

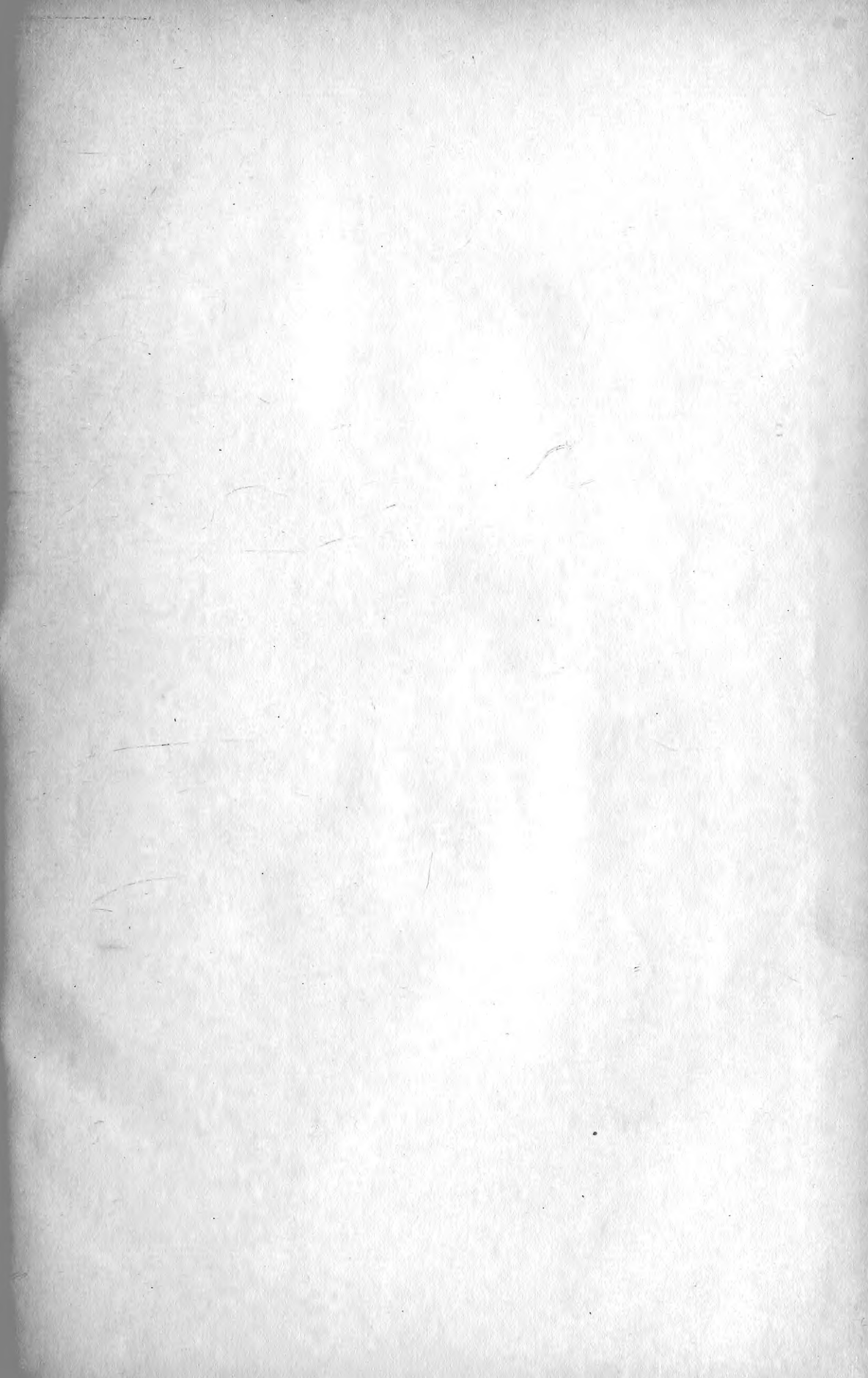
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THE CANADIAN FIELD-NATURALIST



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CONTENTS

	PAGE
The Unnatural History of the Beaver. By Charles Macnamara.....	1
On the Daily Movements of the Coregonine Fishes. By John Lawson Hart.....	8
What is Meant by the Term "Wild Life Conservation?" By J. A. Munro.....	9
An Expedition to Sub-Arctic Canada, 1924-1925. By Capt. J. C. Critchell-Bullock (<i>Continued</i>).....	11
Statement of Financial Standing, Ottawa Field-Naturalists' Club at the Close of the Year, 1929-1930.....	19
Fifty-second Annual Report, Ottawa Field-Naturalists' Club.....	19
Notes and Observations:—	
Nesting of the Lark Sparrow. By E. M. S. Dale.....	21
Lapland Longspurs Singing from Trees. By R. J. Rutter.....	21
Nesting of the Piping Plover (<i>Charadrius meloda</i>) in Alberta. By Frank L. Farley.....	21
Japanese Starling at Alert Bay, B.C. By W. E. Saunders.....	22
Book Review—Bird Picture Cards. By W.E.S.....	22

The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July and August. Its scope is the publication of the results of original research in all departments of Natural History.

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Male Marbled Godwit visiting nest. Female sitting.

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No. 1

THE UNNATURAL HISTORY OF THE BEAVER

By CHARLES MACNAMARA

EVERYBODY speaks highly of the truth, but only a few philosophers and scientists are really satisfied with it. Most people find it dull, and must brighten it with enlivening additions. Probably this is because familiarity breeds contempt. The marvellous is marvellous only at first; when we have lived with it a while it becomes the common-place. Thus the facts about the beaver are wonderful enough, but they will not do by themselves, and there is no animal in the world of which so many untrue stories are told.

The Book of Genesis does not say what Adam called the beasts of the field that were brought unto him to name, and so we do not know if the beaver was among them. Nor is there extant a bill-of-lading of the Ark to inform us if Noah had them in his cargo. As floods are their regular business, it is likely beavers would have scorned the refuge of the Ark. Neither are they mentioned elsewhere in the Bible. Being animals of the cool watery forests of the North, they were unknown to these peoples of the hot and arid South. It seems a pity that Solomon did not know them. If he had, he would probably have directed his sluggard to the beaver instead of to the ant as an example of industry.

But another great Ancient had some acquaintance with them, and Aristotle (384-322 B.C.) in his *Historia Animalium* writes of the beaver with far more scientific restraint than he exhibits with other animals. Quite unimpeachably he says: "The beaver is flatter than the otter and has strong teeth; it often at night time emerges from the water and goes nibbling at the bark of aspens that fringe the riversides." Ancient folklore must have been full of fabulous tales of the beaver, but Aristotle, if he knew them, repeats none of them.

Such reticence was not to be expected of the loquacious Pliny the Elder (A.D. 23-79). With him the unnatural history of the beaver begins. Of course, all he says about the animal is not untrue. With commendable accuracy he states that "with its teeth it can cut down trees on the banks of rivers just as with a knife." And we

cannot blame him much when he relates at great length all the manifold ailments that are cured by "castoreum", a secretion found in a pair of small glands on the beaver's belly. Up to the time of Linnæus, while authors might entitle their works *Historia Animalium*, or *De Natura Animalium* or *Liber Animalibus*, they really discoursed on materia medica rather than on zoology. And to this day castoreum is still a popular remedy, listed in all modern pharmacopœias and even "official" in some of them.

But Pliny transfers to the beaver what Aristotle says about the otter: that when it bites a man ("particularly a hunter" is interpolated fifteen hundred years later by Olaus Magnus) it never lets go until it hears a bone crack. Pliny's chief contribution to our subject however, is the story that the beaver when pursued bites off its castoreum glands (long believed to be its testes) and leaves them for the hunter, hoping he may be satisfied with them and give up the chase. Later, on the authority of a Roman physician, Sextius, Pliny denies the truth of the story. But it was too interesting to be so easily suppressed and it was repeated for many centuries. Claudius Aelianus (ca. A.D. 220) a Latin who spoke Greek so perfectly that he was known as the "Honey-tongued", adorns the story with a few additions. He says that if the beaver after biting off the glands is still pursued, he stands up and shows the hunters that the glands are gone. This was thoughtful of the beaver, as besides saving its own life, it spared the hunters unnecessary trouble; for Aelianus says, "they do not care much for the flesh", and apparently in the third century there was no market for beaver skins. But the beaver could be sly also, and was not above deceiving the poor hunter. "For while still possessing the glands, oftentimes it compresses them so that they cannot be seen, and on exhibiting itself, the hunter thinks they are gone and desists."

The story of the beaver's self-amputation had a great success with medieval writers, and appears in all the Bestiaries of the middle ages, those edifying works that pointed morals for mankind

from the habits, real and mythical, of animals. Phillippe of Thaon, in his Bestiary written about 1130, on the strength of this story, derives the French name of the animal "castor" from "chatre" (castrate). And he draws the allegory that the beaver is the holy man who triumphs over the pleasures of the flesh.

Our next contributor to the beaver's unnatural history is the distinguished Dominican, Albertus Magnus (1206-1280) who besides writing voluminously on scholastic philosophy, summed up in his *Liber Animalibus* all the natural history knowledge of his day. His collected works run to 21 folio volumes, and who has read them these hundred years? To his admirers he was known as "Albert the Great", but his detractors nicknamed him "The Ape of Aristotle". In treating of the beaver, however, he fails to imitate the discretion of his master, and records several fabulous stories. One of the most striking of them, which tells how beavers were supposed to convey building material to their houses, was repeated by natural history writers for the next five hundred years, each author adding a few details of his own. Perhaps the best version is found in *Topsell's Historie of Four-footed Beasts*, first published in London 1608, the text here given being from the second edition of 1658.

"... the tree being down and prepared, they take one of the oldest of their company, whose teeth could not be used for cutting (or as some say, they constrain some strange Beaver whom they meet withal) to fall flat on his back . . . and upon his belly lade they all their timber, which they so ingeniously work and fasten into the compass of his legs that it may not fall, and so the residue by the tail draw him to the water side where these buildings are to be framed: and this the rather seemeth to be true, because there have been some such taken that had no hair on their backs but were pilled; which being espied by the hunters, in pity of their slavery or bondage, they have let them go away free."

In his wearisome poem of antiquarian lore *Polyolbion*, Milhael Drayton (1563-1631) offers an improvement on the crude tail drawing method. He says the beaver keeps the load in place with his tail, while he takes a stick by the middle in his teeth, and

"... at both ends the rest
Hard holding with their fangs unto the labour
pressed
Going backwards towards their homes, their loaded
carriage led."

Albertus also seems to be the first to publish the statement that beavers build their houses of two or three stories with balconies, so as to suit

the varying height of the water. He errs also in asserting that they eat fish as well as bark. But he balks at the story that the beaver never takes its tail out of the water, and that in winter it compels the otter to keep stirring the water around its tail so as to prevent it from freezing. The market for beaver pelts was depressed about the year 1250 when Albertus wrote. He says: "And the skin of the beaver is between black and brown; at one time it was precious, but now is of little value."

The Renaissance may have brought new life to philosophy, literature and art, but it did not do much for zoology. We find the natural historians of the 16th century repeating all the absurdities of the classical and medieval writers, and adding new fictions of their own.

Olaus Magnus (1490-1558) a great Swedish ecclesiastic who lived most of his life in Rome, published his *Historia de Gentibus Septentrionalibus* in 1555. A wonderful storehouse of curious information, this work deals not only with the peoples of the north, as its title might indicate, but with the animals as well. He rehearses much of Aristotle, Pliny and Albertus on the beaver, and records some new and unreliable particulars of his own. For instance, beavers keep their tails and hind legs in the water as a bait for fish. According to the size of the castoreum glands, "as they are either elevated or depressed, farmers prepare their fields in higher or lower places on account of the greater or lesser flooding of the waters." His description of the beaver's tail, as given in an old English translation, reads: "For the tail is scaly like a fish, hard and thick as leather, and is distinguished strangely by many secret knots, and it is most delicate meat and medicine for those that are hurt in their guts." Beaver skins were up again at this time. "The skins of these animals are soft like feathers and therefore valuable, being a wonderful protection against the severity of the cold, and are highly prized garments of great and illustrious men."

The Swiss scholar Konrad Gesner (1516-1565) was a bibliographer, linguist and botanist as well as a zoologist. He undertook a catalogue of all writers who had ever lived, with the titles of their works, and he wrote an account of 130 known languages. His *Historia Animalium* in four folio volumes (Zurich: 1551-1558) is said to mark the starting point of modern zoology, although it is principally taken up with therapeutics. *Topsell's Historie of Four-footed Beastes* is an abridged paraphrase of Gesner in English.

In his chapter on the beaver, which amounts to nine folio pages, Gesner enjoys himself as a linguist in discussing the names of the animal in

ten different languages, and he gives a description of the teeth from an examination he himself made of a captive beaver. But almost all the rest of his matter is copied from other writers, to whom he is very careful to give credit, attributing statements even to *Auctor obscurus* and *Auctor incertus*. An original contribution is the addition of crabs to the beaver's supposed bill of fare, and as a variation on an old theme, he says a person bitten by a beaver "cannot be cured unless he hears the crashing of the teeth."

Gesner has some doubts about the truth of the story that beavers load wood onto one of their fellows and draw him by the tail, but he is inclined to accept it as it is vouched for by "that learned and trustworthy man Olaus Magnus." An *Auctor obscurus* says the beaver is very gentle, but Gesner cannot believe that an animal provided with such sharp and destructive teeth could be gentle by nature or made so by training. He tells how beavers are sometimes captured by breaking open the top of their house and putting in a dog who drives the beaver into a net set at the exit. But according to an *Auctor incertus* the dog sometimes gets the worst of it. To quote Topsell: "Some affirm that she (the beaver) rouseth up her body, and by the strong savour thereof she driveth away the dogs."

Nearly five of the nine pages composing the chapter are taken up with castoreum and other parts of the beaver as medicine. Castoreum was such an universal remedy, the wonder is that any one who could obtain it ever died. Its virtues must suffer from the same fatal exception as those of the mandragora. "The root of the mandragora", says Phillipe of Thaon, "is a sovereign remedy. It cures everything—except death." Gesner himself died of the plague at the early age of 49 years.

A most unmerited stigma is inflicted on the beaver by "that famous Doctor of Physick" John Caius (1510-1573) founder of Caius College, Cambridge, and physician successively to Edward VI, Queen Mary and Queen Elizabeth. Among his many works is a treatise, *De Canibus Britannicis*. In trying to account for a dog mentioned by Beotius called the Fisher, "which seeketh for fish by smelling among rocks and stones", Caius suggests that it might be intended for the beaver which is called a water dog by Aelianus; and he proceeds: "I know likewise thus much more, that the Beaver doth participate this property with the Dog, namely that when fishes be scarce, they leave the water and range up and down the land, making an insatiable slaughter of young Lambs until their paunches be replenished, and when

they have fed themselves full of Flesh, then return they to the water whence they came."

Some more than dubious information is given on the beavers of the River Obi in Siberia by a Russian ambassador, Everard Ysbrandts Ides, who set out from Muscovy in March, 1692, to travel overland to China. An account of his journey appears in a collection of travels edited by Drake, London, 1770. After repeating the old errors that beavers live on fish and make slaves of some of their number, His Excellency introduces a couple of novelties:

"They fell trees with their teeth, which they carry to their dwellings, and there hack out the wood to a certain length, which they artificially fix together, making chests, in which they lay up store of provisions for the winter. When the season approaches in which the females beavers bring forth their young, the whole body of them go together, and frequently gnaw a large tree till it falls down: they then convey it to their holes by the water, and rear it upright before the entrance of the holes, so artificially, that the tree stands perpendicular in the water above four feet deep, and is so firmly fixed, that though the wind blows ever so hard the tree remains in its place."

