family to which they belong, they have the habit of attaching to their backs foreign substances, like seaweed, bryozoans, and sponges, which are held in place by hooked hairs on the surface of the crab. In this way the carapace, and the legs also, may become entirely hidden by a miniature forest which serves to protect the crab from its enemies. Nevertheless, many individuals find their way into the stomachs of fishes. This is true not only of crabs and shrimps, but of smaller crustaceans, such as schizopods and amphipods, which are consumed in great quantities by cod and other large fish as well as by whales and shore-birds.

Only two hermit-crabs are known on the coast, but in favourable spots they are abundant from low-water mark to perhaps fifty fathoms. They are quite different in appearance and behaviour from true crabs. The eyes are not incased in sockets or orbits, the antennæ are long, the claws are very unequal in size, — the right (in these species) always the larger, — and the walking legs are four in number. The hinder part of the body is soft, tapering, and asymmetrical, as it has to accommodate itself to the shape of the gasteropod shell which forms the crab's dwelling. Each individual appropriates a dead shell, and is never seen without it except when the increasing size of the inmate compels it to seek a larger tenement. The transfer from one shell to another is made with striking rapidity, the little creature being very active and wary and on the lookout for its stronger enemies. Although it crawls about with the body covered by the shell, and the limbs extruded, yet it is capable of retreating entirely into its domicile and closing the aperture with its claws. The two Labrador species are very similar; one (*Pagurus pubescens*) has claws covered with stout spines and with hairs which retain particles of mud and sand, while the claws of the other (*Pagurus krøyeri*) are rough, with finer and more numerous spines, and are almost devoid of hair; there is a difference, too, in the shape of the left or smaller claw: the outer surface of the prismatic hand-joint is narrow and lanceolate in

P. pubescens, and about four times as long as wide, while in *P. krøyeri* it is obliquely triangular, between two and three times as long as wide. The eyes of *P. pubescens* are longer than those of *P. krøyeri*, so that the slender scale at the base of the outer antennæ does not reach the end of the eye in the former but does in the latter. By far the easiest way to distinguish these two forms is by the colour pattern; in *P. pubescens* the bands of red on the walking feet are disposed across the middle of each segment, while in *P. krøyeri* they run across the articulations between the segments.

The common lobster of New England extends to southern Labrador and occurs in abundance on the coasts of the Gulf of St. Lawrence. It has been found as far north as Henley Harbour (52° north lat.), and extends perhaps a few miles farther. Its absence along the Atlantic coast of Labrador is explained by the lower temperature produced by the Arctic current, which flows southward close to the shore. While many lobsters are trapped in the shallow bays of the southern coast, the catch is not sufficient to supply a cannery. The lobsters appear to be all fished out when the traps are first set, and various attempts to operate canneries have had to be abandoned.[1]

There are fourteen species of shrimps known on the Labrador coast, varying in length from a half inch to four or five inches. They agree in having the abdomen or posterior part of large size, and generally extended to the full length, though sometimes bent at a right angle instead of being folded up under the thorax, as in the crabs. The shrimps are further marked by a spreading tail fan composed of the terminal segment, or tail, and the two pairs of appendages attached to the preceding segment. In one of the most abundant species (*Sclerocrangon boreas*), of a pale brownish red colour with a chestnut stripe along the sides, the skin is hard and rough, the body is stout in front, tapering posteriorly, the tiny claws which arm the first pair of trunk legs are of curious shape peculiar to the family Cragonidæ, the palmar portion being oblong and bearing a small spine in place of the well-known thumb or immovable finger of the lobster and most shrimps, while a slender movable finger lies transversely or across the end of the palm.

One of the largest shrimps is *Pandalus montagui*, which is abundant especially in weeds on a clear, pebbly bottom; it is compressed laterally and armed with a long, slender, swordlike rostrum or beak, with a row of sharp spines on its middle line; the antennæ may be as long as the rest of the animal, and the legs are all slender without conspicuous claws. The red colour which plays a promi-

[1] *Cf.* Herrick, *The American Lobster*, in Bull. U. S. Fish Comm. for 1895, pp. 14–15.

nent part in all these shrimps is here arranged in obliquely transverse lines or bars on the body, and in specks, blotches, or rings on the legs.

In the numerous species of *Spirontocaris*, the body is shaped as in the preceding, but the beak is much shorter and variously shaped and toothed, but always thin and compressed. The first pair of legs have small but well-defined claws; those of the second pair are notable in being very slender and in having the wrist or antepenultimate segment divided into many small pieces jointed together and tipped with a minute claw.

Besides the true shrimps there swarm at the surface numbers of transparent schizopods, or cleft-footed shrimps, known as *Mysis*, which swim in immense shoals, and form the main food of the sea-trout. These shrimps are of small size, an inch or less in length, with large, dark eyes, and have seven instead of five pairs of trunk-legs, devoid of claws, but each provided with an appendage adapted for swimming. The eggs are carried by the female in a marsupial pouch beneath, which has suggested the name of "opossum-shrimp."

The Cumacea are still smaller crustaceans, half an inch or less in length, distinguished by having the anterior half very robust, the posterior half slender, the eyes sessile, not stalked as in the crabs and shrimps, the carapace leaving five segments of the trunk exposed, the antepenultimate segment of the body the longest, the tail fan composed of three branches. They are abundant in sand at the depth of a few fathoms.

The Phyllocarida, or leaf-shrimps, so called on account of the laminar or leaflike expansions with which their legs are provided, are represented by *Nebalia bipes*, which was dredged by Dr. Packard at the mouth of Henley Harbour in four to twenty fathoms. This little creature, less than an inch in length, is most remarkable for the great size of its ancestors, whose paleozoic remains measure nearly two feet.

The Amphipods, or sand-fleas, are by far the most abundant of the Crustacea, both in species and individuals. They are found on the sand near high-water mark, in seaweed, and among rocks in shallow water, and may be dredged at any depth. None is of large size; individuals range from about one-eighth of an inch to an inch. Many of them hop like fleas. Others move rapidly while lying flat. They act as scavengers, often nearly consuming a dead fish before it can be hauled in. They are sessile-eyed, laterally compressed, somewhat crescent-shaped, with rounded backs, and usually of stout build. An exception is the slim skeleton-shrimp, *Caprella*, which clings to finely branched seaweed and is so flexible that it can bend itself into a ring. Another

slender form (*Ericthonius difformis*) inhabits the delicate tubes of a hydroid, while a third (*Hyperia medusarum*), as its name signifies, lives in the stomach cavity of a jellyfish. The *Euthemisto* is a surface-swimming amphipod, and in sufficient numbers forms an acceptable meal for hungry fishes, as examination of their stomachs has proven. *Gammarus locusta*, the common amphipod, or scud, is the most noticeable species of the shore, being very abundant between tide-marks. These creatures are of an olive brown or light chestnut-brown colour, much like that of the *Fucus* they inhabit. They skip about on their sides, and on entering the water swim rapidly with the back downward or sideways.

The isopods, unlike the amphipods, are flattened above, and are usually of a uniform width throughout their length; in many cases all their legs are about the same size, whence the name "isopod." They also have sessile eyes and are usually of small size, the largest ones in the Labrador fauna being the two *Mesidotea*, which are about three inches long and taper at the posterior end to a sharp point. The most slender form is *Arcturus baffini*, which may attain a length of nearly two inches, with antennæ even longer. Several species are parasitic, as the fish-louse, *Æga psora*, which lives on the skin of the cod and halibut; the shrimp parasite, *Phryxus abdominalis*, a hemispherical, distorted little lump of an isopod occurring under the abdomen of various species of *Spirontocaris* and *Pandalus;* and a similar but smaller form which attaches itself to the schizopod, *Mysis oculata*. The last two isopods exhibit great sexual dimorphism, the females being vastly larger than the males and of wholly different appearance. Other parasites belong to different orders of Crustacea.

The copepods live mostly on the external surface or in the gill cavity of fishes, to which they cling by means of claws and sucking disks. They are represented by *Lepeophtheirus salmonis*, parasitic on salmon and sea-trout. This species is distinguished in the female by a metallic lustre and by long, slender egg strings. Another species is *Lernæa branchialis*, variety *sigmoidea*, in which the female is fixed in one position for life, having lost all trace of appendages save those which fasten her to the host, while the male is reduced to minute size, and, although capable of motion, adheres to some part of the body of the female.

Occasionally a hermit-crab is infested with one of the Rhizocephala (*Peltogaster*), parasites which are allied to the Cirripedia, or barnacles, but are degenerate forms with saclike, unsegmented bodies without limbs; their antennæ are modified into rootlike processes, which bury themselves in the host, from which they derive nourishment.

The barnacles reported from Labrador all belong to the sessile

variety known as acorn-shells. They are found here, as everywhere, incrusting stones, wharves, shells, and other objects. The body of the animal is surrounded by a shell, composed of six or more plates, and in the shape of an irregular cone with the top cut off; the base of the cone is attached to the object incrusted, while the small end is closed by a shelly operculum which may be opened at will. The feathery tentacles, which are modified feet, are then extended and kept constantly waving. The smallest species, *Balanus balanoides*, is the commonest, and is known as the rock-barnacle. A large species, *Coronula diadema*, two inches in diameter and with a very thick shell, lives on the surface of whales. *Balanus porcatus* has been found fossil at Hopedale and Caribou Island in beds of sandy clay and coarse gravel which are exposed between tide-marks and extend beneath the water.

It seems not inappropriate to include in our list two forms which live in pools of fresh water close to the sea; one of these is a schizopod, *Mysis relicta*, which also inhabits Lake Superior, Lake Michigan, and the lakes of northern Europe. It is so closely related to a certain marine form as to suggest a common origin. At Indian Tickle abound the "fairy shrimps," or branchiopods, in which the gills or branchiæ are situated on the feet, the eyes are large and stalked, and the tail is long and slender. These shrimps are able to live in pools which are dry for long periods, as the eggs, when dried, preserve their vitality for an indefinite time. They swim with the back downward, and the gills are bright orange.

III

THE MOLLUSKS

By Charles W. Johnson

The summer visitor, or even the native Labradorian, can know little about the mollusks of Labrador unless he be provided with suitable appliances for dredging in moderate depths of water. The great mass of pack-ice which bounds the shore for a large portion of the year is a destructive agency, preventing the possibility of existence of what, in more southern latitudes, is termed the *littoral fauna*. Beyond the area affected by the ice, however, there is a rich and varied fauna, with constant surprises awaiting the collector with suitable facilities for dredging. Not only is the number of species quite large, but these are also, in many cases, individually abundant. Occasionally one of the larger, rare gasteropods finds its way into the dredge, alluring one to further activity, with the prospect of new species in this comparatively neglected region. The fauna is Arctic, the southern boundary of the Arctic province being the limit of floating ice, which on the Atlantic coast of North America extends to southern Newfoundland. Many of the species are circumpolar in their distribution, or represented by closely related forms or local variations, having undoubtedly a common origin.

Several annotated catalogues of the mollusks of Labrador have been published. Professor A. S. Packard, in 1863 (*Canadian Naturalist and Geologist*, Vol. VIII, p. 412), published "a list of the animals dredged near Caribou Island, southern Labrador, during July and August, 1860." The list contains seventy-eight species of mollusks. In 1867, Professor Packard (*Memoirs Boston Soc. Nat. History*, Vol. I, p. 262) published in connection with a paper on the glacial phenomena of Labrador "a view of the recent invertebrate fauna" in which are recorded one hundred and eight species of mollusks. Miss Katherine J. Bush, in 1883 (*Proceedings U. S. Nat. Museum*, Vol. VI, p. 236), recorded seventy-nine species obtained by the expedition under Mr. W. A. Stearns in 1882. The collection was made at various points between Forteau Bay and Dead Island. Again, in 1891, Professor Packard, in his work, *The Labrador Coast*, published a list of one hundred and twenty-nine species, including all those in the previous lists.

There are many other works bearing on the Mollusca of Labrador, including Gould's *Invertebrata of Massachusetts* (2 ed.), 1870; Sars's *Mollusca Regionis Arcticæ Norvegiæ*, 1878; Friele's *Den Norske Nordhavs Expedition, Mollusca;* etc.