So far we have been dealing with the Old World beaver, which was generally more valued for its supposed therapeutic properties than for its fur. But with the discovery of America, the fur took on a new importance, and beaver skins were one of the chief exports from the northern colonies. Beavers originally existed in enormous numbers in North America. They were found almost everywhere, and were easy to observe; nevertheless nearly all the accounts of them brought back by explorers and travellers repeat the classic myths with new errors grafted on.

Early European writers, while fairly explicit and mostly wrong on the architecture of the beaver lodge, make no mention of the dam. The Old World beavers they knew seemingly never built dams, or so rarely as to escape common observation. It was not until news began to come out of America that the beaver dam appears in literature.

One of the earliest descriptions is by Nicolas Denys (1598-1688) who spent most of his long and troublous life in Acadia as a trader and titular governor of the coast. In 1672 he published at Paris, a *Description Geographical and Historical of the Coasts of North America, with the Natural History of the Country*. The natural history includes a long account of the beaver, much of which is quite authentic; but Denys exaggerates the intelligence of the animal, setting it above all others, "not excepting even the Ape"; and the

way, according to him, that a beaver colony is organized for work would be creditable to any human enterprise.

The building of a dam, he says, is directed by a head architect, who keeps continually visiting the different parts of the work. Under him are eight or ten commandants supervising the workmen, who may "assemble together as many as two, three or four hundred Beavers and more". The workers are divided into carpenters, masons, masons' labourers, diggers, hod-men and loaders. "Each attends to his trade without meddling with anything else. Each lot of tradesmen has a commandant with them who oversees their work, and shows them how it should be done. If they are neglectful of their duty, he chastises them, beats them, and throws himself on them, and bites them to keep them at their tasks". They have stones to sharpen their teeth on, and they knock off work for dinner from eleven to two. They are alleged to beat the earth on the dam with their tails to harden it. "When they are beating like this with their tails, they can be heard for a league in the woods", apparently a confused reference to the loud alarm signal the beavers make by slapping the water with their tails. Denys says quite correctly that beavers do not eat fish, but live off the bark of the aspen. He thinks, however, that the winter wood supply is stored in the lodge under cover to keep it dry. "If it were to get wet the bark would spoil, and it would be no longer good to eat". In reality the wood is piled in the water close to the house, so as to be readily accessible when the ice forms, and the quantity usually stored is far more than could be stowed away in the lodge.

A comparatively mild offender is the Rev. Père de Charlevoix, S.J. (1682-1761) whose elaborate *History of New France* was published in 1754. He was a professor in the City of Quebec from 1705 to 1709, and travelled extensively throughout the country. He gives a very good description of the pile of wood the beavers store in their pond as a provision for the winter, and he will not accept the statement of the Indians that beavers have an organized government, language and laws. But he says they always fell trees toward the water, an erroneous belief still prevalent; and he lapses in describing their tail as serving for a trowel and a hod to carry mud.

The beaver's naked scaly tail always excited wonder, and before the sun of Linnaeus rose, it determined the animal's place in nature, consigning him to a strange classification. Charlevoix says: "Besides by its Tail, it is wholly a Fish, and it has been judicially declared such by the Faculty of Medecine of Paris, and in consequence of this

Declaration, the Faculty of Theology has decided that its flesh may be eaten on fast days."* However, the reverend fathers could seldom take advantage of this Declaration, as no beavers were to be found near their establishments. As for the beaver meat that the Indians preserved by smoking: "I can assure you, Madam," writes Charlevoix to a correspondent, "I know of nothing Worse."

The monumental *Histoire Naturelle* of George Louis Le Clerc, Comte de Buffon (1707-1788) is renowned for its florid style rather than for its accuracy. Buffon was not a profound investigator himself, and relied largely on the writings of others. Thus his chapter on the beaver is mostly a compilation. He says he rejected stories which "swollen by the marvellous, seemed to go beyond the truth, and even sometimes all probability". But however severe his intention, he failed to draw the line in the right place, and his account of the beaver is full of errors.

A tame beaver sent him from Canada was never given a chance to build a dam or house, and Buffon's observations were confined to its food habits. Consequently he thought beavers build their dam by felling a tree across the stream, and setting stakes up against it which they plant in holes dug in the bottom. Between the stakes they wind branches, and plaster them with mud using their tails as trowels. Their houses of two or three stories are built on piles, and have a window in them which he describes rather obscurely as serving "as a balcony for the enjoyment of the air and to bathe during the greater part of the day; they sit there upright, the head and front parts of the body raised, and all the hind parts plunged in the water; this window is carefully pierced, the opening of it is high enough never to be closed by the ice which in the climate where the beavers dwell is sometimes two or three feet thick; they then lower the sill (tablette) by cutting the piles, and make an opening to the water under the ice."

Their habit of sitting half in and half out of the water seems to have changed the nature of their flesh. "The front parts have the quality, taste and consistence of animals of the earth and air; those of the thighs and tail have the smell, taste and all the qualities of fish. This tail . . . is really a true portion of a fish attached to the body of a quadruped."

Another compiler, and who borrowed a good deal from Buffon, was the English naturalist, Thomas Pennant, (1726-1798). He wrote a

*Deny says: "There are also in these parts three kinds of fish of fresh water which have four feet, the Muskrat, the Otter and the Beaver".

number of large volumes on Zoology, but was more celebrated in his day for his *Tours* in Scotland than for his natural history. His *Arctic Zoology* is mostly copied from other authors, and in the case of the beaver, his selection of some of the material is quite uncritical.

"They have a chief or superintendent in the works, who directs the whole. The utmost attention is paid him by the whole community. Every individual has his task allotted, which they undertake with the utmost alacrity. The overseer gives a signal, by a certain number of sharp taps with his tail expressive of his orders. The moment the artificers hear it, they hasten to the place thus pointed out, and perform the allotted labour whether it is to carry wood, or draw clay or repair any accidental breach. They have also their centinels, who by the same kind of signal, give notice of any apprehended danger. They are said to have a sort of slavish beaver among them (analogous to the drone) which they employ in servile works and domestic drudgery."—a curious confusion of such opposites as a drone and a drudge.

Few of the writers quoted so far pretended to any personal knowledge of the beaver and its habits; they did little more than repeat what others had said. In general their misstatements were not intentional, and were mostly due to carelessness and credulity.

This excuse cannot be offered for the next two authors we come to. Their falsehoods are deliberate, and they describe impossible scenes which they assert they witnessed themselves. First we consider le Sieur Claude Le Beau.

In 1727 a certain Claude Le Beau, a young man of good family, was shipped off from Paris to New France by his relations for some misconduct at home, a common method in those days of disposing of troublesome younger sons, and not unknown even now. Le Beau obtained employment in a government office in Quebec, but did not mend his ways, for in 1730 a reward was offered for his arrest for an unspecified crime. The description of his person is unflattering: "of small size, wearing a brown wig, his face marked with small pox, eyes small, dark and deeply set, and he stutters a little in his speech." Meantime he had fled disguised as a savage, and induced some of the Indians from the village of Lorette near Quebec to take him with them on their travels through what is now the New England States. Here he spent some years, and eventually sailed from the English colonies in a ship for Holland. In 1738 his *Avantures* appeared at Amsterdam in two volumes.

The work shows some acquaintance with the

habits of the Indians, but in detail is quite unreliable. For instance, he asserts he hunted white bears on the banks of the Chaudiere River, and caught trout four feet long in Lake Champlain. His account of the beaver is largely imaginary. One day while his savages were preparing their meal, he says he stole away to the river "in the hope of perhaps seeing some beavers at work there."

"I advanced quietly on all fours, to see without being seen, these beautiful born architects of whom I had heard so many marvels. I was already quite close when a certain noise that I heard, exciting my curiosity more and more, induced me to stand upright behind a large tree, to see more at my ease what caused it.

"It was then that without moving from my place, I saw quite a hundred of these animals occupied on a work as admirable as it was surprising. There were a dozen of them, who pressing close to one another, and standing on their hind feet, were sawing or rather cutting with their teeth a large tree about 12 feet in circumference, whilst more than fifty others were occupied in cutting and trimming the branches of another tree already fallen. . . . The most amusing part to me was to see two seated on their tails, solely occupied in watching the workers and in preventing any advance on the side that the tree which they were cutting ought to fall. Several others a little farther off, seemed to me to act as inspectors or overseers to direct the work, it might be in hurrying the idle, or helping to roll away stones, or to take away the cuttings which sometimes impeded the workers too much, or in reloading those who let the mortar fall, while others finally who represented masons, prepared this same mortar mixed with rich earth which others had brought to them from the bottom of the river, and a little gravel collected on the bank.

"This gravel well hardened or beaten together in this clay as much by their tails as by their feet, would afterwards become hard and keep sound at the bottom of the water, as a cement capable of strengthening their dams, and a mortar fit to build the lodges with."

Giacomo Constantio Beltrami (1770-1855) a political refugee from Italy, found his way out to the American frontier about 1823. In that year he was at Fort St. Anthony on the Mississippi, and there attached himself to the exploring expedition of Major Stephen H. Long, which he accompanied as far as Pembina. In 1824 he published at New Orleans an account of his alleged discovery of the sources of the Mississippi.

A lack of truthfulness that would surprise no one in a politician is a fatal defect in an explorer. Major Long says of Beltrami's work: "He has recently published a book which we notice merely on account of the fictions and misrepresentations it contains."

This indictment is certainly true of what Beltrami says about the beaver. He blandly states that he does not know what others "even Buffon from his closet", have written on the subject; "I will communicate what I have seen and learned on the spot respecting this surprising animal."

He then proceeds to describe the dam as built of sharpened stakes driven into deep holes which the beavers dig in the earth, with branches of trees placed crossways against the stakes and the interstices filled with mortar. "This mortar," he says, "becomes harder than the celebrated cement known among the Romans." This description is obviously copied from Buffon, and such a dam Beltrami can never have seen "on the spot."

Such other high-lights from his account may be quoted. "Their house, built likewise of wood, and plastered, is of two stories and double. It is long in proportion to the number of the tribe that are to inhabit it.

"The first story serves in common, as a magazine for provisions, and is under water; the second is above, and serves them for lodging rooms, where each family has its apartment." "The beavers are divided into tribes, and sometimes into small bands only, of which each has its chief, and order and discipline reign there, much more, perhaps, than among the Indians, or even among civilized nations."

"Their magazines are invariably provisioned in summer, and no one touches them before the scarcity of winter is felt, unless extraordinary circumstances render it absolutely necessary, but never in any case does any one enter except by the authority and in the presence of the chief. Their food consists in general of the bark of trees, principally that of the willow, and of all trees which belong to the poplar family. Sometimes when bark is not found in sufficient quantity they collect the wood, and in this case they cut it into bits with their teeth.

"Each tribe has its territory. If any stranger is caught trespassing he is brought before the chief, who for the first offence punishes him *ad correctionem*, and for the second deprives him of his tail, which is the greatest misfortune that can happen to a beaver, for their tail is their cart, upon which they transport, wherever it is desired mortar, stones, provisions, etc., and it is also the trowel, which it exactly resembles in shape,

used by them in building. This infraction of the law of nations is considered among them as so great an outrage, that the whole tribe of the mutilated beaver side with him, and set off immediately to take vengeance for it.

"In this contest, the victorious party, using the rights of war, drives the vanquished from their quarters, takes possession of them, and places a provisional garrison, and finally establishes there a colony of young beavers. . . .

"The Indians have related to me in a positive manner another trait of these animals, but it is so extraordinary that I leave you at liberty to believe or reject it. They assert, and there are some who profess to have been ocular witnesses, that the two chiefs of two belligerent tribes sometimes terminate the quarrel by single combat, in the presence of the two hostile armies, like the people of *Medieve*, or three against three, like the Horatii and Curiatii of antiquity. Beavers marry, and death alone separates them. They punish infidelity in the female severely, even with death. . . .

"The Great Hare at Red Lake wished to make me believe that, having come to a spot where two tribes of beavers had just been engaged in battle, he found about fifteen dead or dying on the field, and other Indians, Sioux and Chippeways, have also assured me that they have obtained valuable booty in similar circumstances. It is a fact that they have sometimes taken them without tails. I have seen such myself."

The unnatural history of the beaver reaches its high-water mark in Beltrami. No other writer has put forward so many deliberate falsehoods as personal observations. The errors of practically all subsequent authors of any pretention are mere slips due mostly to faulty observation.

What still remains one of the best accounts of the beaver was written a generation before Beltrami by Samuel Hearne (1745-1792) the Hudson's Bay Company employee who first explored the course of the Coppermine River, and was a horrified witness of the massacre by his Indian companions of a party of inoffensive Eskimo at a place near the mouth of the river ever since called Bloody Falls. About the only lapse Hearne makes is in saying that beaver dams are always built with a convex curve upstream so as to resist the current. Later and more extended investigation has shown that this is not the case.

American Natural History (3 vols. Philadelphia, 1826) by John D. Goodman, M.D., Professor of Natural History in the Franklin Institute of Pennsylvania, is a painstaking work. Intended to include all known mammals of North America, it begins quite logically with a treatise on "Homo

sapiens of the American or red variety." Nor is it confined to existing species; it discourses also on the "Giant Sloth", the "Gigantic Mastodon" and the "Fossil Elephant." Godman's chapter on the beaver is almost entirely copied from Hearne, and consequently is in general accurate and reliable. But while he devotes 16 pages to showing up the errors of other writers, and ridicules the oft-repeated statement that beavers use their tail for a trowel, he himself writes: "As soon as any part of the material is placed where it is intended to remain, they turn around and give it a smart blow with the tail."

The same mis-statement is repeated in Lewis H. Morgan's *The American Beaver and its Works* (Philadelphia 1868) the first extensive monograph on the subject, and barring a slip like this, a most admirable book.

No exception can be taken to H. T. Martin's elaborate *Castorologia* (Montreal, 1892) or A. R. Dugmore's finely illustrated book *The Romance of the Beaver* (London, 1914). But Thompson-Seton in his *Life Histories of Northern Animals* (New York, 1909) makes a curious mistake in saying that the beaver "never plasters the lodge with mud outside. All lodges are finished outside with sticks." Evidently at the time he wrote this he had never seen an occupied lodge in the fall or winter.

Enos A. Mills *In Beaver World* (Boston and New York, 1913) has had experience with beavers vouchsafed to no other naturalist, and he attributes far more intelligence to them than other writers will allow.

The Outlines of Science edited by Prof. J. Arthur Thomson (London and New York: 1922) propogates an error in stating that the beaver, "to save itself more trouble than is necessary, will stop when it has gnawed the trunk till there is only a narrow core left, having the wit to know that the autumn gales will do the rest". This work also repeats the popular fallacy that beavers cut deeper into a tree on the side nearest the water; and it remarks artlessly: "There is no doubt that beavers make dams of brushwood, stones and mud, thereby securing a larger area for their wood-cutting and easier conditions of transport."

From my present point of view, *The Beaver, its Works and its Ways* (Baltimore, 1927) by E. R. Warren, is a most unsatisfactory book. I can find nothing wrong in it.

Two last items of unnatural history may be entered in this record. They belong to the body of oral tradition—at least I have never seen them printed in a book. You may hear them from some Truthful James of a shantyman as you sit on a bench in the sun outside a lumber depot, or perhaps as you watch the cook at a drive camp burying his bake kettles in the sand.

One story begins rather remotely about potatoes. Some people can't live without them. Jack Morden was so fond of them that when they ran out in a shanty where he was working on the Petewawa he undertook to carry in a bagful on his back from the Depot, a matter of some 18 miles. It got dark on him when he was only about half way back to the shanty, and wolves began to howl so close behind him, that scared as much for his potatoes as for himself, he climbed a tree and dragged the potatoes up after him. Sure enough, three wolves came down the road, and began jumping around the tree. When they saw they could not reach him they quit after a while, and two of them lay down while the third wolf trotted off. In half an hour he came back with two beavers, who set to work at once to gnaw down the tree. They had quite a big notch in it when a gang of habitants drawing hay to the shanty came along and frightened them and the wolves away. Jack had potatoes for his breakfast in the morning.