The following remarks are based partly on the above papers, and partly on a collection of shells made by Mr. Owen Bryant during the summer of 1908. A partial study of these adds several species to the fauna. Very little is said by writers in regard to the mollusks of this region being used for food. The common clam (*Mya arenaria*) is reported plentiful in the more southern portions, but, living in deeper water, it is no doubt more difficult to obtain than in more southern latitudes, while in the more northern portions of the coast it is probably rare or wanting. The truncated clam (*Mya truncata*), a closely related species, but apparently less abundant, extends farther northward than the common clam. The habit of these two species of burying deep in the mud and sand, with only their long siphons extending to the surface, makes it practically impossible to obtain them by dredging, while flats exposed at low tide and subject to freezing would be too cold for their existence. A smaller shell related to the Mya is the little nestling shell (*Saxicava arctica*), which, living in various-shaped cavities in the rocks, etc., is therefore frequently very irregular in form. They usually measure about an inch, though sometimes reach an inch and a half in length.

There are two scallops which frequent the waters of this region. The great scallop (*Pecten magellanicus*), locally known by the name of "pussel," is found in the Strait of Belle Isle. It is excellent eating, the large adductor muscle being removed and fried in lard or butter. The Iceland scallop (*Pecten islandica*) is found along the entire coast in from ten to fifty fathoms; it is also doubtless good eating, but more difficult to obtain. The edible mussel (*Mytilus edulis*) is reported from the entire coast; it spins numerous silken threads called the byssus, by which it attaches itself to various objects. In some places it is extensively used for food, usually boiled and pickled in spiced vinegar. The horse mussel (*Modiolus modiolus*) is found in the more southern part; it also spins a byssus and nestles in chinks and cavities. The great seaweed, or kelp (*Laminaria digitata*), frequently attaches to this shell and, after attaining its great size, the force of currents and waves tears the shell from its mooring and carries it to other places, or it is ruthlessly cast upon the beach to die. Two other mussels are commonly dredged, the black mussel (*Modiolaria nigra*), and the discordant mussel (*Modiolaria discors*), with part of the valves ribbed and part smooth.

Two species of cockles, or heart-shells, are commonly associated

in from ten to fifty fathoms. The Greenland cockle (*Serripes grönlandicus*) is about three inches in length, nearly smooth, with only a few obsolete ribs on the ends; the young is thin, and beautifully mottled with reddish purple. The hairy heart-shell (*Cardium ciliatum*) is about two inches in length, with about thirty-six acute radiating ribs on each valve. The shell is covered with a yellowish epidermis, forming rows of stiff bristles on the edge of the ribs. The common cockle of Europe (*Cardium edule*) is largely used for food. It is probable that both of these are also edible. Perhaps the most common shell of the coast is *Macoma calcarea*, quantities being brought up with each dredge. When on a muddy or sandy bottom, the thin epidermis is usually eroded, giving the shell a chalky appearance. Another characteristic bivalve of the more northern waters is the little brown clam, Astarte, of which four or five species are to be found along the Labrador coast. They are about an inch to an inch and a quarter in length, somewhat triangular in form, thick, with prominent concentric ridges, and a dark brown epidermis. Related to Astarte is *Venericardia borealis*, which has radiating, instead of concentric, ridges.

Other bivalves which are constantly being caught in the dredge are the little, round, glossy brown *Nucula tenuis*, the polished greenish brown *Yoldia myalis*, and the pointed *Leda pernula* with a greenish epidermis and fine concentric lines. This group can be readily recognized by having numerous minute teeth along the hinge. There are a number of other bivalves which are occasionally brought up by the dredge, including a group with thin, pearly shells, represented by *Thracia myopsis*, *Pandora glacialis*, and *Lyonsia arenosa*.

Some of the rivers and streams of the interior contain the fresh-water clam, or pearl mussel (*Margaritana margaritifera*), a species which is also found in northern Europe and Asia. It sometimes yields very handsome pearls, and I have seen a few beautiful ones, which were said to have come from Labrador.

The Gastropoda, or the univalves, as they are often popularly called, slightly exceed the bivalves in the number of species. They seem, however, to be less abundant individually, especially the larger ones. The most prominent of the larger forms belong to the family Buccinidæ, or whelks. The common whelk (*Buccinum undatum*) is found along the entire coast. In northern Europe, where this species is abundant, it forms an extensive article of food. They make an excellent soup; or boiled, until they can be easily removed from the shell, they can be either fried in fat until brown, or eaten with pepper and vinegar. There are six or seven other species of whelks on the Labrador coast,

including: *Buccinum cyaneum, B. ciliatum, B. gouldi, B. donovani*, and *B. tottenii*, dredged in from five to thirty fathoms, and associated with *Chrysodomus despectus, Tritonofusus kroyeri*, variety *cretaceus*, and *Tritonofusus spitzbergensis* Reeve (*Sipho lividus* Morch). To these Mr. Bryant has added the true *Tritonofusus islandicus* and the large brown *Beringius largillierti* with its big protoconch. *Trophon clathratus* is a slender, waxy, white shell, with about twelve thin, elevated, longitudinal ribs, while between the ribs are numerous slight spiral lines. In almost every dredge, we find the little hairy-keeled shell, *Trichotropis borealis*, and equally common the small, cancellated *Admete couthouyi*, belonging to the family Cancellariidæ. Another conspicuous group of shells, which may appropriately be called the little "tower-shells," is represented by three species, *Turritella erosa, T. reticulata*, and *Turritellopsis acicula*. Professor Packard records a dozen species of Bela, little high-spired shells, the most northern representatives of the family Pleurotomidæ. The little pearly Margaritas are quite common in some localities; *Margarita grœnlandica, M. cinerea, M. argentata*, and *M. helicina* are the principal species. The sea-snails are represented by three species. *Natica clausa* is found in almost every haul of the dredge. It is readily distinguished from the others by having a calcareous opercula, and the umbilicus entirely covered by a callus. *Lunatia heros* is recorded from the Strait of Belle Isle, and *L. grœnlandica* from fifteen fathoms in Chateau Bay. A large and interesting shell is the *Aporrhais occidentalis*, allied to the "pelican's foot" (*Aporrhais pes-pelicani*) of Europe, but having the lip entire and not lobed as in that species. It was dredged in numbers, at Gready and Egg harbours, in seven to twenty fathoms. Three species of limpets are also recorded, *Acmæa testudinalis, A. rubella*, and *Lepta cœca*, the latter being the most plentiful.

A remnant of the littoral fauna, of more southern regions, exists in the presence of a few species of the family Litorinidæ. The "periwinkle," *Littorina litorea*, is reported by Stearns as rare; *L. palliata* is recorded from the Strait of Belle Isle, while *L. rudis* is not uncommon along the whole coast. Living in the crevices of the damp, spray-covered rocks, above the direct effects of the ice, they are able to withstand the Arctic conditions.

Shells are frequently covered with a light pink or reddish coloured, stony algæ (*Lithothamnion polymorphum*), frequently referred to as "Nullipores." Clinging to the rocks and shells covered with this reddish growth, we find the little red chitons, *Trachydermon rubrum* and *Tonicella marmorea*, so closely resembling it in colour as to almost escape detection. This was especially noticeable in the collection made by Mr. Bryant at Gready Harbour, in

twelve fathoms, where the shells were quite thickly covered with the red algæ. Seventeen specimens of both species of the red chitons were obtained. The chitons are now placed in a separate order, Amphineura, and represent the lowest type of the Mollusca. They have a shell consisting normally of eight plates, hence the name *Polyplacophora*, the many-plate bearer, is applied to the most important of the two suborders.

A group of beautiful creatures when living, but very difficult to preserve, are the Nudibranchs, or the naked-gilled Mollusca. The large and handsome *Dendronotus arborescens*, with a row of tree-like gills on each side of the back, and branching appendages on the head, was obtained by Professor Packard in Henley Harbour, at a depth of four fathoms. A species of Eolis is also reported from the same harbour, and *Coryphella diversa* from L'Anse au Loup. A group of small shells, which are usually present in each haul of the dredge, are known as Tectibranchs. They are related to the Nudibranchs, but have the gills covered, and usually a shell varying considerably in form in the different families. *Cylichna alba*, *Retusa pertenuis*, *Philine lima*, *Scaphander punctostriata*, and *Diaphana hiemalis* are the principal species.

Each haul of the dredge brings in many other forms of animal life besides Mollusca. The large brachiopod, *Hypothyris psittacea*, is frequently obtained in from eight to fifteen fathoms, while attached to the shells are a number of species of the beautiful incrusting Polyzoa, or Bryozoa, and the minute Foraminifera.

Among the interesting objects of the more open Arctic sea are the little *Pteropods*, or wing shells. Packard reports great numbers of the little Arctic pteropod *Limacina helicina* off Cape Webuc, and says they are like winged sweet-peas, the shape of the body and colour suggesting the resemblance. Another species, *Clione limacina*, with long wings and bright red tints, belongs to the shell-less group Gymnosomata. They sometimes appear in such numbers as to actually discolour the surface of the water. They are said to afford food for the Greenland whale. The pteropods usually come to the surface in the greatest numbers during the night, and can be caught by using a towing-net.

The land mollusks of Labrador are few and scarce. The slug *Agriolimax agrestis* is reported by Packard from Strawberry Harbour, together with the little *Pupilla hoppii*, *Vitrina angelicæ*, and *Euconulus fulva*, variety *fabricii*. They occur under spruce bark and chips in the damp verdure, and represent the few truly Arctic species found also in southern Greenland.

IV

LIST OF THE MAMMALS OF LABRADOR

By Outram Bangs

At Dr. Grenfell's request I have prepared the following list of the mammals of the Labrador peninsula. As I had before written a list of the mammals of this region,[1] it was very simple to compile the present one, which is merely the old one corrected and brought up to date.

In this list political divisions of the region are disregarded, and the area considered includes the whole Labrador peninsula lying to the northward of a line joining the mouth of the river St. Lawrence and the foot of James Bay.

I am able to say very little about the habits of the various forms of mammalian life, occurring in the great Labrador peninsula, knowing them myself only from museum specimens, but under each species or subspecies the distribution, so far as it is known, is given, the first reference is cited, and where a form was described from Labrador the type locality is mentioned.

I believe the list to be practically complete; the species are all given by the names in current use by the best systematists. I trust it may prove of some help to those interested in the biota of the great peninsula.

1. Balæna glacialis Bonnat.
   Balœna glacialis (Right whale) Bonnat. *Tab. Encycl. Cétalogil.*, p. 3. 1789.
   Formerly common on east and south coasts, now nearly exterminated.
2. Balæna mysticetus Linn. Bow head; Greenland whale.
   Balœna mysticetus Linn. *Fauna Suecica*, Vol. II, p. 16. 1761.
   Hudson Bay and Hudson Strait, along the edge of the ice.
3. Megaptera nodosa Bonnat. Humpbacked whale.
   Balœna nodosa Bonnat. *Tab. Encycl. Cétalogil.*, p. 5. 1789.
   Common on south and east coasts.

[1] *American Naturalist*, Vol. XXXII, No. 379, July, 1898, pp. 489–507.

4. BALÆNOPTERA ACUTO-ROSTRATA Lacép. Little-piked whale.
Balænoptera acuto-rostrata Lacép. *Hist. Nat. Cét.*, Vol. I, p. 197. 1803–4.
Common close inshore along the east and north coasts.
5. BALÆNOPTERA PHYSALUS Linn. Common finback.
Balæna physalus Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 75. 1858.
Common along the coasts.
6. BALÆNOPTERA BOREALIS Lesson. Pollock whale.
Balænoptera borealis Lesson. *Hist. Nat. Cét.*, p. 342. 1828.
A rare species.
7. BALÆNOPTERA MUSCULUS Linn. Sulphur-bottom.
Balæna musculus Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 76. 1758.
Common all along the coast.
8. PHYSETER MACROCEPHALUS Linn. Sperm whale.
Physeter macrocephalus Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 76. 1758.
Very rare in Labrador waters, one record by Packard.
9. HYPEROÖDON AMPULLATUM Forster. Bottle-nosed whale.
Balæna ampullatum Forster. *Kalm's Travels in North Am.*, Vol. I, p. 18. 1770.
Common on the northern coast.
10. DELPHINAPTERUS LEUCAS Pallas. White porpoise.
Delphinus leucas Pallas. "*It.* iii, p. 84, t. iv."
Common everywhere along the Labrador coasts.
11. MONODON MONOCERAS Linn. Narwhale.
Monodon monoceras Linn. Ed. X, p. 75. 1758.
Common all along the Labrador coasts.
12. ORCINUS ORCA Linn. Killer.
Delphinus orca Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 77. 1758.
Common on the east coast.
13. GLOBICEPHALA MELAS Traill. Black fish; pilot whale.
Delphinus melas Traill, *Nicholson's Journal*, Vol. XXII, p. 81. 1809.
Recorded from Newfoundland, probably occurring on the south coasts of Labrador, a migratory species.
14. PHOCÆNA PHOCÆNA Linn. Harbour porpoise.
Delphinus phocæna Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 77. 1758.
Found commonly along the south and east coasts.
15. LAGENORHYNCHUS ACUTUS Gray. Striped porpoise.
Delphinus acutus Gray. *Spicil. Zool.*, p. 2. 1828.
Occurs along south and east coasts.
16. DELPHINUS DELPHIS Linn. Common dolphin.
Delphinus delphis Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 77. 1758.
South and east coasts.
17. TURSIOPS TRUNCATUS Montagu. Bottle-nosed dolphin.