The other story is about a tame beaver that belonged to the handyman in Nadeau's shanty the year he was on the Winoway river up above the Quinze. The beaver had the run of the camp, and every night he used to gather up all the socks and moccasins and build a dam with them across the floor. The men did not mind this much, although they used to swear a good deal looking for their moccasins in the morning. But when the beaver took to upsetting the water barrel to see if his dam was tight, he went too far, and was moved out to the handyman's shop for the rest of the winter.

ON THE DAILY MOVEMENTS OF THE COREGONINE FISHES

By JOHN LAWSON HART

THE occupation by fish of an element different from our own unfortunately results in our knowledge of their movements being dependent on circumstantial evidence rather than upon direct observation. The conclusions of the present contribution are drawn from such circumstantial evidence and they are presented in the belief that data better in kind are unlikely to be available.

In order to gain information on the time of day at which fish are most active, a gang of gill nets was lifted at sunrise and sunset each day and was returned to the water in the same place immediately after removing and recording the fish taken in it.

The gang of nets used in the experiment consisted in the following order of one hundred and fifty foot lengths of four and one-half, three, and one and one-half inch gill nets and fifty-foot lengths of five, four and one-half, four, three and one-half, three, two and one-half, two, and, one and one-half inch gill nets.

The experiment was carried out in Macdiarmid harbour in Lake Nipigon. The gang of nets was set approximately parallel to shore in the southern parts of the harbour. Depths at different parts of the net were as follows: at the four and one-half inch end, sixty feet; at the middle, thirty-eight feet; at the one and one-half inch end, twenty-eight feet.

The experiment continued for four days from September 10, 1925, to September 14. The nets were visited in the morning between six o'clock and a quarter after six o'clock, in the evening between seven o'clock and half-past seven o'clock. Accordingly, the nets were in the water for approximately eleven hours during the night and thirteen hours during the day.

Seven species of fish were taken in the nets during the course of the experiment: the common whitefish, *Coregonus clupeaformis* (Mitchill); the cisco, *Leucichthys* sp.; the round whitefish, *Prosopium quadrilaterale* (Richardson); the common sucker, *Catostomus commersonii* (Lacépède); the pike, *Esox lucius* Linnaeus; the yellow perch, *Perca flavescens* Mitchill; and the sauger, *Stizostedion canadense* (Smith).

In the accompanying table are shown the times and dates when the various species were taken. The size of the net which has no direct bearing on the matter under discussion has been omitted in order to simplify the table.

Date 1925	Kind of Fish	Number taken from nets in morning	Number taken from nets in evening
Sept. 11...	Common whitefish.....	3	1
	Cisco.....	2	—
	Round whitefish.....	1	—
	Common sucker.....	4	3
	Pike.....	1	1
	Yellow perch.....	—	1
Sept. 12...	Sauger.....	—	2
	Common whitefish.....	4	—
	Cisco.....	2	—
Sept. 13...	Common sucker.....	1	5
	Common whitefish.....	2	—
	Round whitefish.....	2	—
Sept. 14...	Common sucker.....	1	2
	Common whitefish.....	2	—
	Cisco.....	2	—
Four days...	Common sucker.....	1	—
	Common whitefish.....	11	1
	Cisco.....	6	—
	Round whitefish.....	3	—
	Common sucker.....	7	10
	Pike.....	1	1
	Yellow perch.....	0	1
Sauger.....	0	2	

The results of the experiment as illustrated in the table show that in Lake Nipigon at the depths and season of the investigation, coregonine fishes (ciscoes and whitefishes) are captured in greater numbers at night than in the daytime. This may be considered as proof of considerable activity during the night at least. The failure to capture coregonine fish during the daylight hours may be due either to comparative quiescence during the day or to their ability to avoid the net in better light. The latter possibility appears less likely in view of the capture of rather greater numbers of the suckers, pike, saugers and perch during the day time. There can be little doubt but that a difference in habit between coregonine and the other fishes in Lake Nipigon is indicated by the results. However, an attempt to repeat the experiment in water of greater depth in Lake Ontario failed to give corroborating results.

It is of interest to note the way in which the catch fell off during the experiment. This may have been due either to catching out the fish in the immediate vicinity of the set or more probably to a reduction in the efficiency of the nets resulting from four days continuous use without either drying or liming.

The experiment was carried out by an Ontario Fisheries Research Laboratory field party consisting of Prof. W. J. K. Harkness, Dr. D. S.

Rawson and the writer. Without the financial assistance of the laboratory and the cooperation

of its personnel, the experiment would have been impossible.

WHAT IS MEANT BY THE TERM "WILD LIFE CONSERVATION?"

By J. A. MUNRO

WE ARE accustomed to hearing that our wild life is a national possession which we hold in trust for posterity. We have seen the caption *Wild Life a National Heritage* on many a newspaper article dealing with conservation. So often have these words been used, by sportsmen and by conservationists, that the phrase has almost become a slogan, and, as often is the case with slogans, there is danger that the meaning be lost in the rhythm of the words.

Just what, exactly, is meant by the term wild life?

I take it that a literal interpretation is not intended as this would include all wild living things. So the term generally is used in a restricted sense to include only wild birds and mammals and with this definition there is no present quarrel.

But, there is an increasing tendency upon the part of some sportsmen to identify as wild life only certain bird and mammal species which are classified as game, and to foster the increase of these species at the expense of all other birds and mammals. I submit that under such a policy our wild life will cease to be a national possession and become the heritage of a class which is relatively few in number.

Considering the meaning of the word conservation as applied to wild life its connotations are many and varied. To some people it suggests merely restrictive legislation, to others it implies a policy of non-intervention. In my opinion the word implies:

1. Scientific research.
2. Adequate wild life sanctuaries.
3. Education of the public.
4. Law enforcement.

These are named in what are believed to be the order of their importance. Scientific research is held to be fundamental because knowledge must necessarily be the basis for the intelligent maintenance of wild life, for educating the public as to its value and for framing regulations as to its use.

In my opinion the term conservation does not imply a policy of hands off in connection with the

maintenance of wild life. Certainly it does not mean that all bird and mammal species should be completely protected at all times and under all conditions. Most assuredly it recognizes the necessity of controlling certain birds and mammals whose increase in certain districts conflicts with agricultural and other interests. But certainly also it implies that some thought be given to the welfare of the native bird species which, although not classified as game, are of absorbing interest to many of our people. I refer to the hawks and owls and to non-game birds generally.

It is here that an apparent conflict of interests has arisen between conservationists. On the one hand the sportsman, who is working for the preservation of game birds and game mammals in order that the sport he loves may be perpetuated; on the other hand the nature lover who is concerned with the welfare of wild life in general. To the nature lover the future of, let us say, a grebe or a loon, almost any bird in fact, is just as important as the future of a game bird; whereas the attitude of many sportsmen towards general bird protection is apathetic, or even directly antagonistic. The sportsman's present warfare against hawks and owls illustrates the latter feeling. With the effect of this campaign against the raptors I am not at the moment concerned. I wish merely to point out the evil it has done to the cause of conservation, which is this: stirred up by broadsides of emotional propaganda, both for and against predatory bird control, conservationists have divided into two hostile camps and years of effort towards a sympathetic understanding between sportsman and nature lover may have been undone. Sane conservation may be endangered because the extremists on both sides of the argument are taking control. It has been suggested that hawks of all species should be exterminated so that no guilty individual may escape and it has been said that hawks of all species should be protected in order to prevent the killing of a single beneficial individual.

Undoubtedly predatory bird and mammal control has an important place in conservation but sportsmen are prone to emphasize this beyond all reason. It is stated frequently that if predators are killed off there will be no need for game laws—a wish certainly fathered this thought.

*A paper read at the bi-annual conference of Provincial and Federal Game Officials, Ottawa, August 21-22, 1930.

The apathetic attitude towards general bird protection on the part of some sportsmen may be illustrated by the following question which frequently is asked. "Why do you protect gulls (or loons, or grebe, as the case may be)? What good are they? You can't eat them." To the people who ask this question it would seem that the beautiful organisms known as birds, which have been a source of inspiration since man emerged from barbarism, mean nothing in themselves; at the best they are unnoticed, at the worst they are considered merely as marks at which to shoot.

As for the results of organized hawk and owl killing this much may be said. Usually such campaigns call for the killing of the Accipitrine hawks, (the Goshawk, Cooper's Hawk and Sharp-shinned Hawk), of Eagles, Falcons and the Horned Owl, which are known to feed on game birds. Unfortunately very few sportsmen can distinguish between the different hawk and owl species, so much indiscriminate shooting takes place. Generally speaking the destructive hawks are wary and swift-flying, the beneficial species unsuspecting and slower in flight, consequently it is the beneficial species which most frequently are shot. Thus the price paid in innocent victims may be out of proportion to the number of destructive hawks accounted for.

I would cite as an example the serious reduction in numbers of the entirely beneficial Swainson's Hawk which has taken place in southern Alberta and Saskatchewan during the past decade, and which may be attributed to the activity of hunters. In the early part of the hunting season it is common to find many carcasses of these birds hanging from fence posts or lying on the trails and this is the case in British Columbia also. These hawks have been shot by well-meaning sportsmen in the mistaken idea that they were destroying enemies of game birds.

On the other hand, the Sharp-shinned Hawk, which lives almost exclusively on birds is rarely shot by sportsmen, according to my experience. The impression seems to be that the destructive qualities of the hawk is in proportion to its size.

So far as the Accipitrine Hawks are concerned there does not appear to be the slightest danger of their extermination, but the future of the falcons is another matter. The Prairie Falcon and the rare Duck Hawk are shot whenever possible, and, owing to their comparative scarcity it is possible that the future of these species will be endangered under continued persecution. It is quite true that the falcons are destructive, from the sportsman's standpoint, nevertheless there is a sentiment in favour of their protection.

Admitting, for argument's sake, that the

destruction of these falcons will result in an increase of game birds; is that reason sufficient for the extirpation of the former? Let us examine the viewpoint of the nature lover—to whom a bird is a subject of study, not an object of sport—using the Prairie Falcon and the European Partridge as a text. Here we have to do with a native bird combining strength, courage, beauty of form, and swiftness of flight to a marked degree. Within their nesting territory the female, sometimes the male also, will swoop at an intruder with a defiance of danger that commands respect. The Prairie Falcon is a spirited and dashing pirate. To witness this bird pursue and strike down its quarry affords one of the most thrilling spectacles in the world of birds. Such a sight marks a red-letter day in the calendar of the nature student.

On the other side we are considering an introduced game bird of pleasing appearance. He lies well to a dog, affords a sporting shot when flushed and is highly palatable. But there is little about the European Partridge to interest the nature student. Is it to be wondered that some of them prefer the falcon? It all depends on the point of view.

Or consider the Golden Eagle. The very name arrests the attention—so interwoven is it with our poetry and our folk-lore. People have been known to travel hundreds of miles merely to watch these kingly birds at home, (a nesting site on the ledge of some lofty cliff may be used year after year by a pair of Eagles which mate for life). Such a nature lover will say "What if my eagles do take an occasional fawn (which I very much doubt) have I no rights in the matter? Am I not a citizen and a tax payer? If I prefer watching eagles to hunting deer do I have to apologize?"

Of course the sportsman's rerort is, "I finance game protection, therefore I shall do as I see fit" and to this, at the moment, there is no reply.

Another difference of opinion concerning conservation has risen between the angler and commercial fisherman on the one hand and the nature student on the other. It may be stated briefly that fishermen are inclined to attribute the depletion of the fisheries, in part at least, to the activity of certain bird and mammal species: whereas nature students assert that any reduction in the number of food or game fishes is a comparatively recent condition and due primarily to man's interference with natural conditions.

In point of fact there are practically no data available on the subject. In the meantime the destruction of certain bird species is advocated in the belief that their removal will benefit the fishing industry.

The question of the relationship between birds and fishes is more complex than most people realize. The layman assumes that the presence of fish-eating birds in waters inhabited by food fishes is detrimental to fishing interests. This is pure assumption and the contrary has been demonstrated. For example a recent study of the stomach contents of mergansers from Okanagan Lake, British Columbia, shows that the food of these birds consisted entirely of coarse fishes and crustaceans. In destroying these fish, which are competitors of the more valuable game and food fishes, the birds actually are of benefit to fishing interests.

Considered from an economic standpoint a bird species may be a benefit in one locality and a source of loss in another. Were these local problems investigated by scientific methods and the results made public, it seems to me, that the differences between angler and nature lover might be reconciled. At the present time the nature lover is protesting that fish-eating birds, wherever found, are condemned to death by the angler on purely circumstantial evidence.

The nature lover obtains pleasure and recreation in seeking close association with wild life, and bird life usually is his chief interest. He believes in protecting birds because they are the most interesting things in the world, because so many people love them, because of their educational value and because of their place in our world of art and literature. While he is aware that birds help to control the spread of noxious insects and rodents, and hence are useful to man, he thinks this reason for bird-protection is over-emphasized. He is not dollar-minded and resents the assumption that each bird species must be worth so much in cash before we extend out protection. He dislikes to see human morality ascribed to birds—such a one is good, such another is bad. Good and evil as attributes of a bird seems to

him a child-like conception. This is the nature lover's attitude as I understand it.

"Wild Life a National Heritage." Is our nature lover entitled to a voice in its future? I think so.

The breach between the nature lover and the sportsman is widening. Can the sportsman carry on alone indefinitely? I presume to doubt it.

The nature students of Canada comprise a large and influential body with a force of public opinion behind them. The membership of the twenty natural history societies in Canada is comprised largely of people whose chief interest is in the conservation of wild life. It has been taken for granted that the aims of a Game Protective Association and a Natural History Society are mutually exclusive. I believe the contrary to be the truth. It seems most desirable to advocate close co-operation between two sections of our people who, with some minor differences, are working for the same ends. I believe sportsmen should take the initiative by sponsoring scientific research and nature study, and thus encourage the nature student to join his associations. Furthermore it is suggested that such a broadening of aims might well be reflected in the title of his organization and the Rod and Gun Club or the Fish and Game Association might become a "Wild Life Protective Association".

The foregoing may be summarized as follows:

1. The term "wild life" is interpreted to mean all wild birds and mammals.
2. These belong to the people as a whole, not to any special class.
3. Wild life conservation means the protection of all wild birds and mammals, in a greater or less degree, so that the existence of no species may be threatened.
4. Protection to be effective must be based on the results of scientific research.
5. There is urgent need for unity of effort, amongst all who turn to nature for recreation.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

(Continued from page 213, Vol. XLIV)

AS REMARKED elsewhere the valley along which we travelled is somewhat remarkable for a comparative lack of bird life, especially of game birds. Ducks and geese were most noticeably scarce.

Copious notes on many of the species were kept, but it has been possible to give here only the briefest outline of the observations made.

Owing to the difficulties encountered extensive nesting and collecting could not be proceeded with. A list of the collections made is given below:—

Cephus grylle mandti.

Harelda hyemalis.

Lagopus rupestris.

Anser albifrons.

Gavia adamsi and eggs.

Gavia stellata and eggs.
Larus argentatus and eggs.
Sterna paradisaea and eggs.
Stercorarius longicaudus.
Stercorarius parasiticus.
Eureuntetes pusillus.
Aegialitis semipalmata and eggs.
Otocoris alpestris.
Calcarius lapponicus and eggs.
Plectrophenax nivalis.
Spizella monticola.
Passerculus sandwichensis.
Acanthis linaria and eggs.
Anthus rubescens.
Archibuteo lagopus.
Falco peregrinus and eggs.

*The above specimens are in the collections of the National Museum of Canada, Ottawa.

Lagopus lagopus.
Perisoreus canadensis.
Corvus corax principalis.
Pisobia maculata ?
Branta canadensis.

Colymbus auritus (Linn). HORNED GREBE.—

A pair of grebes probably referable to this species were observed on the water surrounding the ice on Smart Lake on June 6th, 1925. They were the only grebes seen on the journey.

Gavia adamsi (Gray). YELLOW-BILLED LOON.—

This notable loon was abundant in the region traversed particularly along Hanbury River. It was first noted on Artillery Lake on September 28th, 1924, when several individuals were observed flying south at a great height. They were again noted on the following day, but until next spring no more were seen.

The first Yellow-billed Loon observed during 1925 passed northwest on May 30th, but they were not noted as abundant until June 7th when a specimen was collected. The following day five were seen, the next day two, then six, then one, then two, and so on.

On June 27th, two nests of this species were found and the eggs collected. They were found on islands in running water a few miles after leaving Sifton Lake. Both nests were very close to the water, each nest containing two eggs. The eggs of one nest were found to vary considerably in size, a fact that I have tried to show by photographing them together on a caribou skin. The eggs of one nest were found to be well incubated, although those of the other were fresh enough to make good eating.

On July 1st another nest was found, both of the eggs being freshly laid. Here the nest was

found some distance from the water. Having been built on an island in a lake it was evident that the drop in water had not been considered. This species continued as far east as Aberdeen Lake, but after that lake was passed I record none.

Gavia stellata (Pontoppidan). RED-THROATED LOON.—This loon was nowhere abundant although it was a very wide ranging species in the country travelled by us. It was observed most frequently along the lower Hanbury, and about Aberdeen Lake.

A nest was discovered on a small island in Sifton Lake on June 25th, 1925. I collected the nest and the female bird. Within five yards of the loon's island was a rock and on this rock a Herring Gull was nesting. The nest of the Red-throated Loon found was rather more elaborately built than those of the Yellow-billed, contained more material, was softer, and a considerable amount of moss of various kinds had been worked into it.

Gavia immer (Brunn). COMMON LOON.—This species was but rarely observed along the route travelled. The first made their appearance on August 2nd, when five were seen flying together. Loons apparently referable to this species were noted on subsequent occasions, but the date given represents the only occasion on which they came close enough to be recognized definitely.

Gavia arctica. ARCTIC LOON.—This species was occasionally observed between Beverly Lake and the outlet of Schultz Lake. In a pond near Aberdeen Lake on August 19th I observed an adult female with two young birds unable as yet to fly.

Stercorarius pomarinus (Temm). POMARINE JAEGER—This jaeger was first observed on June 1st when nine birds in three flocks were seen flying north. Specimens were collected but no nests found. Their habits and foods seem to resemble those of *S. parasiticus*, but their range eastward seems more limited and none was noted east of the last timber on Thelon River. Like *S. parasiticus* these birds seem to prefer the treeless country, and none were observed flying in the wooded districts along our route, although they often occurred in the open places between isolated clumps.

Stercorarius parasiticus (Linn). PARASITIC JAEGER—This was the more common of the two jaegers met with on the trip, and, although it was never numerous, few days would pass without one or more being seen during the summer. The species was not noticed until May 30th, 1925, when two were seen flying in a northerly direction. Specimens were collected, but unfortunately no nests were found.

The stomach contents of most of these birds were found to consist of mice, although occasionally the remains of egg shell found would testify to the fact that this jaeger considers anything lawful prey. Several mice were taken from the stomachs of jaegers, but on no occasion was the head of a mouse found swallowed. It would appear as though this bird tears the heads off mice before eating them. Jaegers were rarely seen after Beverly Lake, and all of those seen east of the timber on Thelon River were referable to this particular species.

Larus argentatus (Pontoppidan). HERRING GULL.—This gull is found throughout the entire region traversed by us, but in no places was it noted as plentiful. The largest colony was in the delta of the Thelon-Dubawnt Rivers. There on one small island about twenty pairs were discovered with their young. The first colony of any size was on a large rock in the centre of Macdonald Falls on Hanbury River. There were about thirty were seen nesting.

In 1924 the last of this species in the form of a juvenile bird was observed on Artillery Lake on September 29th. In 1925 the first of the species arrived flying north at 8 p.m., May 18th. The first nests were discovered on June 10th near the headwaters of Hanbury River; the eggs were fresh. It was with interest we noted that wherever loons were found nesting gulls' nests would also be found.

An incident at Helen's Falls caused us some little amusement. Three pairs of these gulls had thought wise to nest within a few feet of a pair of Rough Legs, and it seemed that the two species derived the utmost pleasure from annoying and frightening each other as much as possible.

During summer when the caribou meat was so extremely poor we derived considerable benefit on several occasions from eating gulls. No other game could compare with it for nutritious qualities, and had Herring Gulls only been more numerous we should have been saved much anxiety and hunger. When the birds first come in from the coast in the spring they are very fat, and remain in this condition until well into the summer. The young birds as favoured by men at the trading posts, of course, have not the nutriment that the older flesh has.

Larus brachyrhynchus (Rich.) SHORT-BILLED GULL.—A small gull* measuring seventeen and a quarter inches long, shot on August 6th at our

camp on Thelon River, at a point about seventy-five miles west of Beverly Lake seems referable to this species, and it is gratifying to note that this constitutes an easterly record for the species.

These gulls were first observed on July 29th a few miles to the northeastward of Grassy Island on Thelon River. They were not numerous and only fourteen individuals were seen throughout the entire journey. During the first week of August four birds of the year were observed, but these were the only juveniles noted. Their most easterly occurrence was the place at which the specimen shot was found.

Sterna paradisæa (Brunn). ARCTIC TERN.—

This widely distributed species was found, throughout the region traversed, in fair numbers. It was not noted during the fall of 1924, and I do not record observing it until June 7th when one bird was seen on Campbell Lake flying in a northerly direction. After this date the species was regularly noted but it was not until June 27th that more than one a day was observed. On that date a flock of six was noticed. On June 29th about thirty were observed in two flocks.

I do not note detecting this species eastwards of Chesterfield Inlet, but on September 7th a few were seen along the east coast of Hudson Bay. These terns were first found nesting on July 3rd, a nest of two eggs being discovered on the crest of a cone-shaped island. On July 27th the young had left their nests, and on that date very small juvenile birds were seen staggering over the sand. At this time the parent birds were very fierce and on one occasion when I was occupied with photographic work near a nesting place I received several pecks on the head that drew blood.

On August 17th young terns of the year were observed flying strongly though they had not the speed of the adults. Their movements corresponded more to the lazy flapping of sea gulls. Terns collected during the summer were found to have been living solely on mosquitoes and spiders.

Mergus serrator (Linn).—RED-BREASTED MERGANSER—Along Hanbury River this species was comparatively abundant, and during a day's travel as many as twenty-five to forty might be counted. The first of the species observed was seen on Pike's Portage on September 9th, 1924, and on the 22nd of the same month, three were seen on Artillery Lake. Their next occurrence was at Smart Lake June 9th, 1925, when one pair was noted. Another was seen on the following day, but hereafter none was seen until July 1st. After this date they commenced to be seen frequently, on July 4th six were seen, on the 7th eleven, on the 8th two, on the 9th three, until on the 12th thirty were noted. At this time and for some

*The identification of this species is rendered certain by an excellent photograph of a recently killed, practically adult bird and the measurements and colour notes of the collector whereby it appears to be a smallish white gull with gray mantle, black wing tips with white specula, yellow bill and legs, the former without colour spot. This can only be the Short-billed Gull.—P.A.T.

days past they had been moulting, and could not fly. Their powers of endurance, as well as their lack of sense was remarkable, and they would flap laboriously down the river, half in the water and half out, in front of our canoes all day long.

They appear to have been numerous along Thelon River as well, and on July 29th I note fourteen, quite unable to fly, on the 30th twenty-one, and on the 31st thirty-two. All these were apparently males. Females were not seen after June 10th. The last were observed on August 6th, twenty-four being seen in one unhappy bunch flopping down-stream before us. They were not seen further east than the last woods on Thelon River.

Dafila acuta (Linn). PINTAIL DUCK.—This species was exceedingly rare, five only being seen and those occurring near Campbell Lake early on the morning of May 25th. Five were seen flying together.

Marila marila (Linn.)—SCAUP DUCK.—This is another rare species and only once were these ducks definitely recognized, six being seen in the water on the western reach of Hanbury River on July 12th, 1925.

Harelda hyemalis (Linn). OLD-SQUAW DUCK.—This is the most common duck of the region under review, but is nowhere abundant. When entering the treeless plains during September, 1924, I expected to find this species between old Fort Reliance and Artillery Lake, but except for a solitary individual at the extreme southern end of Artillery Lake on September 13th none at all was observed.

Their next occurrence was on June 1st near Campbell Lake. Thereafter they appeared to be scattered out all over the country but in small numbers, and to observe as many as twenty in a day would be unusual. They were most numerous between Lac du Bois and the lake I have named after Radford and Street during the latter part of June. Their nests, however, were nowhere found. None at all was seen after reaching Thelon River. During the latter part of June and early July most of those representing this species were recognized to be male birds.

Oidemia deglandi (Bonap.) WHITE-WINGED SCOTER.—This species was only twice observed, first on June 27th at Sifton Lake, and secondly at Helen's Falls on July 20th.

Anser albifrons (Hartl). AMERICAN WHITE-FRONTED GOOSE.—This species was nowhere common, but a few were found breeding along Hanbury and Thelon River. Various specimens were collected including a downy juvenile on July 12th. These geese were first observed on May

31st near Campbell Lake. They were usually seen flying in twos and threes. A flock was seen on June 25th consisting of six. Two broods were noted on July 29th, but eastwards of the timber on Thelon River none were recorded. The largest flock observed was on July 28th, when twelve were seen flying together. Some were moulting on July 29th.

Chen hyperboreus (Pall). LESSER SNOW GOOSE.—Geese probably referable to this species were seen at irregular intervals. The first were observed on May 27th when twenty-two flew north over Campbell Lake. Their next occurrence was August 14th, when five passed southwards. On August 25th the last of these species were observed when twenty-five in one flock flew east along lower Thelon River.

Branta canadensis (Linn). CANADA GOOSE.—This species was first noted on September 15th, 1924, when, at about 3 a.m., the call of these birds was heard as they were migrating south. Their northward migration was not noted by us and it appears they did not pass over us during the spring of 1925. Their next occurrence was June 27th on Sifton Lake when three individuals were observed, one appeared much smaller than the others and I took it for the Hutchin's Goose.

A single individual was noted on June 28th, but after that none were observed until August 7th, when twenty were seen composing a flock, this was just west of Beverly Lake. Between August 11th and 15th we were in the sandy gravel country around Beverly Lake, and here hundreds of these geese were seen congregated on the islands. During this time many flocks of from twenty to thirty individuals were observed flying south. From the height at which they were flying, however, and their general behaviour, it did not appear to me as though any real migration had started on that date. On August 27th at the mouth of the Thelon-Dubawnt Rivers about fifty individuals were seen, several of which were in a moulting condition and could not fly.

Cygnus sp. ? SWAN.—Swans were of rare occurrence in the region travelled by us, and were noted only on two occasions. They were first seen near Campbell Lake on May 26th, when five were noted flying in a northerly direction. Swans were next seen on Thelon River, when a single pair, which refused to fly, was found on July 30th.

Grus canadensis (Linn). LITTLE BROWN CRANE.—This species seems to be common throughout the region under review. The first was noted on May 24th, one being observed flying in a southerly direction. These cranes were next observed just above Lake Hanbury, a pair being seen walking on a gravel ridge a short distance inland from the

river. Subsequently several were seen on Thelon River, a flock of five being photographed at the entrance to Beverly Lake on August 10th.

Pisobia bairdi ? (Coues). BAIRD SANDPIPER.—A sandpiper conforming to the size and description of this species was shot on July 27th, but unfortunately the specimen was lost. This bird was found to be the most characteristic of the region, it was first noted on June 11th, and extended as far as Baker Lake, where it was still found in numbers at the end of August.

Pisobia maculata ? (Vieill). PECTORAL SANDPIPER.—Two birds that I saw and observed closely through binoculars on May 25th at Campbell Lake appeared referable to this species. Unfortunately I was unarmed and was unable to collect them. This was their only occurrence, although on June 11th another bird was seen in flight that I have noted as being identical so far as it was possible to see.

Squatarola squatarola (Linn). BLACK-BELLIED PLOVER.—We were surprised to find this bird of rare occurrence, particularly as its breeding grounds are said to be the northern treeless country. The species was observed but once at the western end of Aberdeen Lake on August 16th, two individuals being seen.

Ereunetes pusillus (Linn).—SEMPALMATED SANDPIPER.—This species is characteristic of the western portion of the region traversed and occurs more or less abundantly. It was first recorded on May 31st when four were seen flying in a north-easterly direction. It was almost daily noted eastwards of Campbell Lake, but it was much less frequently observed after Thelon River had been reached, in fact it may be said to be of rare occurrence eastwards of Dickson Canyon. Nesting places unfortunately were not discovered.

Charadrius semipalmata (Bonap.). SEMIPALMATED PLOVER.—This species was one of the most widely distributed along our route. It was noted on Artillery Lake during the fall of 1924, but I failed to note the date on which it was supposed to have gone south. Its first occurrence during 1925 was May 30th, when two were seen near Campbell Lake. It was not noted as plentiful, however, until more sandy country in the vicinity of Sifton Lake was reached towards the middle of June. Here the species was found breeding two nests being discovered on June 25th and 26th. As was to be expected this species occurred more numerous in certain localities, and where stretches of rocky and unfavourable river banks and lake shore lines intervened the species was found often to be scarce. These plovers were not seen east of Schultz Lake.

Lagopus lagopus (Linn). WILLOW PTARMIGAN.—This species occurs abundantly about Artillery Lake, but along Thelon River it is scarce. It was first noted on September 16th, 1924, when seven half-white individuals were seen feeding together on the ground. They commenced to move south on September 26th, and on that date about three hundred were seen flying towards the timber. All apparently had left by October 15th, and on that date a few almost white individuals were observed. Just before this they were so tame that several were killed with sticks. I observed this species migrating northwards in the timber near old Fort Reliance on April 24th, but did not observe them in the treeless country until May 4th. After that date they were numerous, but with the melting of the snow they seemed to pass further northward.

On June 1st I note that I believed this species to have paired. No nests were discovered during the journey, but a female in full summer plumage with a brood of chicks that could fly was noticed on July 24th. Many amusing characteristics of the bird were noted, the most strange perhaps being in the instance of a male bird chasing another of the same sex. In order to attract these birds we had set up a decoy in the form of a partially skinned specimen. When looking out of the tent I saw the two birds mentioned coming over a little hillock towards us, running at top speed, both making as much noise as possible. The bird that was leading (the one being chased) passed the decoy we had set up without apparently noticing it; not so with the other bird however; when he fetched alongside he made a peculiar noise to attract the attention of his fleeing enemy. The necessary attention forthcoming, he then proceeded to attack viciously the bird we had set up. Having, after a minute or so, reduced the decoy to a mass of feathers and gore, he desisted and strutted towards his enemy, blood on his beak and (I imagine) a glitter in his eye. It proved too much for the other ptarmigan, which forthwith beat a hurried and undignified retreat.

Lagopus rupestris (Gmel). ROCK PTARMIGAN.—This species was common throughout the winter in the vicinity of our winter camp. It was first observed on October 6th when two individuals were noted. It was not seen daily in any numbers, however, until after *L. lagopus* had passed south, on October 15th. During the colder days of winter these ptarmigan became quite tame, and would allow one to walk within two or three yards of them. They were usually in flocks of about a dozen individuals.

This species was last observed in any numbers

on June 6th, and all had disappeared by July 2nd, one pair being seen on July 1st. This ptarmigan has a great appeal for me. It constituted the only sign of bird life during a rather irksome winter, and its unobtrusive ways and gentle croaking call provided a tempering effect in a region in which one is favoured with little variety.