Delphinus truncatus Montagu. *Memos. Wernerian Soc.*, Vol. III, p. 75. 1821.

Common on the south and east coasts.

I am under the greatest obligation to Dr. Glover M. Allen for helping me prepare this list of the Labrador cetaceans. Many of the species were observed and identified by him during a cruise along the coast in the summer of 1906.

18. PARALCES AMERICANUS Clinton. Moose.

Cervus americanus Clinton. *Letters on Nat. Hist. and Int. Resources of New York*, p. 193. 1822.

Low is in doubt whether or not the moose enters the southwestern limits of Labrador. It is occasionally killed in the region about Lake Edward, Quebec.

19. RANGIFER CARIBOU Gml. Woodland caribou.

Cervus tarandus γ. *caribou* Gmelin. *Syst. Nat.*, Vol. I, p. 177. 1789.

Reported by Low to now be very rare, — almost exterminated, — though formerly abundant throughout the wooded regions. Low also says that the destruction of the woodland caribou has resulted in the dying off, from actual starvation, of a large proportion of the interior Indians, which, in its turn, has caused a great increase in the numbers of the fur-bearing animals.

Mr. Ernest Doane took specimens at Black Bay in September, 1898, and sent me three fine adult females and a male.

20. RANGIFER ARCTICUS Richardson. Barren-ground caribou.

Cervus tarandus var. a. *arctica* Richardson. *F. B. A.*, Vol. I, p. 241. 1829.

According to Low, the barren-ground caribou still ranges in immense herds over the barrens and semi-barrens, south to the Mealy Mountains, between Hamilton Inlet and Sandwich Bay.

21. SCIURUS HUDSONICUS HUDSONICUS Erxl. Northern pine squirrel; red squirrel.

Sciurus vulgaris ε. *hudsonicus* Erxl. *Mammalia*, p. 416. 1777.

Type Locality. Hudson Strait.

Common in the wooded regions, and extending into the semi-barrens. Goldthwaite took specimens at Rigolet. Turner took specimens at Fort Chimo and at Forks, Northwest River, and Doane sent me a large series from Black Bay.

22. ARCTOMYS IGNAVUS Bangs. Labrador woodchuck.

Arctomys ignavus Bangs. *Proc. New Eng. Zoöl. Club*, Vol. I, p. 13. 1899.

Type Locality. Black Bay, Labrador.

Common throughout southern Labrador, in the region about Black Bay and L'Anse au Loup.

Low speaks of a woodchuck as common in the country between

Lake St. John and the East Main River; this may possibly be another form, — *Arctomys monax empetra* Pallas.

23. SCIUROPTERUS SABRINUS MAKKOVIKENSIS Sornborger. Labrador flying squirrel.

Sciuropterus sabrinus makkovikensis Sornborger. *Ottawa Naturalist*, Vol. XIX, p. 48. June, 1900.

Type Locality. Makkovik.

Rather generally distributed throughout the wooded region, though apparently not common anywhere. The Labrador form is a very well-marked subspecies.

24. CASTOR CANADENSIS CANADENSIS Kuhl. Canadian beaver.

Castor canadensis Kuhl. *Beiträge zur Zoologie*, p. 64. 1820.

Low says the beaver is common in the wooded regions, and extends into the semi-barrens, where food is found. I have seen no Labrador specimens.

25. MUS NORVEGICUS Erxleben. Brown rat; Norway rat.

Mus norvegicus Erxleben. *Syst. Reg. Anim.*, Vol. I, p. 381. 1777.

Doane took one Norway rat at Black Bay, November 30, 1899. This is the only specimen I ever saw from Labrador. I have never received specimens of the house mouse, *Mus musculus* Linn., from Labrador, though it must undoubtedly occur there.

26. PEROMYSCUS MANICULATUS MANICULATUS Wagner. Labrador deer-mouse.

Hesperomys maniculatus Wagner. *Weigmann's Archiv.*, Vol. XI, p. 148. 1845.

Type Locality. "The Moravian settlements in Labrador."

Common throughout the peninsula south at least to Hamilton Inlet. The Labrador deer-mouse, like many of its congeners, is apt to take up its abode in buildings and huts like the house mouse, and in Labrador seems to be much more abundant in such places than in the woods and among rocks. I have examined very large series of this species.

27. PHENACOMYS LATIMANUS Merriam. Small yellow-faced phenacomys.

Phenacomys latimanus Merriam. *North Am. Fauna*, No. 2, p. 34. 1889.

Type Locality. Fort Chimo, Ungava, Labrador.

Probably of general distribution in the drier semi-barrens. Known from Labrador only by the specimens sent to Washington by Turner.

28. PHENACOMYS CELATUS CELATUS Merriam. Large yellow-faced phenacomys.

Phenacomys celatus Merriam, *North Am. Fauna*, No. 2, p. 33. 1889.

This northern form has, so far as I know, been taken in the Labrador peninsula only at Fort Chimo, Ungava, whence it ranges west at least to Godbout, Quebec.

29. PHENACOMYS CELATUS CRASSUS Bangs. South Labrador phenacomys.

Phenacomys celatus crassus Bangs. *Proc. New Eng. Zoöl. Club*, Vol. II, p. 39. 1900.

Type Locality. Rigolet, Labrador.

This is a southern form occurring in the eastern forest belt from L'Anse au Loup north at least to Hamilton Inlet; it is much larger than true *P. celatus*, being the largest member of the genus yet known.

30. EVOTOMYS UNGAVA Bailey. Ungava red-backed mouse.

Evotomys ungava Bailey. *Proc. Biol. Soc. Wash.*, p. 130. 1897.

Type Locality. Fort Chimo, Labrador.

Probably restricted to the barrens and semi-barrens. Turner reported the species to be abundant at Fort Chimo, but apparently did not send many specimens to Washington.

The differences between this and the next species appear to be as great as between any two members of the genus Evotomys.

31. EVOTOMYS PROTEUS Bangs. Hamilton Inlet red-backed mouse.

Evotomys proteus Bangs. *Proc. Biol. Soc. Wash.*, p. 137. 1897.

Type Locality. Rigolet, Hamilton Inlet, Labrador.

Very abundant at Hamilton Inlet, and probably throughout the wooded regions. Goldthwaite took a large series at Rigolet, and Doane found it very abundant in the woods, in the neighbourhood of Black Bay.

32. MICROTUS PENNSYLVANICUS LABRADORIUS Bailey. Small Labrador vole.

Microtus pennsylvanicus labradorius Bailey. *Proc. Biol. Soc. Wash.*, p. 88. April 30, 1898.

Type Locality. Fort Chimo, Ungava, Labrador.

This little vole probably occurs only in the barrens and semi-barrens. It can be told from *M. enixus* by its smaller size, shorter, more hairy tail, by its smaller, flatter skull, with shorter rostrum and nasals, and smaller, shorter, incisive foramina, differently shaped zygoma, and larger auditory bullæ. There are, probably, colour differences also, but I have seen alcoholic specimens only. Turner took many specimens at Fort Chimo.

33. MICROTUS ENIXUS Bangs. Larger Labrador vole.

Microtus enixus Bangs. *Am. Nat.*, Vol. XXX, p. 105. 1896.

Type Locality. Rigolet, Hamilton Inlet, Labrador.

Probably common throughout all the wooded regions, its range extending north to the semi-barrens and meeting that of *M. pennsylvanicus labradorius*.

Goldthwaite took a large series at the type locality. I have

examined three specimens in the collection of the Geological Survey of Canada, from "50 miles north of Fort George." Turner took quite a number at Fort Chimo, and Doane secured a large series at Black Bay.

34. MICROTUS CHROTORRHINUS RARUS Bangs. Labrador rock vole.

Microtus chrotorrhinus rarus Bangs. *Proc. Biol. Soc. Wash.*, Vol. XII, p. 187. 1898.

Type Locality. Black Bay, Labrador.

Known only from Black Bay, where Doane secured a good series.

35. FIBER ZIBETHICUS AQUILONIUS Bangs. Labrador muskrat.

Fiber zibethicus aquilonius Bangs. *Proc. New Eng. Zoöl. Club*, Vol. I, p. 11. 1899.

Type Locality. Rigolet, Hamilton Inlet.

Common throughout the southern wooded region, and found, though probably not in such abundance, north to the barren and to Fort Chimo.

36. SYNAPTOMYS INNUITUS INNUITUS True. True's bog lemming.

Mictomys innuitus True. *Proc. Nat. Mus.*, Vol. XVII, No. 999. Advance sheet. April 26, 1894.

Type Locality. Fort Chimo, Labrador.

Known at present only by the type.

37. SYNAPTOMYS INNUITUS MEDIOXIMUS Bangs. Intermediate bog lemming.

Synaptomys innuitus medioximus Bangs. *Proc. New Eng. Zoöl. Club*, Vol. II, p. 40. 1900.

Type Locality. L'Anse au Loup.

This form, larger than, and otherwise different from, true *S. innuitus* of Fort Chimo, is at present known only by two specimens, — one, the type from L'Anse au Loup, and the other from Hamilton Inlet.

38. DICROSTONYX HUDSONIUS Pallas. Hudson Bay lemming.

Mus hudsonius Pallas. Glir. p. 203. 1778.

Type Locality. Labrador.

Found throughout the barrens and on the treeless hills, south at least, to Hamilton Inlet.

39. ZAPUS HUDSONIUS LADAS Bangs. Labrador jumping mouse.

Zapus hudsonius ladas Bangs. *Proc. New Eng. Zoöl. Club*, Vol. I, p. 10. 1899.

Type Locality. Rigolet, Hamilton Inlet.

Abundant in the southern wooded region, about Black Bay, etc., and extending northward, along the coast, to beyond Hamilton Inlet.

40. NAPÆOZAPUS INSIGNIS ABIETORUM (Preble). Northern woodland jumping mouse.

Zapus (Napæozapus) insignis abietorum Preble. *North Am. Fauna*, No. 15, p. 36. 1899.

I have seen but one Labrador specimen of this species, a mounted example from the Geological Survey of Canada collection, taken by Low at Hamilton River.

41. ERETHIZON DORSATUM PICINUM Bangs. Labrador porcupine.
Erethizon dorsatus picinus Bangs. *Proc. New Eng. Zoöl. Club*, Vol. II, p. 37. 1900.
Type Locality. L'Anse au Loup, Labrador.

Common and generally distributed from the St. Lawrence, north to the semi-barrens.

42. LEPUS LABRADORIUS Miller. Labrador polar bear.
Lepus labradorius Miller. *Proc. Biol. Soc. Wash.*, Vol. XIII, p. 39. 1899.
Type Locality. Fort Chimo, Ungava.

Of general distribution in the barrens and semi-barrens of Labrador, occasionally reaching so far south as Hamilton Inlet. Turner took specimens at Fort Chimo and Solomon Island.

43. LEPUS AMERICANUS AMERICANUS Erxl. American varying hare.
Lepus americanus Erxl. *Syst. Reg. Anim.*, p. 330. 1777.
Type Locality. South side of Hudson Strait.

Common throughout the wooded region, and extending into the edge of the barrens. Goldthwaite took fourteen specimens at Hamilton Inlet.

44. PHOCA VITULINA Linn. Harbour seal.
Phoca vitulina Linn. *Syst. Nat.*, Vol. I, p. 38. 1758.

Common along the whole coast, and in the lower parts of the rivers. It is also, according to Low, found in many of the fresh-water lakes of the interior, and the Indians assert that these fresh-water seals never leave the lakes. This should be carefully looked into, and it is to be hoped that collectors in Labrador may be able to take some of these fresh-water seals.

One skull in Bangs's collection from Okkak, obtained by Sornborger from the Eskimo.

45. PHOCA HISPIDA Schreber. Ringed seal.
Phoca hispida Schreber. *Säugt.*, Vol. III, p. 312, Pl. LXXXVI. 1775. (*Vide* Thomas. *Zoölogist*, p. 102. 1898.)

Common along the entire Labrador coast.