Archibuteo lagopus sancti-johannis (Gmel). **ROUGH-LEGGED HAWK.**—This Arctic species was the most common of the hawks of the region, and it extends throughout the whole of the region under review. I first noted the bird on September 21st, and almost every day until October 23rd one or more would be seen. None were observed after this until March 2nd when a hawk, probably referable to this species, was seen flying south. The next occasion on which they were seen was April 24th, and following that date they commenced to be more numerous.

Nests were observed on several occasions the first being at the Dickson Canyon, where on July 15th a nest of two young was observed in the cliff face. Another nest just below Helen's Falls on Hanbury River on July 20th also contained two young; these were fledged downy, though still so young as to be incapable of much movement.

A specimen collected in May was found to have been living on caribou flesh.

Falco islandus. **WHITE GYRFALCON.**—Two large almost pure white falcons only were observed by us, the first on October 23rd, and the second on February 25th, both being seen hunting over Casba River.

Falco rusticolus gyrfalco (Linn). **GYRFALCON.**—Efforts were made to secure specimens of the hawks and falcons, but our efforts were not attended with much success, and no specimens of this particular species were taken. Hawks of various species were occasionally observed flying about, and I am inclined to believe that this gyrfalcon is an inhabitant of the region traversed, and I noted that falcons which I believed to be referable to this species were observed at various places. As however, I have had little experience with this particular bird and as it was found possible to examine none in the flesh I can give no definite ruling on the matter.

Falco peregrinus anatum (Bonap). **DUCK HAWK.**—Eastward of Lac du Bois to Baker Lake this falcon occurs more or less numerously, and from almost every cliff we passed would come to our ears the uncouth, fierce cry of this powerful bird. They were found breeding in several places though time only allowed us to inspect and collect one nest. This was at the place where the bird was

first observed, namely near Timber Rapid on Hanbury River.

The nest, containing four well-incubated eggs, was found on a ledge in a cliff face at a height of about thirty-five feet above the water, the cliff facing southeast. Three old nests were found on the same ledge, testifying to the fact that the same or other birds of this species had nested there for four different years at least. Immediately alongside this ledge on a jutting rock six feet from the falcon's nest was found a last year's nest of the Rough-legged Hawk.

The male bird which was collected was very fat though badly infected with parasitical worms. The stomach was found to contain eight young longspurs and larks, and the crop other young birds as well as an adult Horned Lark. This was on July 1st. This species next occurred at Helen's Falls on July 18th where a nest of three young was found; it was inaccessible, however. Here as at all other places where these falcons were nesting the adult birds attacked us with the greatest fury, swooping down from great heights at incredible speed, and passing over our heads within a few feet. On occasions I would endeavour to bring these fierce birds down with my collecting gun, but the amount of shot they would carry, and the number of times they would return to the attack when sorely wounded greatly surprised me. They are certainly most courageous.

On July 30th I note that the behaviour of the old birds gave the impression that the young were probably moving about, although juvenile birds were not observed during the trip.

Cryptoglaux funerea (Richardson). **ARCTIC SAW-WHET OWL.**—Small hornless gray owls were noted during June in the treeless region as far north as Hanbury River, and it is probable that they were referable to this species. Unfortunately we did not succeed in securing specimens.

Nyctea nyctea (Linn). **SNOWY OWL.**—This interesting owl was usually seen when least expected. The first of the species was detected near Casba River on October 20th. It next made its appearance on October 23rd. Then it was not observed until December 16th, when two were seen sitting on a glacial erratic near the mouth of Casba River. When disturbed they flew away south. Another was observed on February 17th in the vicinity of our house, sitting on a rock. On the night of May 21st-22nd was its next occurrence, when a single individual was noted sitting, apparently roosting, on a prominent rock on the summit of a high ridge. The last of these owls was seen on May 29th.

Otocoris alpestris (Oberholser). **HORNED LARK.**—The last of the Horned Larks observed by us in

1924 left the treeless country on November 4th. They reappeared on May 16th at the northern end of Artillery Lake. As far as the eastern end of Sifton Lake they were fairly numerous, but eastward of that lake they were but very rarely seen. Four nests of this species were found. The first we discovered by watching a jaeger. What it contained we could not tell, because by the time we arrived he had eaten whatever was in it. That was on June 21st. A nest of partially fledged young was found on June 23rd. At first we thought it contained only three young birds, but as something caused us to move the birds we found that underneath was one very small, underfed individual. We enlarged the nest to provide the necessary room for him. We were camped by this nest for some days, and at the end of the third day we observed that the female bird disappeared, possibly killed by a jaeger. After this the male bird manfully proceeded with the task of bringing up the family.

Two more nests were discovered on June 25th, one containing four and the other five eggs; the eggs were not incubated. In each instance the nest was found built into a little natural cup on the top edge of a fold in the ground about six inches high. The nests faced either south or slightly east of south. The nests were constructed of grass or fine twigs and usually had one or two feathers lining them, in every instance the nest would be so situated that the twigs of some small bush would practically conceal it from view.

Perisoreus canadensis (Linn). CANADA JAY.—The whiskey jack is of common occurrence everywhere except in the treeless region. It was noted as far north as the edge of the forest and appears to winter there.

It was noted in the timber along Thelon River, but not more than three pairs were seen, the first pair being observed by Hornby on August 1st.

Corvus corax principalis (Ridgw). NORTHERN RAVEN.—This well-known bird was rare in the region under review, and was but occasionally seen. It was observed on Artillery Lake during the fall of 1924, and it appeared to go south on October 9th, seven being seen flying in a southerly direction on that date. On the 10th a few more were seen, however, but the last of this species left the treeless country in our vicinity on October 20th. Its next occurrence was on February 21st when one unfortunate individual left one of his toes in a fox trap. Following this it was not seen until the middle of June. I believe that not more than a dozen were seen during the whole journey.

Nests were not discovered, but old nests were found inland at a point about twenty-five miles south of Walmsley Lake in a locality where shelter

was afforded by a few spruce trees. Whenever this place was visited ravens were found to be flying about, and I am of the opinion that they remained there throughout the entire winter.

Loxia leucoptera (Gmel). WHITE-WINGED CROSS-BILL.—This species was not observed on the Northern Plains. Hornby, however, reports seeing these birds at the edge of the timber on Artillery Lake on February 12th, seeing ten in a flock.

Acanthis linaria (Linn). REDPOLL.—This species was first noted on June 15th on Sifton Lake, and until August 11th, when the delta of Dubawnt River was reached it was of common occurrence. The presence of this species I believe generally testified to the fact that timber or scrub spruce existed in the vicinity. Specimens were taken, and a nest of four eggs three inches off the ground in a small bush on June 20th.

Plectrophenax nivalis (Linn). SNOWFLAKE.—These birds were frequently seen in the region, although at no time were they as numerous as I would have expected. In my diary I do not note observing the species until September 22nd, 1924, at a point on the eastern shore of Artillery Lake near its northern extremity. At this time they were associating with Lapland Longspurs. The last of them were seen on November 13th when three passed over Casba River flying in a southerly direction, the last of the small birds.

On April 6th during a gale small birds were next observed in the treeless region. Two birds probably referable to this species suddenly appeared out of the drifting snow, but rising above the crest of the hill on the lee side of which they were flying, they were immediately blown away again and lost to sight. It was but a momentary view that I obtained, and I was at a loss to determine the species. I note the occurrence here as being the first occasion on which small birds were observed during 1925. The next occasion on which these birds were noted was May 6th, when a large flock was observed flying north. During this season the time of greatest movement for northward migrating birds was from 2:30 to 3:30 in the morning.

On May 19th Snowflakes were observed flying south. We took this to be a sign of bad weather ahead, and on the following day a fierce gale set in. By June 1st I note that most of the small birds had paired off, and on June 3rd a large colony of birds of this species was found paired on a small island in Campbell Lake. During the journey eastwards we often looked for their nests, but all along Thelon River and Hanbury River in the spring and summer the species was rare and no nests were found. They were feeding on mosquitoes. On August 19th these birds were

again forming into flocks, about twenty individuals to a flock. By September 5th on Baker Lake they were more numerous and in larger flocks and inclined to move southward. On September 20th at Port Harrison on the far side of Hudson Bay they were still in some numbers. Several specimens were collected.

Calcarius lapponicus (Linn). LAPLAND LONG-SPUR.—This species was first observed on the last portage from Great Slave Lake into Artillery Lake on September 12th. As we passed northwards we commonly found them in small flocks flying with the Snowflakes. By October 1st many had passed south, and none were seen after October 9th. The next record of them is on May 11th when a few were seen flying north. By May 24th, however, I note them as very numerous. On June 7th a few of them had paired, and on June 17th a new nest containing five eggs was found. A neat nest of coarse grass lined with ptarmigan feathers, situated on the south side of a tuft of grass. The Lapland Longspurs at this time were not to be found near Snowflakes, but they shared their nesting grounds with Horned Larks with which they seemed on very friendly terms.

On July 1st two nests were found, one contained well incubated eggs and the other newly hatched young. On August 20th this species was observed flying again in small flocks. Their range extends from Artillery Lake to Hudson Bay except that they are not to be found in the wooded portion of the Thelon Valley.

Spizella monticola (Gmel). TREE SPARROW.—This bird was found to be exceedingly rare along our route. Only one individual was observed, and I was fortunate enough to secure it as a specimen. It was taken on Sifton Lake on June 15th near a very small clump of scrub spruce, an isolated growth standing no higher than four feet.

Passerculus sandwichensis alaudinus (Bonap). WESTERN SAVANNAH SPARROW.—I first noted this species in the treeless region in the vicinity of Campbell Lake on May 26th. They were rare,

however, and were not seen after the end of that month nor in any other locality than that named.

Planesticus migratorius (Linn). ROBIN.—The Robin was noted at old Fort Reliance during the summer of 1924, and as far north as Burr Lake on Pike's Portage, but when travelling northward of that lake along the eastern shore of Artillery Lake no specimens were seen. It was next observed in the woods along Thelon River, but nowhere was it found in numbers as one is inclined to believe one would from reading Tyrrell's account. About three pairs were seen during the latter part of July and the beginning of August.

Riparia riparia (Linn). BANK-SWALLOW.—A large colony of swallows probably referable to this species was found in a cut portion of the river bank just opposite Tyrrell's Hawks' Rock on the lower Hanbury River. The species was entirely confined to a stretch of bank about two hundred yards long, and altogether about a hundred pairs were nesting there. This was on July 22nd.

Anthus rubescens (Tunstall). PIPIT.—Specimens of this species were collected, and it is interesting to note that it was discovered only in the timber of Thelon River. Along that portion of our route it occurred more frequently than any other bird, and was the most notable inhabitant of the timbered stretches.

Penthestes sp. ?. CHICKADEE.—A Chickadee was noted in the treeless country on November 4th, 1924. I failed to secure it as a specimen, unfortunately. No other occurrence of this genus was noted.

Hylocichla sp. ?. THRUSH.—Occasional glimpses were caught of birds, that I took to be thrushes, in the vicinity of Dickson Canyon. Specimens, unfortunately, were not secured. There are clumps of timber in sheltered places in the vicinity of the Canyon, and as I cannot make any better ruling I suggest that thrushes are to be found at this point.

(To be continued)

STATEMENT OF FINANCIAL STANDING, OTTAWA FIELD-NATURALISTS' CLUB, AT THE CLOSE OF THE YEAR, 1929-1930

ASSETS		LIABILITIES	
Balance in Bank.....	\$426.86	NIL.	
Bills receivable.....	79.87	Balance.....	\$506.73
	<u>\$506.73</u>		<u>\$506.73</u>
RECEIPTS		DISBURSEMENTS	
Balance, November 20, 1929.....	\$428.33	Printing and Mailing "Naturalist"....	\$1,268.55
Membership—Current.....	1,091.67	Editor.....	90.00
Advance.....	62.66	Separates and Illustrations.....	300.59
Advertisements.....	65.00	Postage and Stationery.....	69.88
Back Numbers.....	334.45	Binding, Misc., Advertising.....	62.24
Separates—Illustrations.....	234.80	Bank discount.....	21.55
Miscellaneous.....	22.76	Balance, November 28, 1930.....	426.86
	<u>\$2,239.67</u>		<u>\$2,239.67</u>

Audited and found correct:

November 28, 1930.

P. KINGSTON,
HARRISON F. LEWIS,

Auditors.

WILMOT LLOYD,

Treasurer.

STATEMENT, RESERVE FUND, NOVEMBER 22, 1930

ASSETS		LIABILITIES	
Victory Bonds—1934 Issue.....	\$1,050.00	NIL.	
Balance in Bank.....	220.57	Balance.....	\$1,270.57
	<u>\$1,270.57</u>		<u>\$1,270.57</u>
RECEIPTS		DISBURSEMENTS	
Balance, November 26, 1929.....	\$158.97	NIL.	
Interest—Bonds.....	57.75	Cash in Bank.....	\$220.57
—Bank.....	3.85		<u>\$220.57</u>
	<u>\$220.57</u>		

Audited and found correct:

November 28, 1930.

P. KINGSTON,
HARRISON F. LEWIS,
Auditors.

W. T. MACOUN, Chairman.

WILMOT LLOYD, Treasurer.

FIFTY-SECOND ANNUAL REPORT, OTTAWA FIELD-NATURALISTS' CLUB

Annual Meeting, Tuesday, December 2nd, 1930, National Museum

1. MEETINGS.—During the past year three meetings of Council were held at the following residences of its members: Messrs. W. J. Wintenberg, Mr. C. Sternberg and Miss Faith Fyles, with the average attendance of 15, approximately 50% of the membership of the Council.

no lectures during the year. Communications were received from a lecture bureau offering the services of Captain Knight to lecture on the "Golden Eagle" but this had to be refused as the fees were beyond the means of the Club.

3. EXCURSIONS.—The usual four annual excursions were held during the month of May.

2. LECTURES.—Unfortunately the club held

The first on Geology in the vicinity of Lemieux Island, south side of Ottawa River. Leader, Dr. F. J. Alcock. The second on Amphibians at Rockcliffe Park in the vicinity of Mackay Lake. Leaders: Dr. R. M. Anderson, Messrs. G. A. Miller, Herbert Groh and Mr. Robert Lockwood. The third, and always the most popular, was on Birds and other Natural History at Fairy Lake. Leaders: Dr. Ralph De Lury, Messrs. Hoyes Lloyd, G. A. Miller, Herbert Groh and C. E. Johnson. The fourth and the last at Britannia on Botany. Leaders: Miss Cowan, Miss Faith Fyles, Dr. R. M. Anderson, Messrs. Herbert Groh and Robert Lockwood. The attendance at these excursions were larger than last year, being augmented by the Normal School students under the guidance of Mr. G. A. Miller.

4. COMMITTEES.—Mr. Hoyes Lloyd and Dr. Harrison F. Lewis again represented the Club on the International Committee for Bird Protection. Mr. W. S. Hart, Vice-President of Province of Quebec Society for the Protection of Birds, also a member of the Club, represented this society at the annual meeting of the Royal Society held in Montreal in May last.

Dr. M. O. Malte, Chief Botanist, National Herbarium of Canada, a member of the club Council, represented the Club at the International Botanical Congress held in Cambridge, England, in August last.

5. PUBLICATION COMMITTEE'S REPORT.—Mr. Hoyes Lloyd, Chairman of the Publication Committee, submits the following report: "The publication of the Club, *The Canadian Field-Naturalist*, has been issued regularly and on time. The Publisher and the Editor deserve great credit for this, and for the general excellence of the paper in matter and make-up. This is attested by the many favourable comments from readers. We feel that the Club has done its part in maintaining the publication at its present high standard, and all that the Committee requires is additional support in the matter of members."

6. FINANCES.—Mrs. Hoyes Lloyd, our very efficient Treasurer, states in her report that the Club has a surplus of \$466.83, an increase over last year's surplus of \$38.83, which I am sure you will agree is most satisfactory, although the Club again lost in membership during the year. Two complete sets of *The Canadian Field-Naturalist* were sold to institutes in the U.S.A., which greatly augmented this year's surplus. It is regretted that the sale of these two complete sets will be the last as there are no more available. Therefore if any members know where numbers prior to 1889 could be obtained, it would be a

great financial help to the Club, as these sets are always in demand.