46. PHOCA GRŒNLANDICA Fabricius. Harp seal.
Phoca grœnlandica Fabricius. *Müller's Zoöl. Dan. Prod.*, Vol. VIII. 1776.

Common along the whole Labrador coast.

47. ERIGNATHUS BARBATUS Fabricius. Bearded seal.
Phoca barbata Fabricius. *Müller's Zool. Dan. Prod.*, Vol. VIII. 1776.

Low reports this seal to be rare in the St. Lawrence and in southern Labrador, but more common northward, — in Hudson Strait, Hudson Bay, and James Bay.

48. HALICHŒRUS GRYPUS Fabricius. Gray seal.

Phoca grypus Fabricius. *Skriv. af. Naturh.-Selsk.*, Vol. I, ii, p. 167, Pl. XIII, Fig. 4. 1791.

Rare along the Labrador coast.

49. CYSTOPHORA CRISTATA Erxleben. Hooded seal.

Phoca cristata Erxleben. *Syst. Reg. Anim.*, p. 590. 1777.

Not common along the Labrador coast.

50. ODOBENUS ROSMARUS Linn. Atlantic walrus.

Phoca rosmarus Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 38. 1758.

Now restricted to northern Labrador, reaching south only to about Nachvak. Formerly abundant along the whole Labrador coast. A fine pair, ♂ and ♀, skulls in Bangs's collection, obtained by Sornborger from the Eskimo at Okkak.

51. LYNX CANADENSIS CANADENSIS Kerr. Canada lynx.

Lynx canadensis Kerr. *Anim. King.*, p. 157. 1792.

Common within the wooded area from the Atlantic coast to Hudson Bay, Low.

52. VULPES RUBRICOSA BANGSI Merriam. Labrador red fox.

Vulpes rubricosa bangsi Merriam. *Proc. Wash. Acad. Sci.*, Vol. II, p. 667. 1900.

Type Locality. L'Anse au Loup, Labrador.

Common throughout the whole of Labrador from the St. Lawrence to Hudson Strait.

53. VULPES LAGOPUS UNGAVA Merriam. Labrador white fox.

Vulpes lagopus ungava Merriam. *Proc. Biol. Soc. Wash.*, Vol. XV, p. 170. 1902.

Type Locality. Fort Chimo, Ungava.

The Arctic fox is abundant in the barren-grounds and extends south to about Lake Michikamaw and to Nichicum. Along both coasts it pushes rather farther south; on the Atlantic to Hamilton Inlet, and rarely even to the Strait of Belle Isle; on the coast of James Bay to its southern part.

Two skulls in Bangs's collection from Hebron, obtained by Sornborger.

54. CANIS OCCIDENTALIS Richardson. Timber-wolf.

Canis lupus, occidentalis Richardson. *F. B. A. Mamm.*, p. 60. 1829.

According to Low, the timber-wolf is now very rare in the southern wooded region, owing to the extermination of the woodland caribou. It is still common in the barrens and semi-barrens of the north.

One skull in Bangs's collection from Hopedale, collected by Sornborger.

55. CANIS ALBUS Joseph Sabine. Arctic wolf.
Canis lupus — albus Joseph Sabine. *Franklin's Narrative.* Appendix, p. 655. 1823.

Occasionally taken in northern barren-grounds, Low.

56. LUTRA CANADENSIS CANADENSIS Schreber. Canada otter.
Mustela lutra Canadensis Schreber. Säugthiere, Pl. CXXVI, B.

Low states the otter to be common throughout the wooded region and to range northward into the semi-barrens. One skull in Bangs's collection from Okkak, Sornborger. Turner sent one specimen to Washington from "Forks," Ungava. (Although it appears in the catalogue, it cannot now be found.) Doane took specimens at Black Bay.

57. MEPHITIS MEPHITICA Shaw. Canada skunk.
Viverra mephitica Shaw. *Museum Leverianum*, p. 172. 1792.

Said by Stearns to be found occasionally on the southern coast of Labrador. I found it common at Lake Edward, Quebec, and it is probable that its range does reach Labrador, though I never have seen a specimen from that region.

58. GULO LUSCUS Linn. American wolverine.
Ursus luscus Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 47. 1758.

Abundant throughout Labrador, especially northward to Hudson Strait.

Two skulls from Okkak in Bangs's collection, obtained by Sornborger. Turner sent one specimen to Washington from Fort Chimo. Doane sent me some beautiful specimens from L'Anse au Loup.

In Labrador the wolverine is usually called "badger."

59. PUTORIUS VISON VISON Schreber. Little black mink.
Mustela vison Schreber. *Säugt.*, Vol. III, p. 463. 1778.

Low says the mink is found only in the southern part of Labrador, seldom occurring north of East Main and Hamilton rivers. Doane sent me four specimens from Black Bay.

60. PUTORIUS CICOGNANII CICOGNANII Bonap. Small brown weasel.
Mustela cicognanii Bonap. *Fauna, Italica, Mamm.*, p. 4. 1838.

Reported by Low to be common everywhere south of tree limit.

Goldthwaite took two specimens, ♂ and ♀, at Rigolet. Turner took one at "Forks," Ungava. Doane sent me a fine series from Black Bay and L'Anse au Loup.

One would expect to find *Putorius cicognanii richardsoni* Bonap. replacing the present form in the western and northern barrens, and very possibly it does, but I have seen no specimens from that region.

61. MUSTELA AMERICANA BRUMALIS Bangs. Labrador marten; sable.
Mustela brumalis Bangs. *Amer. Nat.*, Vol. XXXI, p. 162. February, 1897.

Type Locality. Okkak, Labrador.

Formerly I thought that the marten of southern Labrador would prove to be true *M. americana*, but specimens sent me by Doane from L'Anse au Loup are *M. a. brumalis*, and I now doubt the existence in Labrador of two forms.

The Labrador subspecies is a fine large, dark-coloured marten, and is generally distributed throughout the wooded regions.

62. MUSTELA PENNANTII PENNANTII Erxl. Pennants's marten; fisher.

Mustela pennantii Erxl. *Syst. An.*, p. 479. 1777.

Pennants's marten, according to Low, rarely enters the southwestern limits of Labrador, not occurring east of Mingan nor north of Mistassini.

63. URSUS AMERICANUS Pallas. Black bear.

Ursus americanus Pallas. *Spicil. Zool.*, fasc. XIV, p. 5. 1780.

Ursus americanus sornborgeri Bangs. *Amer. Nat.*, Vol. XXXII, p. 500. 1898.

Type Locality. Okkak, Labrador.

Of general distribution throughout Labrador, north to tree limit.

At one time I thought the Labrador black bear was separable as a subspecies and named it *W. a. sornborgeri*, but since then I have examined a large number of additional skulls and find none of the characters on which I based the subspecies to hold good, most of these skulls being indistinguishable in size or in any other way from skulls from Nova Scotia, Maine, New Hampshire, etc., with which I compared them.

In my former list I included *Ursus richardsoni* Swainson — the barren-ground bear — on the strength of reports that Low had of it from the Nascaupee Indians. I am now inclined to discredit these, so far as Labrador is concerned. Indians everywhere have many traditions that persist in a remarkable manner, and often they are borrowed from tribes that live at a distance. I can find no evidence that the barren-ground bear occurs in the barrens of Labrador, and until it is actually known to be there it must be struck from a list of the mammals of Labrador.

64. THALARCTOS MARITIMUS Linn. Polar bear; ice bear.

Ursus maritimus Linn. *Syst. Nat.*, Ed. XII, Vol. I, p. 70. 1766.

Low says the polar bear ranges south along the Atlantic coast of Labrador occasionally as far as the Strait of Belle Isle, and in Hudson Bay to Charleton Island. The species seldom goes far inland, except to produce its young. Sornborger told me that the polar bear is very common and resident in northern Labrador.

Four skulls in Bangs's collection, all obtained by Sornborger of the Eskimo at Hebron and Okkak.

65. SOREX PERSONATUS MISCIX Bangs. Labrador shrew.
Sorex personatus miscix Bangs. *Proc. New Eng. Zoöl. Club.*, Vol. I, p. 15. 1899.
Type Locality. Black Bay, Labrador.
Common throughout the Labrador peninsula from Fort Chimo south.

66. CONDYLURA CRISTATA Linn. Star-nosed mole.
SOREX CRISTATUS Linn. *Syst. Nat.*, Ed. X, Vol. I, p. 53. 1758.
Goldthwaite saw and fully identified a star-nosed mole that the dogs had caught at Rigolet.
Doane sent me a female from Black Bay, taken October 20, 1898.

67. MYOTIS LUCIFUGUS LUCIFUGUS Le Conte. Little brown bat.
Vespertilio lucifugus Le Conte. *McMurtries' Cuvier*, Appendix, p. 431. 1831.
Low supposed the bats seen by him on Hamilton River and at Lake Mistassini to belong to this species. I took this bat at Lake Edward, Quebec, and Miller (*North Am. Fauna*, No. 13, p. 63) records it from Godbout and Ottawa, Quebec, and from James Bay, Ontario. It is also found in Newfoundland.

68. MYOTIS SUBULATUS SUBULATUS Say. Say's bat.
Vespertilio subulatus Say. *Long's Exped. to Rocky Mts.*, Vol. II, p. 65, footnote. 1823.
Reported by Stearns from Natashquan. Miller (*North Am. Fauna*, No. 13, p. 76) records specimens from Mount Forest and North Bay, Ontario, and Godbout and Ottawa, Quebec.

V

LIST OF THE BIRDS OF LABRADOR

With brief annotations

By Charles W. Townsend, M.D., and
Glover M. Allen, Ph.D.[1]

1. Colymbus holbœlli. Holbœll's grebe.
Rare transient visitor.
2. Colymbus auritus. Horned grebe.
Rare transient visitor; possibly breeds.
3. Gavia imber. Loon.
Common summer resident.
4. Gavia arcticus. Black-throated loon.
Summer resident, not uncommon in the north; rare in the south.
5. Gavia lumme. Red-throated loon; "whabby."
Common summer resident.
6. Fratercula arctica. Puffin; "paroquet."
Abundant summer resident.
7. Cepphus grylle. Black guillemot; "sea-pigeon."
Abundant summer resident.
8. Cepphus mandtii. Mandt's guillemot.
Summer resident.
9. Uria troile. Murre.
Common summer resident in south; a few winter.
10. Uria lomvia. Brunnich's murre.
Common summer resident; a few winter.
11. Alca torda. Razor-billed auk; "tinker."
Common summer resident; a few winter.
[Plautus impennis. Great auk; "penguin."]
Extinct.
12. Alle alle. Dovekie; "bull-bird."
Abundant transient and winter visitor.
13. Megalestris skua. Skua; "sea-hen."
Accidental visitor.
14. Stercorarius pomarinus. Pomarine jaeger; "bo's'n."
Common summer visitor; probably breeds in north.

[1] Vide *The Birds of Labrador*, Proc. Boston Soc. of Nat. Hist., Vol. 33, No. 7, July, 1907.

15. STERCORARIUS PARASITICUS. Parasitic jaeger.
Common summer visitor; perhaps breeds in north.
16. STERCORARIUS LONGICAUDUS. Long-tailed jaeger.
Rare summer resident.
17. PAGOPHILA ALBA. Ivory gull; "ice partridge."
Common winter visitor.
18. RISSA TRIDACTYLA. Kittiwake; "tickler."
Abundant summer resident.
19. LARUS GLAUCUS. Glaucous gull.
Common summer resident; a few winter.
20. LARUS LEUCOPTERUS. Iceland gull.
Rare transient or winter visitor.
21. LARUS MARINUS. Great black-backed gull; "saddle-back."
Common summer resident.
22. LARUS ARGENTATUS. Herring gull.
Common summer resident.
23. LARUS DELAWARENSIS. Ring-billed gull.
Uncommon summer resident, locally in south.
24. LARUS PHILADELPHIA. Bonaparte's gull.
Common transient; autumnal visitor in south.
25. XEMA SABINII. Sabine's gull.
Rare transient visitor.
26. STERNA CASPIA. Caspian tern.
Very rare summer resident in south.
27. STERNA HIRUNDO. Common tern.
Common summer resident in south.
28. STERNA PARADISÆA. Arctic tern.
Common summer resident, locally.
29. STERNA ANTILLARUM. Least tern.
Extirpated.
30. FULMARUS GLACIALIS. Fulmar.
Common summer visitor.
31. PUFFINUS GRAVIS. Greater shearwater.
Abundant summer visitor.
32. PUFFINUS FULIGINOSUS. Sooty shearwater.
Common summer visitor.
33. PROCELLARIA PELAGICA. Stormy petrel.
Rare summer visitor.
34. OCEANODROMA LEUCORHOA. Leach's petrel.
Common summer resident in south.
35. OCEANITES OCEANICUS. Wilson's petrel.
Uncommon summer visitor.
36. SULA BASSANA. Gannet.
Uncommon summer resident, locally.
37. PHALACROCORAX CARBO. Cormorant.
Common summer resident, locally.

38. PHALACROCORAX DILOPHUS. Double-crested cormorant; shag.
Common summer resident, locally.
39. MERGANSER AMERICANUS. American merganser.
Rare summer resident.
40. MERGANSER SERRATOR. Red-breasted merganser.
Common summer resident.
41. LOPHODYTES CUCULLATUS. Hooded merganser.
Rare summer resident.
42. ANAS BOSCHAS. Mallard.
Rare transient visitor.
43. ANAS OBSCURA. Black duck.
Common summer resident.
44. ANAS OBSCURA RUBRIPES. Red-legged black duck.
Common summer resident.
45. MARECA AMERICANA. Baldpate; American widgeon.
Rare transient visitor.
46. NETTION CRECCA. European teal.
Accidental visitor.
47. NETTION CAROLINENSIS. Green-winged teal.
Rare summer resident.
48. QUERQUEDULA DISCORS. Blue-winged teal.
Very rare summer resident.
49. SPATULA CLYPEATA. Shoveller.
Accidental visitor.
50. DAFILA ACUTA. Pintail.
Very rare transient visitor.
51. AYTHYA AMERICANA. Redhead.
Very rare transient visitor.
52. AYTHYA MARILA. Greater scaup duck.
Rare summer resident in northwest.
53. CLANGULA AMERICANA. American golden-eye; whistler.
Common summer resident.
54. CLANGULA ISLANDICA. Barrow's golden-eye.
Rare transient visitor and summer resident.
55. CHARITONETTA ALBEOLA. Buffle-head; "sleepy diver."
Rare transient visitor.
56. HARELDA HYEMALIS. Old-squaw; "hound."
Common summer resident in northern parts.
57. HISTRIONICUS HISTRIONICUS. Harlequin duck; "lord and lady."
Common summer resident in northern parts.
[CAMPTOLAIMUS LABRADORIUS. Labrador duck. Extinct.]
58. SOMATERIA MOLLISSIMA BOREALIS. Northern eider; Greenland eider.
Abundant summer resident north of Hamilton Inlet.

59. SOMATERIA DRESSERI. American eider; "sea-duck"; "metik."
Common summer resident in southern part.
60. SOMATERIA SPECTABILIS. King eider; "king duck."
Abundant transient visitor; not uncommon summer resident in the north.
61. OIDEMIA AMERICANA. American scoter; "butter-bill coot."
Common transient visitor; rare summer resident.
62. OIDEMIA DEGLANDI. White-winged scoter; "brass-wing diver."
Abundant summer resident.
63. OIDEMIA PERSPICILLATA. Surf scoter; "bottle-nosed diver."
Abundant summer resident.
64. ERISMATURA JAMAICENSIS. Ruddy duck.
Uncommon summer resident on shores of Hudson Bay.
65. CHEN HYPERBOREA NIVALIS. Greater snow goose; "wavey."
Very rare summer resident in northwest; common transient visitor on shores of Hudson Bay.
66. CHEN CÆRULESCIUS. Blue goose; "blue wavey."
Common transient visitor on shores of Hudson Bay.
67. ANSER ALBIFRONS GAMBELI. American white-fronted goose.
Accidental visitor.
68. BRANTA CANADENSIS. Canada goose.
Common summer resident.
69. BRANTA BERNICLA GLAUCOGASTRA. White-bellied brant.
Abundant transient visitor locally.
70. OLOR COLUMBIANUS. Whistling swan.
Very rare summer resident in northwest.
71. BOTAURUS LENTIGINOSUS. American bittern.
Very rare summer resident in southwest.
72. ARDEA HERODIAS. Great blue heron.
Accidental visitor.
73. FLORIDA CŒRRLEA. Little blue heron.
Accidental visitor.
74. NYCTICORAX NYCTICORAX NÆVIUS. Black-crowned night-heron.
Accidental visitor.
75. RALLUS VIRGINIANUS. Virginia rail.
Accidental visitor.
76. PORZANA CAROLINA. Sora.
Accidental visitor.
77. FULICA AMERICANA. American coot.
Accidental visitor.
78. CRYMOPHILUS FULICARIUS. Red phalarope.
Common transient visitor; rare summer resident.
79. PHALAROPUS LOBATUS. Northern phalarope.
Common summer resident.

80. GALLINAGO DELICATA. Wilson's snipe.
Rare summer resident.
81. MACRORHAMPHUS GRISEUS. Dowitcher.
Rare transient visitor.
82. TRINGA CANUTUS. Knot.
Uncommon transient visitor.
83. ARQUATELLA MARITIMA. Purple sandpiper.
Rare transient and winter visitor.
84. ACTODROMAS MACULATA. Pectoral sandpiper.
Common autumnal transient visitor.
85. ACTODROMAS FUSCICOLLIS. White-rumped sandpiper.
Common transient visitor.
86. ACTODROMAS MINUTILLA. Least sandpiper; "peep."
Common summer resident.
87. PELIDNA ALPINA SAKHALINA. Red-backed sandpiper; American dunlin.
Uncommon transient visitor.
88. EREUNETES PUSILLUS. Semipalmated sandpiper; "peep."
Common summer resident, locally.
89. CALIDRIS ARENARIA. Sanderling.
Common transient visitor.
90. LIMOSA NÆMASTICA. Hudsonian godwit.
Very rare transient visitor.
91. TOTANUS MELANOLEUCUS. Greater yellow-legs.
Common summer resident.
92. TOTANUS FLAVIPES. Yellow-legs.
Uncommon transient visitor.
93. HELODROMAS SOLITARIUS. Solitary sandpiper.
Uncommon summer resident.
94. TRYNGITES SUBRUFICOLLIS. Buff-breasted sandpiper.
Very rare transient visitor.
95. ACTITIS MACULARIA. Spotted sandpiper.
Common summer resident.
96. NUMENIUS HUDSONICUS. Hudsonian curlew.
Uncommon autumn transient visitor.
97. NUMENIUS BOREALIS. Eskimo curlew; "the curlew."
Formerly abundant autumn transient visitor; now very rare.
98. SQUATAROLA SQUATAROLA. Black-bellied plover.
Common transient visitor.
99. CHARADRIUS DOMINICUS. American golden plover.
Uncommon autumn transient visitor.
100. ÆGIALITIS SEMIPALMATA. Semipalmated plover; "ring-neck."
Common summer resident.
101. ARENARIA MORINELLA. Ruddy turnstone.
Common transient visitor.

102. Hæmatopus palliatus. American oyster-catcher.
Extirpated; formerly summer resident.
103. Canachites canadensis. Hudsonian spruce grouse.
Common permanent resident.
104. Bonasa umbellus togata. Canadian ruffed grouse.
Not uncommon permanent resident in southern part.
105. Lagopus lagopus. Willow ptarmigan.
Common permanent resident in wooded portions.
106. Lagopus rupestris. Rock ptarmigan.
Common permanent resident in treeless portions, except in extreme north.
107. Lagopus rupestris reinhardti. Reinhardt's ptarmigan.
Common permanent resident in the extreme north.
108. Pediocætes phasianellus. Sharp-tailed grouse.
Uncommon, permanent resident in western Labrador.
109. Ectopistes migratorius. Passenger-pigeon.
Formerly very rare, now extirpated.
110. Zenaidura macroura. Mourning dove.
Accidental visitor.
111. Cathartes aura. Turkey vulture.
Accidental visitor.
112. Circus hudsonius. Marsh-hawk.
Very rare summer resident in the south.
113. Accipiter velox. Sharp-shinned hawk.
Very rare summer resident in the south.
114. Accipiter cooperi. Cooper's hawk.
Rare summer resident in the south.
115. Accipiter atricapillus. American goshawk.
Uncommon permanent resident.
116. Buteo borealis. Red-tailed hawk.
Very rare summer visitor.
117. Archibuteo lagopus sancti-johannis. American rough-legged hawk.
Very common summer resident.
118. Aquila chrysætos. Golden eagle.
Very rare permanent resident.
119. Haliaëtus leucocephalus alascanus. Northern bald eagle.
Rare summer resident.
120. Falco islandus. White gyrfalcon.
Common permanent resident.
121. Falco rusticolus. Gray gyrfalcon.
Rare winter visitor.
122. Falco rusticolus gyrfalco. Gyrfalcon.
Rare visitor.

123. FALCO RUSTICOLUS OBSOLETUS. Black gyrfalcon.
Common permanent resident.
124. FALCO PEREGRINUS ANATUM. Duck-hawk.
Common summer resident.
125. FALCO COLUMBARIUS. Pigeon-hawk.
Common summer resident.
126. FALCO SPARVERIUS. American sparrow-hawk.
Rare summer visitor.
127. PANDION HALIAËTUS CAROLINENSIS. American osprey.
Common summer resident in south.
128. ASIO ACCIPITRINUS. Short-eared owl.
Common summer resident.
129. SYRNIUM VARIUM. Barred owl.
Very rare summer visitor in the south.
130. CRYPTOGLAUX TENGMALMI RICHARDSONI. Richardson's owl.
Rare permanent resident.
131. CRYPTOGLAUX ACADICA. Saw-whet owl.
Rare summer resident.
132. MEGASCOPS ASIO. Screech owl.
Very rare summer visitor in southern part.
133. ASIO MAGELLANICUS HETEROCNEMIS. Labrador horned owl.
Common permanent resident.
134. NYCTEA NYCTEA. Snowy owl.
Not common permanent resident.
135. SURNIA ULULA CAPAROCH. American hawk-owl.
Common permanent resident.
136. COCCYZUS ERYTHROPHTHALMUS. Black-billed cuckoo.
Very rare summer visitor in south.
137. CERYLE ALCYON. Belted kingfisher.
Common summer resident in southwest.
138. DRYOBATES VILLOSUS LEUCOMELAS. Northern hairy woodpecker.
Uncommon summer resident in south.
139. DRYOBATES PUBESCENS MEDIANUS. Northern downy woodpecker.
Common permanent resident in southern half.
140. PICOIDES ARCTICUS. Arctic three-toed woodpecker.
Common permanent resident north to tree limit.
141. PICOIDES AMERICANUS. American three-toed woodpecker.
Common permanent resident north to tree limit.
142. COLAPTES AURATUS LUTEUS. Northern flicker.
Uncommon summer resident in southern half.
143. CHORDEILES VIRGINIANUS. Night-hawk.
Common summer resident in south.
144. TROCHILUS COLUBRIS. Ruby-throated hummingbird.
Very rare summer resident.

145. TYRANNUS TYRANNUS. Kingbird.
Rare summer resident in south.
146. SAYORNIS PHŒBE. Phœbe.
Very rare summer resident in south.
147. NUTTALLORNIS BOREALIS. Olive-sided flycatcher.
Very rare summer resident in southwest.
148. EMPIDONAX FLAVIVENTRIS. Yellow-bellied flycatcher.
Common summer resident in southwest.
149. EMPIDONAX TRAILLII ALNORUM. Alder flycatcher.
Not uncommon summer resident in southwest.
150. OTOCORIS ALPESTRIS. Horned lark; shore lark.
Abundant summer resident throughout the Arctic Zone, especially on coast.
151. PERISOREUS CANADENSIS NIGRICAPILLUS. Labrador jay.
Abundant permanent resident in forested regions.
152. CORVUS CORAX PRINCIPALIS. Northern raven.
Common permanent resident.
153. CORVUS BRACHYRYNCHOS. American crow.
Uncommon summer resident in the south.
154. XANTHOCEPHALUS XANTHOCEPHALUS. Yellow-headed blackbird.
Accidental visitor.
155. EUPHAGUS CAROLINUS. Rusty blackbird.
Common summer resident.
156. PINICOLA ENUCLEATOR LEUCURA. Pine grosbeak.
Common summer resident; winters in southern portion.
157. CARPODACUS PURPUREUS. Purple finch.
Common summer resident in south.
158. LOXIA CURVIROSTRA MINOR. American crossbill.
Uncommon summer resident; may winter.
159. LOXIA LEUCOPTERA. White-winged crossbill.
Common permanent resident.
160. ACANTHIS HORNEMANNII. Greenland redpoll.
Abundant winter visitor in the north.
161. ACANTHIS HORNEMANNII EXILIPES. Hoary redpoll.
Abundant permanent resident in the north.
162. ACANTHIS LINARIA. Redpoll.
Abundant permanent resident.
163. ACANTHIS LINARIA ROSTRATA. Greater redpoll.
Common winter visitor; rare summer resident in the north.
164. ASTRAGALINUS TRISTIS. American goldfinch.
Accidental visitor.
165. SPINUS PINUS. Pine siskin.
Uncommon summer resident in the south.
166. PASSERINA NIVALIS. Snowflake; snow bunting.