7. ROAD-SIDE MARKERS.—The Ottawa Field-Naturalists' Club has undertaken to point out to the public by means of Road-side Markers, some of the interesting changes which have accompanied the geological development of the district. In this connection two markers were placed on the Government Driveway by permission of the Federal District Commission, adjacent to Mackay Lake. This was done through the personal efforts of Dr. E. M. Kindle. These stones were made by Messrs. C. M. Sternberg and A. Miles. We extend the grateful thanks of the Club to these gentlemen.

8. COUNCIL.—In retiring from office your Council feel that the past year has been successful, both financially and otherwise, but urges all members to try to increase the membership for the coming year to enable the Club to issue a better paper, especially in the way of illustrations.

To the incoming executive and Council we wish every success on the Club's entering on the 53rd year of its existence.

Honorary President: HARRISON F. LEWIS
Honorary Secretary: BERTRAM A. FAUVEL.

POND LIFE AND THE MICROSCOPE

At the Annual Meeting of the Ottawa Field-Naturalists' Club held at the National Museum of Canada, Mr. W. E. Harris, in an address entitled "Pond Life and the Microscope" showed to an appreciative audience what an amateur microscopist and photomicrographer can do when he tries. In addition to lantern slides of photographs taken from material mounted by the speaker, both mounted and living objects were projected on the screen at magnifications up to 200 diameters. The essentials of the demonstration were: a 400 candle-power lamp, six inch condenser, cooling tank, a one-inch objective, a screen, some old soap boxes and lots of black paint. With considerable experience of natural history societies both in Canada and the Old Country, the writer has seldom seen micro-projection so successfully carried out, and gladly takes this opportunity of making a brief record of some of the objects shown at the meeting. The lantern slides included: collecting apparatus, photomicrographs of parts of *Dytiscus*, water mite, *Cyclops*, *Daphnia*, *Hydra*, *Melicerța*, *Vorticella*, rotifers, *Stentor*, *Volvox*, snail eggs, sun animalcule. Objects projected through the microscope included parts of *Dytiscus* and water boatman, dragon fly larva, culex larva, *Cypris*, *Daphnia*; living *Daphnia*, *Cyclops* and *Hydra*. In using these and others to illustrate his address,

Mr. Harris brought home to his audience the labour and patience involved in this type of work. Long may he and others continue such

work—in spite of jazz, radio, movies and bridge parties.—F.J.F.

NOTES AND OBSERVATIONS

NESTING OF THE LARK SPARROW.—The nesting of the Lark Sparrow (*Chondestes grammacus grammacus*) in Southern Ontario, is perhaps of sufficient rarity and interest to be worthy of recording in *The Canadian Field-Naturalist*.

Credit for the discovery belongs to J. F. Calvert, and although he claims it was a case of luck or chance, it would appear that, coupled with these factors, there was at least a certain amount of keen observation.

The birds were found on May 24th, 1930, and on Mr. Calvert's return to the city (London) the following day, the news was passed around and an expedition organized to visit the locality the following week.

On May 31st some half dozen members of the McIlwraith Ornithological Club, with Mr. Calvert as guide, motored to Walsingham where the nest had been found, situated on the ground, just below an overhanging bank alongside the road about half a mile south of the village. When we arrived, the nest, which on May 24th had contained four eggs, was found to have in it young birds, one of which stretched up its head and neck for food as we came near. The parents were not in sight, but in a few minutes, one, presumably the female, put in an appearance in a nearby tree, with food in its mouth. After waiting for some minutes to assure itself that all was safe, it flew to the ground and after feeding the young, settled down upon the nest. The male bird had in the meantime arrived upon the scene, and during the next few minutes gave us a splendid opportunity of becoming well acquainted as it leisurely moved about on the bare roadway in excellent light and at very close range. It was interesting to note that it walked rather than hopped. The only thing that might have added to the pleasure of the occasion would have been to hear its song, but although we remained in the vicinity for quite a while, it did not favour us. As we prepared to take our leave, we went over near to the nest where we could plainly see the mother bird sitting closely and all the while keeping an eye on us, wondering, possibly, what all the fuss was about.

From 1878 to 1889 one or two pairs of Lark Sparrows nested regularly near London, but since that date records for this section of the province have been few and far between, the last

apparently being a pair near Komoka in the summer of 1900.—E. M. S. DALE.

LAPLAND LONGSPURS SINGING FROM TREES.—On March 17th, 1929, while crossing a field just north-east of Toronto, the writer was attracted by a strange chorus of bird song coming from a large oak tree standing in the field. A closer approach revealed a flock of about a dozen small birds perched among the upper branches. They would remain silent for a short time, then with a few opening notes, the whole flock seemed to join in a sweet, indescribable, twittering song, regularly interspersed with short, clear whistles which made it rather distinctive. The birds proved to be Lapland Longspurs, most of them apparently in a plumage resembling the typical female, although it was impossible to be positive of details viewing the birds with only the sky as a background. Enough was seen, however, to make the identification quite certain.

On March 23rd, 1930, about two miles directly east from the above mentioned location, I had a very similar experience. This time the birds, seven of them, were in an apple tree and as they were lower than on the first occasion and allowed quite a close approach a better view was obtained. As before, a majority seemed to be in an indeterminate plumage, probable changing from winter to spring, but two or three, viewed at close range, were in full, adult, spring male dress. This flock was very restless, constantly flying from branch to branch about the tree. The singing performance was as before, all the birds appearing to join in the chorus, though it is probable that only the males, if both sexes were present, were singing.

I do not think it would be possible to give a transcription of the song on paper, especially as it was never heard from a single bird, but some idea may be gained by stating that it had the same form as a Goldfinch or Siskin chorus, the only distinctive feature being the short whistle before mentioned. On both occasions when the birds took flight the usual Longspur *ch-r-r-r* was heard.—R. J. RUTTER.

NESTING OF THE PIPING PLOVER (*Charadrius meloda*) IN ALBERTA.—While canoeing on a small lake about fifteen miles north-west of Camrose, on June 15th, 1930, in company with Mr. Arthur

Twomey, a visit was made to a low, rocky island where a dozen or more Common Terns and several pairs of Avocets were nesting. This island is about 300 feet in length and 100 feet in breadth and at its highest point is about five feet above the present level of the lake. Vegetation is entirely absent on the sandy surface of the island but numerous rocks scattered over the higher portions provide partial shelter for the nesting birds.

Immediately upon landing, a bird note entirely new to both observers was heard, and was the cause of much speculation as to its origin. It was a soft, low, muffled whistle repeated at irregular intervals and appeared to come from a considerable distance. At the time it was suggested that it might be a bird on the mainland half a mile distant. While progressing along the center of the island towards its northern point, a small, light-coloured wader was seen flying along the shore line; it alighted about 150 feet ahead of us close to another bird which we took to be its mate. Upon a closer approach it was clearly evident that the notes were uttered by these birds, which at the time were believed to be either Piping Plovers or Semipalmated Plovers (*Charadrius semipalmata*). So close did we approach the birds that their throats could be seen expanding and contracting every time they whistled. They seemed to be interested only in the northern point of the island and when disturbed always returned to that locality. Believing that they might have a nest in the vicinity, I remained to watch the actions of the strangers, while Mr. Twomey went on to another island for further investigations. During an hour of watching the birds showed little interest in me and continued to feed along the shore, sometimes at quite a distance from each other, occasionally calling with their soft notes. When it was apparent that their only thought was hunting food, I moved slowly toward their favourite area and within a few minutes my eyes fell on a slight depression in the fine gravel

in which was a single egg. There was no attempt at nest building or lining and the egg lay on several brownish flat pebbles. The nest was about 40 feet from the water and was entirely in the open. The birds showed little concern when I was inspecting the nest and surroundings.

We again visited the island on June 23rd and found that the nest contained four eggs, which were taken and are now in the National Museum at Ottawa. On this occasion we had our glasses and examined the birds at close range and were satisfied that they were Piping Plovers. This, I believe, the first record of their nesting in Alberta, and it is the first time I have observed them in my thirty years' residence in this province.—FRANK L. FARLEY.

JAPANESE STARLING AT ALERT BAY, B.C.—On page 24, Vol. XLIV, of *The Canadian Field-Naturalist*, I reported the Japanese Starling at Alert Bay, B.C., on the authority of Miss Edna Moorhouse, who had spent a few years at Alert Bay. Miss Moorhouse was no more familiar with the bird than I was with the details of its range, but she took the word of her friends there that the bird was a Starling. Publication of the note brought forth a prompt question from Mr. J. A. Munro, who is well posted on the ornithology of British Columbia, and ever since then I have been trying to get more exact information, which has now arrived, in the form of a reply from a friend of Miss Moorhouse to the effect that the birds are not really Starlings, but are, as Mr. Munro suggested, Brewer's Blackbirds.—W. E. SAUNDERS.

CORRECTION.—Through an unfortunate error, the caption under the excellent photograph on page 205, Volume 44, December, 1930, was made to read "Female Goldfinch about to feed young". Reference to the photograph makes it obvious that it is the male bird.

BOOK REVIEW

BIRD PICTURE CARDS—A Series of 60 Coloured Bird Post Cards with descriptive matter, published by the National Museum of Canada, Ottawa. Price \$1.00 postpaid or two for five cents singly.

The National Museum of Canada has issued a set of sixty coloured plates of common birds by Allan Brooks in postcard size for use in schools and by private individuals. The name of the artist guarantees a high quality of work in the picture and the reproduction is good.

The text, doubtless by P. A. Taverner, is in his usual happy vein and enumerates the interesting and economic points of each species very well.

If any criticism were to be offered it would be that the series is a mingling of East and West that does not lend itself to the greatest utility in either section. But as there are only three exclusively eastern birds pictured, and only about a dozen exclusively western ones, this criticism carries little weight.

Someone made a slip in christening the White-breasted Nuthatch with the new name of the "Carolina Nuthatch". The bird is no more a denizen of Carolina than he is of Ohio or Canada, and this translation of his scientific name will bewilder some beginners without accomplishing any good purpose.

Bird students feel themselves used sufficiently badly by having the Latin names changed, and this has grown to be such an inconvenience that it has resulted in the discontinuance of their use by many students, and they are very likely to refuse to use everyone's new-fangled English names and to stick to the old ones, whose meaning is understood. The Committee in charge of the Check List for the American Ornithologists' Union made an attempt to standardize the

English names in their last publication, and they ordered that the Pigeon Hawk be known henceforth as the Pigeon Falcon, but the ordinary everyday student goes blithely on his way, using the old and familiar cognomen of Pigeon Hawk and relegates the suggested change to the limbo of unappreciated wisdom. Other similar suggestions received the same treatment and it is to be hoped that those official adjudicators of changes in Latin names will take the hint.—W.E.S.

NOTE.—Regarding the above criticism it seems well to point out that these cards were published by the Dominion Government for Dominion use west as well as east and it seemed most proper to diversify them for that purpose.

As to the authority for the use of the name "Carolina Nuthatch". This is a revival of a once current term and not a new creation. As the picture in question illustrates the Slender-billed Nuthatch of the west as well as it does the White-breasted Nuthatch of the east is seemed that an inclusive specific title was called for rather than a limiting subspecific one such as the reviewer suggests.—P.A.T.



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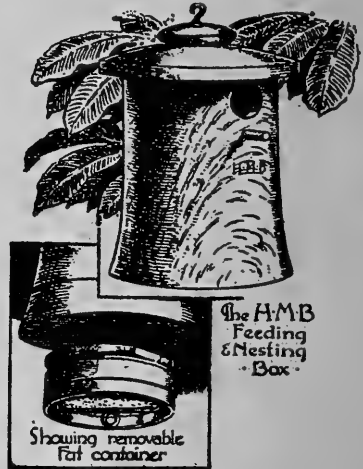
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CONTENTS

	PAGE
Obituary—Dr. Henry Marc Ami. By A.H.	25
Places of Special Geological Interest in Ontario and Quebec. By M. E. Wilson.....	25
Forestry vs. Game Cover. By Otto Schierbeck.....	28
Unsuspecting Chickadees. By Harrison F. Lewis.....	30
An Expedition to Sub-Arctic Canada, 1924-1925. By Capt. J. C. Critchell-Bullock (<i>Concluded</i>).....	31
Christmas Bird Census, 1930.....	35
Notes and Observations:—	
Elk Remains in Norfolk County. By Monroe Landon.....	40
Unusual Bird-banding Return. By D.L.....	40
Notes on the Acadian Sharp-tailed Sparrow (<i>Passerherbulus nelsoni subvirgatus</i>) at Kamouraska, Quebec. By Willie La Brie.....	40
The Prothonotary Warbler. By W. E. Saunders.....	41
The Acadian Flycatcher. By W. E. Saunders.....	41
A Second Record of the Saury or Billfish (<i>Scombresox saurus</i>) from the Gulf of St. Lawrence. By J. R. Dymond.....	41
Occurrences of Some Southern Sulphur Butterflies at Vineland, Ontario. By W. E. Hurlbut.....	42
Book Review. By H.F.L.....	42
Official Canadian Record of Bird-banding Returns.....	44

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The Canadian Field-Naturalist

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No. 2

DR. HENRY MARC AMI

THE Ottawa Field-Naturalists' Club has sustained a heavy loss in the death of Dr. Henry Marc Ami, one of its oldest and most honoured members. And not only so, for Canada at large has lost a great scientific man. Indeed to estimate his value we would need to go far afield, for so versatile was Dr. Ami, that beyond his immediate specialties, his knowledge and interests in very many subjects rendered him a well-known man, not only all over Canada but also in the United States and in Europe.

He was primarily a geologist, deeply trained in palæontology and archæology, but withal, whether in zoology or botany, he was an eminent naturalist. Yet alluding to what he was as a scientist does not fully portray the man. Those who knew him well could hardly have been long in his presence without being impressed with the knowledge he possessed of general literature, music, and art. His tastes were manifold, and if he delved into the earth in his search for relics and fossils, he also glimpsed into the Cosmos and spoke of the stars. Dr. Ami was an optimist, and the writer of this obituary has ever remembered a few words spoken by him when the two of us were walking alone at the close of one of the naturalists' excursions. The words were these: "Everything is trying to go one better."

With all his learning, Dr. Ami was most approachable, and no matter how elementary a

question might be he answered it with a grace and a sympathy that tended to enlighten the questioner. This and his congenial manner made him popular at the naturalists' excursions and at the lectures. At the excursions for years he was a leader and instructor, and his addresses under the pine trees, in open meadows, or by lake or stream, had a stimulating effect upon the minds of those who heard him speak. As a lecturer also he had a happy way of addressing his auditors and of holding their attention as he explained the pictures thrown upon the screen, many of which were from photographs taken by himself in the open field of nature.

Of late years Dr. Ami devoted himself to pre-historical research work in France, in connection with which he had brought to light a mass of information that must prove to be of lasting value. So well was he known through his scientific accomplishments during long years that many title and honours were bestowed upon him. The Ottawa Field-Naturalists' Club may be congratulated that it has had such a man among its members, for with his mental endowments and the fruits of his work, it may be long before Canada, in what was especial to him, again sees his like.

All that is mortal of Dr. Ami is hidden away under the ground, but his real personality abides and is cherished in our memories.—A.H.