Abundant summer resident in the north; winter visitor in the south.

167. CALCARIUS LAPPONICUS. Lapland longspur.
Abundant summer resident in the north; winter visitor in the south.

168. PASSERCULUS SANDWICHENSIS SAVANNA. Savanna sparrow.
Very common summer resident.

169. ZONOTRICHIA LEDCOPHRYS. White-crowned sparrow.
Abundant summer resident.

170. ZONOTRICHIA ALBICOLLIS. White-throated sparrow.
Common summer resident in south.

171. SPIZELLA MONTICOLA. Tree sparrow.
Common summer resident.

172. JUNCO HYEMALIS. Slate-coloured junco.
Uncommon summer resident.

173. MELOSPIZA CINEREA MELODIA. Song sparrow.
Uncommon summer resident in southwest.

174. MELOSPIZA LINCOLNI. Lincoln's sparrow.
Common summer resident in south.

175. MELOSPIZA GEORGIANA. Swamp sparrow.
Common summer resident in southwest.

176. PASSERELLA ILIACA. Fox sparrow.
Common summer resident in south.

177. HIRUNDO ERYTHROGASTER. Barn swallow.
Very rare summer resident.

178. IRIDOPROCNE BICOLOR. Tree swallow.
Common summer resident locally.

179. RIPARIA RIPARIA. Bank swallow.
Common summer resident in a few localities.

180. AMPELIS CEDRORUM. Cedar waxwing.
Rare summer resident.

181. LANIUS BOREALIS. Northern shrike.
Not uncommon summer resident.

182. HELMINTHOPHILA RUBRICAPILLA. Nashville warbler.
Very rare summer visitor in the south.

183. HELMINTHOPHILA PEREGRINA. Tennessee warbler.
Not uncommon summer resident in Hudsonian Zone.

184. DENDROICA ÆSTIVA. Yellow warbler.
Common summer resident locally in the south.

185. DENDROICA CÆRULESCENS. Black-throated blue warbler.
Accidental visitor.

186. DENDROICA CORONATA. Myrtle warbler; yellow-rumped warbler.
Common summer resident, chiefly in Canadian Zone.

187. DENDROICA MACULOSA. Magnolia warbler.
Common summer resident in Canadian Zone.

188. DENDROICA CASTANEA. Bay-breasted warbler.
Very rare summer resident.
189. DENDROICA STRIATA. Blackpoll warbler.
Very common summer resident.
190. DENDROICA BLACKBURNIÆ. Blackburnian warbler.
Rare summer resident in the south.
191. DENDROICA VIRENS. Black-throated green warbler.
Common summer resident in the south.
192. DENDROICA VIGORSII. Pine warbler.
Very rare summer resident.
193. DENDROICA PALMARIUM HYPOCHREPEA. Yellow-palm warbler
Rare summer resident in the south.
194. SEIURUS AUROCAPILLUS. Oven-bird.
Rare summer resident in the south.
195. SEIURUS NOVEBORACENCIS. Water-thrush.
Not uncommon summer resident in wooded portions.
196. GEOTHLYPIS TRICHAS BRACHIDACTYLA. Northern yellow throat.
Common summer resident in south.
197. WILSONIA PUSILLA. Wilson's warbler.
Common summer resident in south.
198. WILSONIA CANADENSIS. Canadian warbler.
Rare summer resident in south.
199. SETOPHAGA RUTICILLA. American redstart.
Common summer resident in south.
200. MOTACILLA ALBA. White wagtail.
Accidental visitor.
201. ANTHUS PENSILVANICUS. American pipit.
Abundant summer resident throughout Arctic Zone.
202. OLBIORCHILUS HIEMALIS. Winter wren.
Uncommon summer resident in south.
203. SITTA CANADENSIS. Red-breasted nuthatch.
Uncommon summer resident in south.
204. PARUS ATRICAPILLUS. Chickadee.
Not uncommon summer resident in south.
205. PARUS HUDSONICUS. Hudsonian chickadee.
Abundant permanent resident.
206. REGULUS SATRAPA. Golden-crowned kinglet.
Common summer resident in south.
207. REGULUS CALENDULA. Ruby-crowned kinglet.
Common summer resident in south.
208. HYLOCICHLA FUSCESCENS. Wilson's thrush.
Rare summer resident in south.
209. HYLOCICHLA ALICIÆ. Gray-cheeked thrush; Alice's thrush.
Common summer resident.

210. HYLOCICHLA USTULATA SWAINSONII. Olive-backed thrush.
Common summer resident in southwest.
211. HYLOCICHLA GUTTATA PALLASII. Hermit thrush.
Common summer resident in south.
212. MERULA MIGRATORIA. American robin.
Abundant summer resident.
213. SAXICOLA ŒNANTHE LENCORHOA. Greenland wheatear.
Rare summer resident.

ADDITIONAL SPECIES

Observed by CHARLES W. TOWNSEND, M.D., and A. C. BENT, in 1909.

214. ÆGIALITIS MELODA. Piping plover.
Rare summer resident in south.
215. CYANOCITTA CRISTATA. Blue jay.
Accidental visitor in south.
216. MNIOTILTA VARIA. Black and white warbler.
Not uncommon summer resident in south.

VI

LIST OF CRUSTACEA ON THE LABRADOR COAST

By Mary J. Rathbun

Compiled from various lists published by Dr. Packard,[1] Professor Smith,[2] and Dr. Ortmann,[3] from collections in the U. S. National Museum,[4] obtained by Mr. Lucien M. Turner,[5] in 1882 and 1883, and by Mr. Owen Bryant,[6] in 1908.

Brachyura

Cancer irroratus Say. Hamilton Inlet [7] (Packard); Caribou Island (Packard).

[1] Packard, A. S., Jr., "A List of Animals dredged near Caribou Island, Southern Labrador, during July and August, 1860," *The Canadian Naturalist and Geologist*, Vol. VIII, pp. 401–429, Pls. I–II, December, 1863.

Packard, A. S., Jr., "Observations on the Glacial Phenomena of Labrador and Maine, with a View of the Recent Invertebrate Fauna of Labrador," *Mem. Boston Soc. Nat. Hist.*, Vol. I, pp. 210–303, Pls. VII–VIII, 1867.

Packard, A. S., "Life and Nature in Southern Labrador," *Amer. Nat.*, Vol. XIX, pp. 269–275, 365–372, 1885.

[2] Smith, Sidney I., "List of the Crustacea dredged on the Coast of Labrador by the Expedition under the Direction of W. A. Stearns, in 1882," *Proc. U. S. Nat. Mus.*, Vol. VI, pp. 218–222, 1883.

Smith, Sidney I., "Review of the Marine Crustacea of Labrador," *Proc. U. S. Nat. Mus.*, Vol. VI, pp. 223–232, 1883.

Smith, S. I., "List of Crustacea from Port Burwell collected by Dr. R. Bell in 1884, in Observations on the Geology, Mineralogy, Zoölogy, and Botany of the Labrador Coast, Hudson's Strait and Bay." By Robert Bell. Appendix IV, pp. 57DD–58DD. *Geol. and Nat. Hist. Survey of Canada*, 1884, Montreal. Pp. 1DD–62DD.

[3] Ortmann, A. E., "Crustacea and Pycnogonida collected during the Princeton Expedition to North Greenland," *Proc. Acad. Nat. Sci. Phila.*, Vol. LIII, 1901, pp. 144–168, 1 text figure.

[4] By permission of the Secretary of the Smithsonian Institution.

[5] Determined by Prof. S. I. Smith.

[6] By permission of Mr. Bryant in advance of his report on the expedition.

[7] On p. 203 of *The Labrador Coast*, Packard says that the shore-crab occurs *south of* Hamilton Inlet.

Chionœcetes opilio O. Fabricius. Off northern Labrador, 10–15 fms. in stomachs of fish (Packard); Henley Harbour (Smith); Chateau Bay, 30–50 fms. (Packard); Strait of Belle Isle, 10–50 fms. (Packard).

Hyas araneus Linn. Outside of Hebron, 60 fms., gravel (Bryant); off Fish Island, 75 fms., mud, and Nain, 7 fms., mud (Bryant); Domino Run, 0–1 fm. (Ortmann); Battle Harbour, 12–14 fms. (Ortmann); Henley Harbour (Smith); near Caribou Island, common (Packard); L'Anse au Loup and Forteau Bay, 15–25 fms., sand, kelp, and dirt (Stearns); abundant along the whole coast, 5–50 fms. (Packard).

Hyas coarctatus Leach. Henley Harbour, shallow water and 8 fms. (Smith), 30 fms. (Packard); Temple Bay (Smith); near Caribou Island, common (Packard).

Anomura

Pagurus pubescens Krøyer. Hopedale, 10 fms. (Packard); Egg Harbour, 7 fms., mud (Bryant); Dead Island, 1–3 fms., rocky (Smith); Fox Harbour, 3 fms., sand (Smith); Battle Harbour, 0–1 fm. (Ortmann); Henley Harbour, shoal water (Smith); Temple Bay, 10 fms. (Smith); Strait of Belle Isle, 50 fms. (Packard); L'Anse au Loup, 10–15 fms., sandy (Smith); abundant on the whole coast from low-water mark to 50 fms. (Packard).

Pagurus kröyeri Stimpson. Port Burwell (Smith); Nachvak, in stomach of cod (Turner); outside of Hebron, 60 fms., gravel (Bryant); off Fish Island, 75 fms., mud (Bryant); halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant); Port Manvers, 30 fms., sticky mud (Bryant); Nain, 7 fms., mud (Bryant); Shoal Tickle near (southeast of) Nain (Bryant); Dead Island, nullipore (Smith); Henley Harbour, 3–15 fms. (Smith); Temple Bay, 10 fms., rocky (Smith); not so abundant as *P. pubescens* (Packard).

Macrura

Homarus americanus Milne Edwards. South of Hamilton Inlet (Packard); Henley Harbour, rare (Packard); near Caribou Island, common (Packard).

Crago septemspinosus Say. Caribou Island, very large and abundant on mud flats (Packard).

Sclerocrangon boreas Phipps. Labrador Reef, Ungava (Turner); Port Burwell (Smith); Komaktorvik Bay, 5 fms., rocky

(Bryant); Nachvak, cod stomach (Turner); Egg Harbour, 7 fms., mud (Bryant); Dead Island, 1–3 fms., rocky (Smith), Square Island, 30 fms. (Packard); Henley Harbour, 4–10 fms., one with a *Pontobdella* an inch long attached to under surface (Packard); Strait of Belle Isle, 10 fms. (Packard); Caribou Island, 8 fms. (Packard); L'Anse au Loup, 8–10 fms. (Smith).

Nectocrangon dentata Rathbun = *N. lar* Smith, not Owen. Nachvak[1] (Turner); outside of Hebron,[1] 60 fms., gravel (Bryant); Nain,[1] 7 fms., mud (Bryant); Shoal Tickle [1] near (southeast of) Nain (Bryant), Egg Harbour,[1] 7 fms., mud (Bryant); Dead Island,[2] nullipore (Smith); Square Island,[2] 30 fms. (Packard); Henley Harbour,[1] 10 fms. (Smith); near Caribou Island,[2] 10 fms.,[3] mud, rare (Packard).

Sabinea septemcarinata Sabine. Halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant); Thomas Bay, 15 fms. (Packard).

Spirontocaris grœnlandica J. C. Fabricius. Port Burwell (Smith); Komaktorvik Bay, 5 fms., rocky (Bryant); Nachvak, in cod stomach (Turner); Egg Harbour, 7 fms., mud (Bryant); Dead Island, 1–4 fms. (Smith); Square Island, 15–30 fms. (Packard); Domino Harbour, 7 fms. (Packard); Fox Harbour, 1 fm. (Smith); Strait of Belle Isle, 10 fms. (Packard); Caribou Island, 14 fms. (Packard); L'Anse au Loup, 10–15 fms. (Smith).

Spirontocaris spina Sowerby. Nachvak (Turner); outside of Hebron, 60 fms., gravel (Bryant); Shoal Tickle near (southeast of) Nain (Bryant); Egg Harbour, 7 fms., mud (Bryant); Square Island, 15–30 fms., not common (Packard); Henley Harbour, shoal water and 10–15 fms. (Smith); Temple Bay, rocky (Smith), near Caribou Island, frequent in 10–50 fms. (Packard).

Spirontocaris phippsii Krøyer. Port Burwell (Smith); Komaktorvik Bay, 5 fms., rocky (Bryant); Nachvak (Turner); outside of Hebron, 60 fms., gravel (Bryant); halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant); Shoal Tickle near (southeast of) Nain (Bryant); Battle Harbour, 12–14 fms. (Ortmann); Domino Harbour, 7 fms. (Packard); off Belles Amours, 10 fms., rocky (Packard, as *turgida*); L'Anse au Loup, 8 fms. (Smith).

Spirontocaris polaris Sabine. Labrador Reef, Ungava, pale flesh

[1] Specimens examined by the present writer.
[2] Probably this species.
[3] In Packard's first list (1863) the depths are erroneously given in feet.

colour, not active (Turner); Port Burwell, 68 mm. long (Smith); Nachvak (Turner); outside of Hebron, 60 fms., gravel (Bryant); Dead Island, 3 fms., seaweed (Smith); Square Island, 15–30 fms. (Packard), Strait of Belle Isle, 10 fms. (Packard).

Spirontocaris fabricii Krøyer. Labrador Reef, Ungava (Turner); Port Burwell (Smith); Nain, 7 fms., mud (Bryant); Shoal Tickle, near (southeast of) Nain (Bryant); Egg Harbour, 7 fms., mud (Bryant); Dead Island, 3 fms. (Smith); Fox Harbour, 1 fm. (Smith); Henley Harbour, 10–15 fms. (Smith); Domino Harbour, 7 fms., not common (Packard); L'Anse au Loup, 15 fms., sand, and on rocky bottom (Smith); Forteau Bay, 20 fms. (Smith).

Spirontocaris gaimardii Milne Edwards. Komaktorvik Bay, 5 fms., rocky (Bryant), varying toward *belcheri;* halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant), varying toward *belcheri;* Nain, 7 fms., mud (Bryant), varying towards *belcheri;* Shoal Tickle near (southeast of) Nain (Bryant); Hopedale, 10 fms., (Packard); Egg Harbour, 7 fms., mud (Bryant); Square Island, 30 fms. (Packard); Henley Harbour and Sloop Harbour, 8 fms. (Packard); Caribou Island, 15 fms. (Packard); common (Packard).

Spirontocaris gaimardii belcheri Bell. Nachvak (Turner); off Fish Island, outside of Hebron, 75 fms., mud (Bryant); Henley Harbour, 10 fms. (Stearns), varying toward typical *gaimardii;* L'Anse au Loup, 8–15 fms. (Stearns).

Spirontocaris stoneyi Rathbun. Shoal Tickle, near (southeast of) Nain (Bryant).

Spirontocaris macilenta Krøyer. Off Fish Island, 75 fms., mud (Bryant); halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant); Shoal Tickle near (southeast of) Nain (Bryant); Square Island, 15–30 fms., rare (Packard).

Pandalus montagui Leach. Port Burwell (Smith); Nain, 7 fms., mud (Bryant); Hopedale, 10 fms. (Packard); Egg Harbour, 7 fms., mud (Bryant); Sloop Harbour, 6 fms. (Packard); Henley Harbour, 20 fms. (Packard); Temple Bay, 10 fms., rocky (Smith); L'Anse au Loup, 8–15 fms. (Smith); Forteau Bay, 20 fms. (Smith).

Schizopoda

Mysis oculata O. Fabricius. Port Burwell (Smith); Komaktorvik Bay, 5 fms., rocky (Bryant); Dead Island (Smith); Caribou Island (Packard); swarms in tidal pools and abundant along the whole coast (Packard).

Mysis mixta Lilljeborg. Ungava in stomach of murre, *Uria columba* (Turner); Rigolet, not common (Turner).
Mysis relicta Lovén. Indian Harbour, fresh water (Bryant).

PHYLLOCARIDA

Nebalia bipes Fabricius. Mouth of Henley Harbour, 4–20 fms. (Packard).

CUMACEA

Diastylis rathkii Krøyer. Mouth of Koksoak, Ungava (Turner); Fox Harbour, 3 fms., sand, abundant (Smith); Belles Amours, 6 fms., Thomas Bay, 15 fms., mud, Square Island, 15–30 fms., Henley Harbour, 8 fms., Chateau Bay, Long Island, 15 fms. (Packard); common in 10–50 fms. (Packard).
Diastylis quadrispinosus G. O. Sars. Off Belles Amours, 4–6 fms. (Packard, *The Labrador Coast*, p. 113. Not given, however, in his list of Crustacea and perhaps confused with the preceding).

ISOPODA [1]

Leptochelia filum Stimpson. Caribou Island, 8 fms., sandy, rare (Packard).
Gnathia cerina Stimpson. Chateau Bay, Long Island, 15 fms., sandy (Packard).
Ægа psora Linn. Port Burwell (Smith); Nachvak (Turner); Strait of Belle Isle, on under side of cod (Packard); north shore of Gulf of St. Lawrence (Whiteaves).
Arcturus baffini Sabine. Port Burwell (Smith).
Mesidotea entomon Linn. Nachvak (Turner).
Mesidotea sabini Krøyer. Halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant).
Synidotea marmorata Packard. "Cock Capelin," Gready Harbour (Bryant); Sloop Harbour, Kyuetarbuck Bay, 7 fms., sandy, reddish brown (Packard); Battle Harbour (Ortmann).
Asellus aquaticus Linn. Hopedale and Square Island, common in soil under stones, etc., in company with *Limax* (Packard).
Jæra marina O. Fabricius. Indian Tickle (Packard); Indian Harbour, Sandwich Bay (Packard); Fox Harbour (Smith); Caribou Island, common near high-water mark (Packard); abundant at low water under stones (Packard).

[1] Names revised according to Richardson, "A Monograph on the Isopods of North America," *Bull. U. S. Nat. Mus.*, No. 54, 1905. Isopods in Bryant collection determined by Dr. Harriet Richardson.

Munnopsis typica M. Sars. Halfway from Cape Mugford to Hebron, 60 fms., mud, sand (Bryant); off Beachy Island, between Flint Island and Cape Mugford, 80 fms., soft mud (Bryant).

Phryxus abdominalis (Krøyer). Port Burwell, on *Spirontocaris polaris* (Smith); Nachvak, on *S. polaris* (Turner); off Fish Island, 75 fms., mud, on *S. macilenta* (Bryant); halfway from Cape Mugford to Hebron, 60 fms., mud, sand, on *S. macilenta* (Bryant); Nain, 7 fms., mud on *S. gaimardii* var. (Bryant); Shoal Tickle near (southeast of) Nain, on *S. macilenta* (Bryant); L'Anse au Loup, on *S. gaimardii belcheri* (Stearns).

Dajus misidis Krøyer. Labrador (Packard), probably from *Mysis oculata* (Smith).

Amphipoda [1]

Hyperia medusarum (O. F. Müller). Domino Harbour, found with numerous young in the stomach cavity of *Cyanea arctica* (Packard); Dead Island (Smith).

Euthemisto libellula Mandt. Mouth of Koksoak, Ungava (Turner); lat. 56° north, long. 60° west (Turner).

Socarnes vahli Krøyer. Nachvak (Turner).

Orchomenella minuta Krøyer. Henley Harbour, 10–15 fms. (Smith).

Tryphosa höringii Boeck. Labrador (Packard).

Anonyx nugax Phipps. Port Burwell (Smith); Fox Harbour, 3 fms. (Smith); Dumplin Harbour, Sandwich Bay, 4 fms. (Packard); Henley Harbour, 10–15 fms. (Smith); off Henley Harbour, 40 fms., 3 miles from land, pebbly bottom (Packard); Sloop Harbour, 8 fms. (Packard).

Centromedon pumilus Lilljeborg. Labrador, 15 fms., sand (Packard).

Onesimus edwardsii Krøyer. Atlantic coast of Labrador (Smith).

Pontoporeia femorata Krøyer. Fox Harbour, 1–4 fms. (Smith); Belles Amours, 5–8 fms., muddy, abundant (Packard).

Phoxocephalus holbölli (Krøyer). L'Anse au Loup, 15 fms. (Smith).

Ampelisca macrocephala Lilljeborg. L'Anse au Loup, 10 fms. (Smith); Henley Harbour, 10–15 fms. (Smith); Chateau Bay, 30 fms. (Packard); Stag Bay, 10 fms., hard bottom (Packard); Caribou Island, 8 fms., sand (Packard); Long Island, 15 fms., sand (Packard); Strawberry Harbour, 14 fms., hard (Packard).

Ampelisca eschrichtii Krøyer. Mouth of Koksoak, Ungava (Turner); Ungava Bay, 28 fms. in mud, pale yellow (Turner); Nachvak

[1] Names revised according to G. O. Sars, *An Account of the Crustacea of Norway*, Vol. I, 1895.

(Turner); Chateau Bay, presumably (Smith); Caribou Island, 14 fms. (Packard).

Byblis gaimardii Krøyer. Dead Island, 2–4 fms. (Smith); Henley Harbour, 10–15 fms. (Smith); Temple Bay (Smith); Chateau Bay, 30 fms. (Packard); Chateau Harbour, Long Island, 15 fms., sand (Packard).

Haploops tubicola Lilljeborg. Chateau Harbour, Long Island, 15 fms., sand (Packard); Caribou Island, probably (Smith).

Stegocephalus inflatus Krøyer. Nachvak, in cod stomach (Turner).

Parædiceros lynceus M. Sars. Port Burwell (Smith); Henley Harbour, 10–15 fms. (Smith); Henley Harbour, 4 fms. (Packard); Temple Bay, 10 fms. (Smith); Caribou Island, 8 fms., sand (Packard); L'Anse au Loup, 15 fms. (Smith); Forteau Bay, 20 fms. (Smith).

Pleustes panoplus Krøyer. Port Burwell (Smith); Henley Harbour, 4 fms., among weeds, not uncommon (Packard); L'Anse au Loup, 10 fms. (Smith).

Paramphithoë bicuspis Krøyer. Henley Harbour, probably (Smith).

Acanthozone cuspidata Lepechin. Temple Bay, 10 fms. (Smith).

Acanthonotosoma inflatum Krøyer. L'Anse au Loup, 8 fms., rocky (Smith).

Acanthonotosoma serratum O. Fabricius. Dead Island, shallow water (Smith).

Rhachotropis aculeata Lepechin. Port Burwell (Smith); Nachvak (Turner); Square Island, 30 fms. (Packard); Henley Harbour, 10–15 fms. (Smith); Temple Bay, 10 fms. (Smith).

Halirages fulvocinctus M. Sars. Henley Harbour, 10–20 fms., hard, weedy bottom (Packard).

Apherusa bispinosa Bate. Henley Harbour, 10–20 fms., hard, weedy bottom, rare (Packard).

Calliopius lævisculus Krøyer. Henley Harbour, 4 fms., very abundant (Packard); Stag Bay, 15 fms., on hard, weedy bottom (Packard).

Pontogeneia inermis Krøyer. Square Island, 15 fms. (Packard); Henley Harbour, 4 fms. (Packard); Stag Bay, 15 fms., on hard, weedy bottom (Packard).

Amathilla homari J. C. Fabricius. Labrador Reef, Ungava (Turner); Rigolet (Turner) abundant under stones on beach.

Gammarus locusta Linn. Ungava Bay, amid floating ice (Turner); Labrador Reef, Ungava, abundant under stones among the sand and silt (Turner); mouth of Koksoak, Ungava, common under stones on beach (Turner); Davis Inlet, common (Turner); Port Burwell (Smith); Rigolet (Turner); Fox Harbour, 1–4 fms. (Smith); Gulf coast (Whiteaves); whole coast (Packard).

Melita dentata Krøyer. Square Island, 15–30 fms. (Packard);

Henley Harbour, 10–15 fms. (Smith); Temple Bay, 10 fms. (Smith); Strait of Belle Isle, 15 fms., mud (Packard); Chateau Bay, 20–30 fms. (Packard); near Caribou, 10 feet, mud, sand (Packard).

Amphithoë rubricata Montagu. Henley Harbour, 8 fms. (Packard).

Ericthonius difformis Milne Edwards. Caribou Island, 8 fms., sand (Packard).

Unciola irrorata Say. Henley Harbour (Smith); Caribou Island (Packard).