PLACES OF SPECIAL GEOLOGICAL INTEREST IN ONTARIO AND QUEBEC

I—Ripple Marks near Perth, Lanark County, Ontario

By M. E. WILSON

WHEN the Palæozoic sea advanced into the lower Ottawa valley it filled in the irregularities of the Precambrian peneplained surface with sandstone. This sandstone, known as the Potsdam sandstone, from the locality in New York state where it was

first described, is usually not more than 100 feet thick but in one of the two Ottawa Dairy well borings, the only boring in Ottawa that has been drilled completely through the Palæozoic sediments into the Precambrian, 290 feet of sandstone were intersected. This thickness, however, is

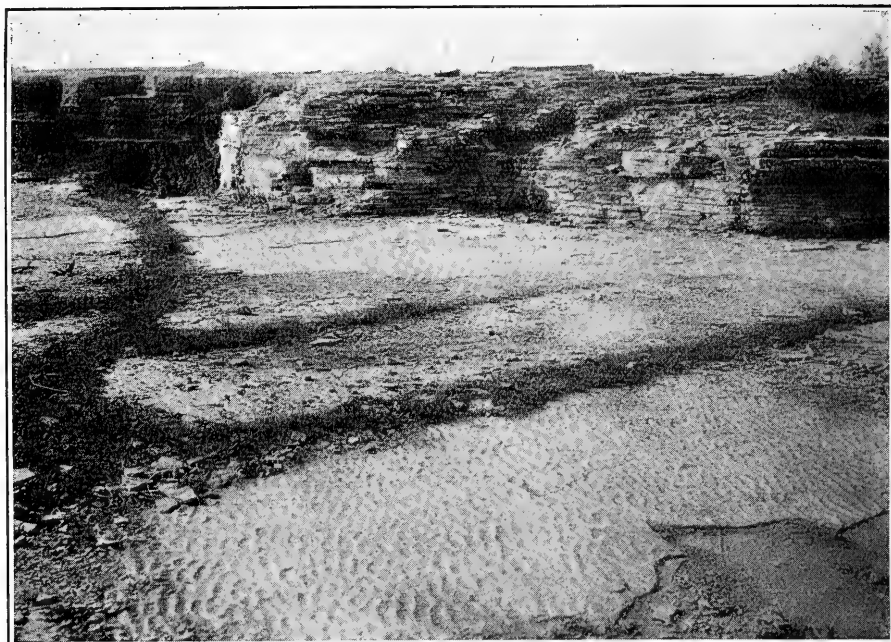


FIGURE 1.—Quarry in "Transition Beds," on the farm of Mr. H. J. Hands, Lot 10, Concession II, Drummond Township, Lanark County, Ontario, where remarkably well preserved ripple marks may be seen.

certainly exceptional and local. The Potsdam sandstone is succeeded by the sandy dolomitic limestone or limey dolomite of the Beekmantown, the change from the Potsdam to the Beekmantown taking place in most places transitionally, beds of sandstone up to four feet thick alternating with beds of sandy dolomitic limestone. These alternating beds formerly known as "Transition Beds", but now called Theresa in New York state, are usually thin, the maximum thickness so far observed by the writer being 30 to 40 feet in the vicinity of Smiths Falls.

The sandstone of the Potsdam and the Transition Beds is ripple marked in many places, the ripples being for the most part of the unsymmetrical type. The greater part of the ripples trend northeast-southwest or east-west and the steeper side of the crests of the ripples are on their southeast or south sides indicating that the current by which they were formed came from the northwest or north.

During the past season the writer encountered some exceptionally perfect ripple marks in sandstone of the Transition beds in a quarry excavated for road material on the farm of Mr. H. J. Hands, Lot 10, Concession II, Drummond Township, Lanark County, Ontario. The quarry lies about

3 miles northeast of Perth and 300 yards north of the second line of Drummond which forms a part of the original stage road from Perth to Ottawa, and the most probable route of the proposed Ottawa-Sarnia highway.

The mode of occurrence of the ripples in thin beds on the quarry floor is shown in Figure 1. They occur nearly everywhere throughout the entire extent of the quarry which is over 200 feet long by 100 feet wide and throughout a vertical range of about 14 inches. The total thickness of strata exposed in the quarry face is about 5 feet. This consists of thin bedded sandy dolomitic limestone, in which beds or zones and lenses of white sandstone up to 1 inch thick are intercalated sparingly near the top but more abundantly near the bottom. Closer views of the ripple marks are shown in Figures 2 and 3. Although these ripple marks were formed during the early Palæozoic and hence are almost certainly several hundred million years old they are as perfect as the day they were made. In Figure 3 it can be seen that sun cracks have been superimposed on the ripple marks. This shows that the ripple-marked beds were dried by the sun before the succeeding bed was laid down and hence were deposited on an intertidal flat.



FIGURE 2.—*Ripple Marks on floor of Hands Quarry near Perth. This Quarry lies about 300 yards north of the original Perth-Ottawa stage road which is also the probable route of the Ottawa-Sarnia Highway.*



FIGURE 3.—*Ripple Marks intersected by Sun Cracks on floor of Hands Quarry near Perth, Ontario. The presence of the Sun Cracks show that these strata were deposited on an intertidal flat.*

FORESTRY VS. GAME COVER

By OTTO SCHIERBECK



GAME conservation and protection is rapidly developing into a science. In the olden days, and to a certain extent to-day, our game laws were formulated on the basis of popular opinion, the say-so of guides and woodsmen, and sentiment. They should, however, be formulated on the basis of scientific study of the biology of the game animals. What applies to the game laws applies, perhaps in a higher degree, to the game refuges and game sanctuaries which are now being set aside all over the Dominion and the United States for the conservation of wild life. First of all it applies to the selection of the areas, and last but not least to the treatment of them. In this paper, I shall deal with the latter phase of this question.

One of the platforms of the Canadian Forestry Association, and of foresters in general, is that forestry and game conservation go hand in hand. One of our strongest arguments for fire protection is the destruction of wild life during a forest fire, and the destruction of the cover and browse following a fire. This argument is right, of course. Forest fires have, perhaps, contributed more to the destruction of our wild life than has the hunter's gun, and fire protection is, therefore, highly essential in a game sanctuary. But fire barrens, with their profuse abundance of berries—raspberries, chokecherries, huckleberries, blueberries, etc.—are nevertheless essential in every game sanctuary. Unfortunately, up to the present time the carelessness of visitors, campers, etc., has taken care of this question and I think that in general there are sufficient fire barrens in our game sanctuaries to take care of our wild life. However, the question might arise in some game sanctuaries, where it would be necessary to burn areas in order to create for the animals the very necessary berry grounds.

Another essential form of vegetation on barrens, especially those where caribou, elk and to a certain extent deer are kept, is the reindeer-moss, the grey lichen so commonly found on rocky barrens, which is necessary as a winter food for the aforementioned animals. This reindeer moss is very easily destroyed by forest fires, and comes back very slowly, the Biological Department at Washington having made a study of the question and come to the conclusion that it takes from thirty to forty years to replace this vegetation

after a forest fire. The Province of Nova Scotia did have quite a stand of woodland caribou, but about thirty or forty years ago it was swept from end to end by disastrous forest fires, due to a settlement scheme launched by the Provincial Government. Those forest fires destroyed the reindeer-moss and to-day, as a consequence, the caribou have disappeared. The reindeer-moss is now coming back but I doubt if the caribou will follow it, and it will in all probability be necessary to plant new stock of this game animal.

The fire barrens on which the reindeer-moss is now growing are, however, gradually returning to forests which, by their shade, are killing the reindeer-moss. I have no doubt that similar conditions exist on many of our game reserves, the reindeer-moss being crowded out by the second-growth forest. It might, therefore, be necessary to cut this second growth away in order, so to speak, to cultivate the reindeer-moss.

That fire barrens are essential to the wild life of the forest was well known by the Indians and it was common for them, especially for the sake of providing trapping grounds for bears, to start forest fires. In the olden days they seem to have had the knack of regulating those forest fires but nowadays, unfortunately, in the north country they seem to have forgotten it and a number of forest fires are, without doubt, due to the Indians burning barrens for the purpose of providing berry grounds for the wild animals.

Another very important question from a game conservation standpoint is the ground cover, the so-called "second storey" under the principal forest trees. Most of our big game animals depend on this second storey for their food, the most important trees, from a browsing standpoint, being the striped maple, red maple, dogwood, several honeysuckles (*Lonicera*), etc. The sudden disappearance of some species or other of big game animals from a certain region is without doubt due to the disappearance of their favourite browse, either from cutting or fire; and, quite frequently, to the fact that the forest grows mature and too dense, thereby killing off the second storey. There is a continual fight going on in the forest between the different species of trees, the more shade-enduring ultimately gaining the supremacy over the less shade-enduring, soil conditions and site of course playing

an important part. The change of the predominant type affects the under storey very much, and in many cases it might be advisable to put a guiding hand in this fight in order to maintain the proper under storey. This treatment might be altogether contrary to forestry principles, the principles recognized for growing the greatest amount of the best-producing, most valuable trees on the soil best adapted for them.

Some game animals have a special preference for certain plants or shrubs. For instance, I can mention that the white-tailed deer are especially fond of the so-called "ground hemlock" (*Taxus canadensis*) which, in Nova Scotia, is found as a ground vegetation under hemlock. The deer gather together on the lakes surrounded by hemlock stands, the ground hemlock being very prolific on the edge of lakes. Large flocks of deer are quite frequently seen on those lakes, from which the snow is generally swept clear, browsing on the ground hemlock. The cutting of the hemlock stands will cause the ground hemlock to disappear as it can only exist and thrive under the shade of older trees. I have noted the disappearance or diminution of the deer stand in sections of the country where old hemlock stands have been cut extensively. It might, therefore, be advisable to keep the stands intact even if they are over-mature and fit for cutting.

I have in the foregoing just mentioned a few examples to illustrate my point. Most of the game reservations or game sanctuaries are located on land belonging to the Crown, on land over which the game authorities have absolute control. The greatest demand with regard to forestry in later years has been for working plans—plans that provide for the harvesting of the forest on the principle of sustained yield. The Governments of the different Provinces and States are now all busy preparing these working plans, and without doubt many of our game preserves or sanctuaries are being cruised and surveyed for this purpose.

I wish to draw the attention of officers in charge of game protection on these reserves to the necessity of making provision in their working plans for the welfare of the game through the necessary abundance of the different shrubs, berry bushes, mosses, etc. Therefore, when a working plan is under preparation the game authorities should be called in for consultation, being prepared to supply sufficient statistics to give their demands weight. The foresters have all the statistics for the preparation of working plans on the basis of sustained yield at their finger tips—they are undertaking detailed cruises, measuring diameter and height of trees, exam-

ining growth, etc., in order to help them in their determinations. What are the game authorities doing? As far as I know, nothing. Have we as yet come to an understanding of the necessary browse area required by our different big game animals? Is there anybody who has yet prepared a list of the shrubs or plants which our big game animals prefer? Has anyone ever prepared a list of berries or seeds demanded by our game birds? Is there anyone who has made a study of the growing conditions of those shrubs which are so necessary to the welfare of our game, and has anyone ever given a thought to the best methods of growing those shrubs or to the treatment of the forest in order to make them thrive? We are very much in need of scientific research in this connection.

When a working plan is under preparation by foresters, the game authorities should be able to furnish data stating the stand of big game which it is desired that the forest reserve should maintain. The area of barrens required should be laid down, also the area of hardwood forest, with its undergrowth of browse, the area of conifers demanded, and regulations for the treatment of the mature forest so as to produce browse should be taken into consideration.

Last, but not least, it should be remembered that our game sanctuaries and game reserves are not established for the purpose of perpetuating game alone, but also with a view to the creation of national playgrounds. Aesthetic considerations are therefore of extreme importance in the treatment of the forest.

Many a famous lake derives its fame from single groups of especially beautiful trees, from forest-clad islands, from groves of exceptionally magnificent trees, and in many cases a single, solitary tree is of extreme importance from an æsthetic standpoint. Those groves and trees should be exempt from lumbering, but on the other hand they should be treated by forest experts in such a way as to prolong their life as far as possible. Many a trail or woodland road derives its beauty from the stands through which it passes, from the majesty and grandeur of exceptionally old and beautiful trees, such as Douglas Fir, or White Pine stands; or it might be through hardwood stands which by their colouring in the hunting season in the fall, produce an unforgettable beauty. Even if it should be decided to start lumbering those stands, the beauty might still be conserved by leaving uncut strips on both sides of the road from three to four hundred feet in width. Logging slash along tourist driveways or trails is always ugly and a hindrance to fire protection. A special beauty might be due to glades

or meadows where a single, solitary tree, such as an oak, elm or pine, has a beautifying effect. It might be advisable not alone to protect those groups, but also to prevent the meadow or glade from growing up into second growth forest.

All these questions are of extreme importance and should be well considered in the forestry treatment of our national parks. The tourist's dollar is fast becoming more and more important

in Canada, and in order that its flow may not be minimized but increased these questions are all of great importance. The authorities in charge of our national parks are doing splendid work in building trails, camps, and so on, but these improvements and expenditures may easily become valueless if the game disappears due to lack of browse or if the natural beauty of the parks is blemished through lumbering.

UNSUSPECTING CHICKADEES

By HARRISON F. LEWIS



WHEN, in early childhood, I first manifested an active interest in the wild birds about my home, I was given the oft-repeated advice that, in order to make their close acquaintance, I should put salt on their tails, which would result in my catching them with ease. Success in the application of this formula has never been my lot, but the experiences narrated below show that, in some cases, at least, the use of salt is not essential.

On a chilly day, with drizzling rain, about the year 1915, as I was walking on the outskirts of Wolfville, Nova Scotia, I saw a Black-capped Chickadee (*Penthestes atricapillus atricapillus*) feeding in a leafless alder bush. There was nothing unusual in its appearance, but the fact that it did not seem to heed me in the least when my path led me within a few feet of it attracted my attention. Wondering a little how near the bird I would have to go before it actively evaded me, I paused a moment, then stepped slowly in its direction. When I had advanced to the outer twigs of the bush in which it was busily feeding, it still appeared unaware of my presence, so, while expecting to see it fly away at any moment, I slowly extended my hand toward it. When my fingers were close to it I suddenly closed them upon it and had it securely in my grasp. The Chickadee seemed greatly surprised at this occurrence and struggled violently for a moment in a futile attempt to free itself, but I believe that my own surprise was equal to that of the bird, for I had confidently anticipated its escape rather than its capture.

When I had recovered a little from the first shock of unexpected success, I began to doubt whether the Chickadee could be in good health. "Perhaps," I thought, "it has from some cause lost the ability to fly". I took it into a neighbouring house and showed it to one or two other persons, holding it in my hand all the while, then I carried it to the open door and released it. It

flew away at once with strong, sustained flight as though in the best of condition.

No other experience comparable to this was mine until October 14, 1930, on the morning of which day I was investigating duck-foods on Lake Ramsay, at Sudbury, Ontario. While canoeing near the north shore of the lake, in cool, cloudy weather, with a light north-east breeze, I heard the notes of Hudsonian Chickadees (*Penthestes hudsonicus hudsonicus*), which were evidently in a residential district of the city bordering the lake. Most of the houses in this part of the city are surrounded by private lawns, provided with birches and other broad-leaved shade trees, forming an environment which it is not unusual for these Chickadees to visit in autumn in this latitude.

A few minutes later, the hour being about half-past nine in the morning, I went ashore and walked up one of the city streets in the vicinity from which the Chickadee notes had come. As I passed the city pumping station, a trim brick building with limited, well-kept grounds about it, my attention was attracted by some fern clumps that still showed bright green in an otherwise dismantled flower-bed bordering the foundation of the building. These fern clumps were about a foot in diameter and very neat in appearance, the small, numerous fronds rising only some two inches from the ground near the center of each clump and then reclining uniformly all around with their tips lying on the soil in a circle. This arrangement of the fronds left a small cup-like hollow in the center of each clump, and as I looked at them I was suddenly aware that a Hudsonian Chickadee crouched motionless in one of these hollows. Its side was toward me, but its head was rotated in my direction, so that it nearly faced me. Its position on the circular fern clump resembled closely that of a garnish on a salad, and, though very unusual, had an appearance of neatness and symmetry that, in conjunc-

tion with the pronounced colour contrast of brown back and green foliage, was most attractive.