Dulichia porrecta Bate. Rarely found (Packard).

Caprella linearis Linn. Battle Harbour, 12–14 fms. (Ortmann).

Caprella septentrionalis Krøyer. Henley Harbour (Smith); whole coast, 4–30 fms., among weeds (Packard).

Ostracoda

Cypridina excisa Stimpson. Labrador (Packard).

Copepoda

Lernæa branchialis Linn. var. *sigmoidea* Steenstrup and Lütken. Labrador in Stearns collection (Smith); attached to skin of cod (Packard).

Lepeophtheirus salmonis Krøyer. Ungava Bay, on salmon and sea-trout (Turner); Rigolet, on *Salmo salar* (C. B. Wilson).

Branchiopoda

Branchinecta arctica Verrill. Indian Tickle, north shore of Invuctoke Inlet, abundant in a pool of fresh water (Packard); Indian Harbour (Bryant).

Cirripedia

Balanus porcatus Costa. Whole coast, only in deep water (Packard).

Balanus crenatus Bruguière. L'Anse au Loup, 10 fms. (Smith); whole coast (Packard).

Balanus balanoides Linn. Whole coast (Packard).

Coronula diadema Linn. Taken quite frequently from the skin of whales caught in the Gulf of St. Lawrence (Packard).

Rhizocephala

Peltogaster paguri Rathke. Henley Harbour, on *Pagurus pubescens*, shallow water (Smith).

BOOKS, ETC., ON LABRADOR

Census of Newfoundland and Labrador, 1901. Newfoundland Colonial Secretary, St. John's, N. F., 1903. 2 vols. 8°.

BROWNE, PATRICK WILLIAM. "Where the Fishers Go," *The Story of Labrador*. New York (Cochrane Pub. Co.), 1909. Illus.

BRYANT, HENRY GRIER. *A Journey to the Grand Falls of Labrador*. New York (Century Co.), 1892. pp. 48. 8°.
(From the Geographical Club of Philadelphia, Bulletin No. 2, Vol. 1.)

CABOT, WM. BROOKS. *In Northern Labrador*. Boston (Badger, publisher), 1912. Portraits.

CARTWRIGHT, GEORGE (1739–1819). *Captain Cartwright and His Labrador Journal*, edited by Charles W. Townsend, with introduction by W. T. Grenfell. Boston (Estes & Co.), 1911. Portraits and maps.

Last Cruise of Miranda. Transatlantic Publishing Co., 1893.

CARTWRIGHT, GEORGE. *A Journal of Transactions and Events, During a Residence of nearly Sixteen Years on the Coast of Labrador*. Newark (Allin & Ridge), 1792. 3 vols., portrait and maps. 4°.

CHAPPELL, EDWARD. *Voyage of His Majesty's ship Rosamond to Newfoundland and the Southern Coast of Labrador*. London (J. Mawman, pub.), 1818. 8°.

CILLEY, JONATHAN PRINCE, JR. *Bowdoin Boys in Labrador*. An account of the Bowdoin College Scientific Expedition to Labrador. Rockland, Maine, 1891. 8°

DELABARRE, EDMUND BURKE. Report of the Brown-Harvard Expedition to Nachvak, Labrador, in 1900. Philadelphia, 1902. Maps. 8°. (Reprinted from Bulletin of Geographical Society of Philadelphia, Vol. 3, 1902.)

DURGIN, GEORGE FRANCIS (1858–1905). *Letters from Labrador*. Concord, N. H., 1908. 117 pp.

FISK, WILBUR WARREN. *The Glazier Party in the Wilds of Labrador*. Boston (?), 1902. Broadside. 2 columns, size $13\frac{3}{4}'' \times 6\frac{3}{8}''$.

GRENFELL, W. T. *Labrador; The Country and the People.* New York (Macmillan), 1909.

GRENFELL, W. T. *Vikings of To-day.* London (Marshall), 1895. 8°.

HAYDON, A. L. *Canada at Work and at Play.* With a chapter on Newfoundland and Labrador with introduction by Lord Strathcona. London (Cassel & Co.), 1904. sm. 8°.

HIND, HENRY YOULE. Exploration in the Interior of Labrador Peninsula, the Country of the Montagnais and Nasquapee Indian. London (Longman), 1863. 2 vols., colored plates. 8°.

DUNCAN, NORMAN. *Dr. Grenfell's Parish.* F. H. Revell Co., 1905. 12°.

DUNCAN, NORMAN. *Dr. Luke of the Labrador.* F. Revell. 1903.

HUTTON, SAMUEL KING. *Among the Eskimos of Labrador.* A record of five years' close intercourse with the Eskimo tribes of Labrador. Philadelphia (J. B. Lippincott Co.), 1912. Portraits.

GRENFELL, W. T. *Down to the Sea.* New York (F. H. Revell Co.), 1910.

GRENFELL, W. T. *Off the Rocks.* Philadelphia (S. S. Times Co.), 1906.

GRENFELL, W. T. *Down North on the Labrador.* New York (F. H. Revell Co.), 1911. 229 pp., portrait.

KLEINSCHMIDT, SAMUEL. *Grammatik der grinlandischen sproche mit theilweisem Einschluss des Labradordialects.* Berlin (G. Reimer), 1851. 182 pp., folded table, 8°.

Labrador. "Great Probability, The, of a North West Passage Deducted from Observations on the Letter of Admiral de Fonte." Appendix containing the account of a discovery of part of the coast and inland country of Labrador, made in 1753. London, 1768. xxiv + 153.

STORER, HORATIO ROBINSON. *Observations on the fishes of Nova Scotia and Labrador, with Description of New Species.* (From the *Boston Journal of Natural History*, Oct., 1850.) Boston, 1850. 24 pp., 2 plates. 8°.

United States, Hydrographic Office. Publications, No. 73, 78. *Newfoundland and Labrador* (1884), compiled by W. W. Gillpatrick and John Gibson; (also), supplement No. 1 (corrected to April 1, 1886), compiled by Richard G. Davenport and John Gibson. Washington, 1884–86, 2 vols. 8°.

GOSLING, W. G. *Labrador; Its Discovery, Explanation and Devel-*

opment. New York (John Lane Co.), 1911. Portraits, 22 cm. in 8 maps.

RICHARDS, GEORGE MILTON. Geological notes, microscopical features of the rock specimens. Maps. (In Dillon Wallace, *The Long Labrador Trail.* N. Y., 1907. pp. 289–308.)

United States Coast Survey Sketch showing the Geology of the Coast of Labrador. By Oscar M. Lieber. Washington, 1860.

PACKARD, ALPHEUS SPRING, Jr., M.D. (born 1839). "Observations on the Glacial Phenomena of Labrador and Maine with a View of the Recent Invertebrate Fauna of Labrador. Oct. 5, 1865, illus. two plates. (In Boston Sec. of Natural History, *Memoirs*, Vol. 1, pp. 210, 303. Boston, 1867.)

DALY, REGINALD ALDWORTH. *The Geology of the Northeast Coast of Labrador.* Illustrated. Map. (The Harvard College, Museum of Com. Zoölogy Bulletin. Cambridge, 1902, Vol. 38, pp. 203–270).

GLADWIN, GEORGE E. *Pen and Ink Sketches.* "Coast and Harbors of Labrador, Summer of 1876." Boston (Osgood & Co.), 1877. 32 heliotypes, map. 8°.

United States, Hydrographic Office. North America. East Coast. *Coast of Labrador from Cape St. Charles to Sandwich Bay.* From British surveys to 1882 (chart edition of Sept., 1887). Washington, 1887.

PROWSE, DANIEL WOODLEY, Editor. *The Newfoundland Guide Book, 1905.* Including Labrador and St. Pierre. London, 1905. Maps. 8°.

(SAYER, ROBERT, and BENNETT, JOHN, publishers.) *The North American Pilot for Newfoundland, Labrador.* A collection of 60 charts and plans drawn from original surveys, etc. London, 1779.

WALLACE, DILLON. *The Long Labrador Trail.* New York (The Outing Publishing Co.).

WALLACE, DILLON. *The Lure of the Labrador Wild.* The story of the exploring expedition conducted by Leonidas Hubbard, Jr. Maps. New York (F. H. Revell Co.), 1905. 8°.

TUCKER, EPHRAIM W. *Five Months in Labrador and Newfoundland during the Summer of 1838.* Concord (Boyd & White), 1839. 156 pp. 16°.

United States, Hydrographic Office. *Newfoundland and the Labrador Coast.* 3d edition, 1909. Washington, 1909. 816 pp., 24 cm. in 8.

TOWNSEND, CHARLES WENDELL. *Along the Labrador Coast.* Boston (Dana Estes & Co.), 1907. Maps, portraits. 8°.

TOWNSEND, CHARLES WENDELL. *A Labrador Spring.* Boston, (Dana Estes & Co.), 1910. Plates and 21½ cm.

STEARNS, WINIFRED ALDEN. *Labrador, a Sketch of Its People, Its Industries, and Its Natural History.* Boston (Lee & Shepard), 1884. 12°.

SWEETSER, MOSES FOSTER. *The Maritime Provinces.* A handbook for travellers, a guide to maritime provinces of Canada, also Newfoundland and the Labrador Coast. Boston (J. R. Osgood & Co.), 1875. 16°.

ROUILLARD, OLIVIER EUGENE. "La cote nord du Saint-Lauraut et le Labrador Canadien. Quebec (Laflaunne & Proulx), 1908. 188 pp. 8°.

PACKARD, ALPHEUS, SPRING, Jr., M.D., 1839. *The Labrador Coast.* A journal of two summer cruises to that region with notes on Eskimo, etc. New York (N. D. C. Hodges), 1891. 8°.

PRICHARD, HESKETH-HESKETH (born 1876). *Through Trackless Labrador.* New York (Sturgis & Walton Co.), 1911. Portraits, maps, etc. 8°.

HUARD, VICTOR A. *Labrador et Anticosti.* Montreal (Beauchenim), 1897. Illus., map. 8°.

HUBBARD, MINA BENSON (Mrs. Leonidas). *A Woman's Way through Unknown Labrador.* London (Murray), 1908. Portraits. 8°.

NOBLE, LOUIS LEGRAND. *After Icebergs with a Painter.* A summer voyage to Labrador and around Newfoundland. New York (Appleton & Co.), 1861. 12°.

CANTO, ERNESTO DO. *Quem den o nome ao Labrodor?* Ponta Delgada (Archivo dos Acores), 1894. 23 pp. 4°.

LONG, WM. JOSEPH. *Northern Trails; Some Studies of Animal Life in the Far North.* (Illus. by Copeland.) Boston (Ginn & Co.), 1905. 12°.

These studies were made in Labrador.

STEARNS, WINIFRED ALDEN. *Bird Life in Labrador.* (Cut from the American Field for April 26, Oct. 11, 1890.) New York, 1890.

BIBLIOGRAPHY

Animal Sanctuaries in Labrador. Col. Wm. Wood. Commission of Conservation. Ottawa, 1912.
Through Trackless Labrador. Hesketh Prichard.
Labrador. Professor A. S. Packard, 1891.
Cruise of Neptune. Dr. A. P. Low, 1906.
After Icebergs with an Artist. Wm. Bradford, 1864.
Notes on the Natural History of Labrador. W. H. Stearn, 1875. Robert Bell, 1884.
In an Unknown Land. E. C. Robinson.
Last Cruise of Miranda. Elliot Stoch, 1909.
Bowdoin College Exploration, 1891. A. H. Norton, 1901.
Ornithological Results of Canadian Neptune Cruise.
Expedition to Hudson Bay and Northwest. C. W. Eifrig, 1903–1904.
The Lure of the Labrador Wild. Dillon Wallace.
The Long Labrador Trail. Dillon Wallace.
A Woman's Way in Labrador. Mrs. Hubbard.
Captain Cook. Charts on Record Voyage, 1768.
Captain Cartwright and His Journal. Dana Estes & Co. Charles Townsend, 1911.
Along the Labrador Coast. Dana Estes Co. Charles Townsend, 1911.
A Labrador Spring. Dana Estes and Co. Charles Townsend, 1909.
Journals of Captain George Cartwright. Published in Newark, England, 1792.
Newfoundland and Its Untrodden Ways. J. S. Millais.
Guide to Labrador. D. W. Prowse, 1910.
The Tenth Island. Becks Wilson, 1897.
Audubon. Grant Edwards.
Labrador. Professor A. S. Packard,
Voyages to Newfoundland. Lt. Edward Chappell, R. N. 1818. Mawman, London, publishers.

INDEX