After admiring this pretty picture and wondering what the bird was doing there, I approached to investigate, walking slowly, but without elaborate precautions. The bird did not move, although it presumably saw me, for its bright eyes were wide open. When I stood beside it, I gradually stooped down, extended my hand until my fingers were close about the little body, then suddenly grasped it. As in the previously-described experience, fifteen years earlier, the bird and I shared the resulting surprise. As soon as I touched the little creature, it struggled violently in an effort to escape, but without

avail, for I held it securely and harmlessly. I carried it to a yard about one hundred yards away and showed it to Mr. A. B. Smith, of Sudbury. After I had held it for some four or five minutes, I released it, whereupon it immediately flew vigorously to the upper part of a birch tree near at hand, where it perched and called for some time, in no way panic-stricken. Shortly afterward, it flew away.

In neither of the instances described had I been carrying on the feeding of small birds in the vicinity nor been doing anything else to make them unusually tame, nor, as far as I am aware, had any one else been doing so.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

GAME CONSERVATION

(Concluded from page 18)

EVEN the views of the idealist change materially with regard to this subject very soon after as his stock of provisions runs low, and he finds himself faced with visions of starvation. No matter how great his love of wild-life he will eventually dispense with sentiment. It is all a matter of degree, his finer feelings may cause him to disregard the first pangs of hunger, especially if some alternative to killing a particular species of game appears likely to present itself in the form of an animal appealing less to the æsthetic sense. But sooner or later the primitive forces in him will assert themselves, his finger will crook impulsively (and instinctively) round the trigger, and, should he be fortunate, over rolls another fine animal.

On the next occasion when he is faced with the problem the matter presents itself in a rather different light. He remembers the anxiety he suffered, the long days of waiting and hoping, wasted days when he was too weak to go about his business, he remembers the good meat he allowed to pass simply because of his idealism, meat that he was forced to procure after all. He may chuckle to himself for his narrowness of mind. But whatever he does, when next provisions run low he arms himself with rifle and cartridges, walks to the nearest herd of deer and picks out the finest looking buck. He can see what he is getting, there is some satisfaction in it, he forgets that his hooks and nets may catch fine fish the following day. All he knows is that they may not, and that by that time the deer may have passed on.

This is how the Indian thinks, in part at any rate, but unfortunately he has exaggerated the

seriousness of his position. The Indian says "I have a large family, they have a large capacity for good meat and so have I. To-morrow the caribou may be here in hundreds, but for the next six months there may be no sign of them. If I shoot six they will last me two weeks, if I shoot twelve I shall have sufficient for twice that period". The Indian in consequence shoots all that he can. Five days later more caribou pass. Apart from the fact that his last killing was difficult to cache well, so that much of it has been eaten by other animals, these fresh deer happen to pass a little closer to home, fresh blood makes good eating, hides are valuable both to himself and to the trader, tongues make good trade, and fresh killings attract more fur, fur being good trade also. Once again he kills as many as he can.

His father and his grandfather did so, since then there has apparently been no change in the times, caribou are as numerous as ever, so surely it can do no harm.

A period of starvation may ensue, the animal comes out in man, self-preservation is his only thought. The stern struggle for existence hardens him. Generations of hardship have been the lot of his kind, cruelty has been his portion, cruelty as dealt him by circumstance. Any day may be his last. He may not consider it in this light but nevertheless he knows it instinctively and subconsciously. What to him is a bullet in the heart of a caribou?

The Indians on the south shore of Great Slave Lake and of Artillery Lake are Yellowknives and hunters. They live a nomadic existence. Often they live on what they can shoot. They become therefore connoisseurs of meat, but they are not epicures such as we of the civilized world are.

Which of us will sit down to table for every meal for years with no more varied diet than fish and meat, just the two, nothing else? In a caribou carcass there is little variation. Except for the back-fat, the marrow, the tongue, parts of the internal organs, and the head, all is much the same. Even an animal shows a distinct preference for certain pieces. So does the Indian, he likes a change now and again, the ever-lasting boil becomes monotonous, I might even say that a change becomes necessary. The change to a fish diet in the spring certainly seems to be, they long for it, even sicken for it.

One has but to live as the Indian does to appreciate more or less accurately his position, but until one realizes his position justice in the matter of game conservation can with difficulty be administered.

Game and wild-life are conserved presumably for economic reasons of national importance; occasionally the fact that a certain species at one time numerous is in danger of extermination is a governing factor in its enforcement, even though that species is of no real economic importance to the State. Local tribunes are wont at times to demand the conservation of certain species for sentimental reasons alone, regardless of the fact that the animal in question has a more harmful influence on economics than otherwise. This is not the case in the country under review. All the animals conserved are of actual or potential value to Canada or the rest of the world.

Although the birds deserve mention the country through which we passed is comparatively speaking not a bird country, and the wooded valley of the Thelon is remarkably destitute of bird-life.

On Great Slave Lake the sea gulls no doubt suffer to a considerable extent during the nesting season, when the post natives put out in boats and collect their eggs in thousands. This, however, has gone on for centuries and it is doubtful whether it makes any appreciable impression on their numbers.

Some steps might possibly be taken to control the "birds-nesting" on Hudson Bay; from what I could gather it would appear that annual excursions are organized by the traders and natives to the nesting colonies in the vicinity of most of the posts, and that boatloads of the eggs of game birds are collected for eating. The extermination of certain species that habitually used to breed along these coasts and along the Labrador coast has doubtlessly been occasioned by the robbing of the nests.

It would be easier to organize measures of control than, later, to attempt the re-establishment of certain species. Although the Black

Guillemot (*Cephus grylle*) is usually understood to nest alone, rather than in colonies, it would appear that along the east coast of the Bay they are found nesting in rookeries. Advantage is taken of this fact, and I heard that enormous numbers of their eggs are taken every year. This bird is now not so numerous in Hudson Bay as I expected.

Of course, after the winter the diet of salted meats and canned goods to which the trader is reduced in those districts where caribou and other game is with but the greatest difficulty secured, becomes decidedly unpalatable and the change to fresh eggs is a welcome relief. Strict conservatory measures would therefore constitute a hardship and could with difficulty be enforced.

The shortage of fresh meat in the posts along the coast surprised me, and I have often wondered why some form of simple though effective ice-house has never been introduced. The companies' steamers that call during the summer could well bring a quantity of frozen meat instead of the livestock which is now imported, and this innovation would assist to a large extent to prevent the depletion of game.

The most important matter with which we have to deal, however, is the protection of the Caribou (*Rangifer arcticus*) and the Musk-oxen (*Ovibos moschatus*).

Their existence is chiefly endangered by the advance of civilization. As the tide advances so, in converse ratio, the game retreats until, brought to bay on the last of its range, it gradually falls before our deadly weapons, the products of civilization. Before the advent of the white man with his destructive inventions, and the introduction of a market value for hides and meat, these two species were in little danger of extinction. The community dependent on them for food and raiment was small, the methods they employed to secure the necessities of life were such that slaughter at all times of the year was impossible. The biggest killings were usually made when the herds were least likely to suffer from depredations; does were rarely killed at that time of the year when their destruction would mean the death of the unborn calf as well.

Now, however, the facilities that advancement offers, provide all and sundry with the means of destruction at any time of the year, and almost in any locality.

Comparatively speaking, the native is now neither the poor Indian nor the starving Eskimo. He knows that should hard times crown his efforts and should he be in the vicinity of a trading post, he has but apply for further debt, to be set on his feet again. There are many in the north country

who hold that it is now the "poor" white man rather than the poor Indian, the latter having but few responsibilities.

One of the matters that caused me no little surprise was the caribou hide trade. When we reached Pike's Portage at the beginning of September, 1924, a number of Indians were met returning from the hunting grounds carrying large packs. Each individual was packing about thirty hides. Questioning them we found that they were for sale at the trading posts at the rate of six dollars per hide. Apparently there is a market for almost an unlimited number.

As I did not pass through Resolution or Smith on my return I had no opportunity of finding out the number that is annually exported in this manner. But it must be large. As deer skin clothing is the only really suitable garment for use on northern trails in winter, nothing can compare with it for warmth and lightness, a ban placed on the exportation of these hides would entail considerable discomfort to those who travel in all weathers in the Northwest Territories and the introduction of such a measure is hardly to be contemplated. Nevertheless the fact that only picked hides are worth while bringing must have its effect when it is realized that probably only fifty per cent of the caribou at this time of the year, the summer, have hides that will find favour with the residents at the posts.

At Baker Lake I saw the return of a hunting party, three men, who had killed in less than a week seventy caribou, yet they brought back with them only five hides and a little meat, only a quarter of a load for the seventeen-foot canoe in which they were travelling. On the other side of Hudson Bay, however, there were hundreds of Eskimos in desperate need of hides for winter clothing.

When hunts are conducted under the supervision of white men a distinct change is noticed. About thirty miles along the southern shore of the same lake we saw a camp of hunters. They were the police party, three Eskimos with a con-

stable in charge. Unfortunately I have forgotten the constable's name, but he certainly deserved credit for the manner in which he had conducted his hunt. They had shot a number of caribou, but a good locality had been selected, the caribou had evidently been chosen before being shot, every caribou as it had been shot had been packed into camp and butchered, every hide without exception had been carefully cleaned and baled, and all the meat systematically prepared for shipment to the post.

Apparently impossible to educate natives along these lines, so that they will conduct their hunts in an orderly manner, for one thing they are spread out over so vast a country, individually and by single families, that it is impossible to administer them.

Most fortunately the position as it now stands is reasonably satisfactory. Although the numerous trading establishments along the coast must have their effect in limiting the caribou migrations, the fact that no posts have yet been built in the interior, in the heart of the caribou and musk-ox country, leaves all but the flankers of the annual movements immune from systematic slaughter.

The natives do not travel as much as they used to do, and we found no sign of recent camps anywhere along our line of travel between Artillery Lake and Aberdeen Lake. In fact there is a huge area lying between Kazan River and the Coppermine River, as far south as Dubawnt Lake, and (except for the Back's River Eskimos) as far north as the coast wherein game find comparative immunity. The Back's River Eskimos who live solely on caribou meat and live in the interior throughout the winter, must kill large numbers, but they are a small community, D. Jenness believes not more than thirty individuals. They are now given to trading with the posts on the coast, King William Island, Kent Peninsula, and Ellice River, and it may be imagined that before long they will become absorbed by the coast Eskimos.

FISH

The fish listed below are those only that were observed in the more northern waters we traversed. The fish of Athabasca River, Slave River, and Great Slave Lake are too well known to require mention here.

The numbers and weights of fish daily taken by us were noted, as well as the various places in which they were taken. To give such lengthy detail does not seem necessary, and I have treated the matter as concisely as possible.

Catostomus catostomus (Forster). NORTHERN SUCKER.—Tyrrell states that this species is abundant in Artillery Lake. We fished with nets in this lake until the end of November, but succeeded in catching only one representative of this species.

It occurs infrequently along Thelon River at the average weight of about three and a half pounds. We were surprised to find it in some numbers at the foot of Dickson Canyon. How it came there we could not imagine with a several hundred feet fall above where it was found and a sheer drop of fifty feet immediately below.

Amphiodon alosoides (Rafinesque). GOLDEYE.—This species was caught near the mouth of Taltson River and as far east as the Narrows on Great

Slave Lake; it was not found elsewhere along our route.

Coregonus sp. WHITEFISH.—This species is abundant in Great Slave Lake as far as old Fort Reliance. In Artillery Lake it was found in small numbers, five being caught in two months only, fish weighing but four pounds.

It extends thereafter to Baker Lake, though in some localities it is, of course, more numerous than in others, according to the nature of the country through which the rivers are flowing. The best whitefish fishing we had was at the western extremity of Aberdeen Lake, where in one night we caught twenty, weighing five pounds each, in one net.

Leucichthys sp. ? (Richardson). TULLIBEE.—This species was first caught east of the Narrows on Great Slave Lake, but it was not abundant.

During October it was found to be numerous in Artillery Lake, but after November 1st it was only occasionally caught. Its next occurrence was at Schultz Lake where one of three pounds was caught. I examined it carefully and it struck me as being slightly different to those that we had caught further west the previous year. It was not seen further east.

Cristivomer namaycush (Walbaum). LAKE TROUT.—This fish inhabits all the waters travelled by us, but on Thelon River it is not so plentiful as Tyrrell leads one to believe. One of these

trout caught in Artillery Lake on November 11th weighed 31 lbs. This species also occurred in the small lake at the foot of Dickson Canyon. One caught here weighed 10½ lbs., and measured 28½ inches long, 15 inches in girth.

Thymallus signifer Richardson. ARCTIC GRAYLING.—This species was first caught in Great Slave Lake just east of the Narrows. Its next occurrence was at the foot of Dickson Canyon, where two were taken, it also occurs below Helen's Falls and at the last falls of Hanbury River. Below Helen's Falls the species is numerous and afforded us some little amusement with the wet fly. The species does not appear to inhabit the waters to the east of the mouth of Hanbury River.

Cottus cognatus Richardson. BULLHEAD.—Lake trout were found living on these small cottoids along Hanbury River. We found that a partly digested fish of this species taken from the stomach of a trout and placed on a hook provided the best bait for large individuals of the species *C. namaycush*. This species was not observed in Thelon River.

Lota maculosa Le Sueur. LOCHE.—This voracious fish is almost absent in the Hanbury-Thelon system. It was caught only once during the journey from Great Slave Lake to Hudson Bay.

LIST OF LEPIDOPTERA COLLECTED AT PORTAGE GROVE FALLS, HANBURY RIVER, N.W.T., ON JULY 6-8, 1925

DIURNALS

- Eurymus boothi* Curt. 1 M.
Eurymus hecla var. *glacialis* McLach. 1 M.
Eurymus palæno var. *chippewa* Edw. 3 M., 1 F.
Oeneis taygete Hbn. 2 M.
Oeneis semideca var. *arctica* Gibs. 1 M.
Erebia rossi Curt. 4 M., 1 F.

- Brenthis polaris* var. *americana* Strand. 1 M.
Brenthis freija var. *tarquinius* Curt. 1 M.
Brenthis improba Buti. 1 M.
Brenthis aphirape var. *tricularis* Hbn.

NOCTUIDAE

- Agrotiphila quieta* Hbn. 1 M.

LYMANTRIIDAE

- Gynaephora rossi* Curt. 1 F.

LIST OF INSECTS COLLECTED

Trichoptera:

- Chilostigma præterita* Walk., S.E. Sifton Lake, June 27, (H. & B.); Campbell Lake, n.w., June 3, J. Hornby.

Plecoptera:

- 1 ? specimen, Hanbury River, July 4, (H. & B.). M. needed.

Diptera:

- Tipula arctica* Kby. 2 F. Hanbury Lake to Hanbury River Portage, Grove Falls, July 6-8, 1925.

Hymenoptera:

- Bremus arcticus* Kby., Hanbury Lake to Han-

bury River Portage, Grove Falls, July 6-8, 1925.

Bremus sp., S.E. Sifton Lake, Hanbury River, June 22, 1925.

Coleoptera:

Agabus tristis. Hanbury River, July 4, 1925.

Stereocerus similis, Campbell Lake, N.W., June 3, 1925 (Hornby).

Silpha lapponica, Hanbury River, July 4, 1925.

Lepyru sp. near *palustris*, Burr Lake, Sept. 1, 1926.

NOTE: The above collection of Lepidoptera proved most interesting and contains species which have heretofore been known only from the extreme North. *Eurymus boothi* was taken by the Canadian Arctic Expedition around Coronation

Gulf and is also known from Baffin Land. *Erebia rossi* and *Brenthis improba* might also be mentioned as great rarities. Noctuid, *Agrotiphila quieta*, described from Northern Europe,

is the first authentic specimen which we have from the Canadian Arctic region.—J. McDUNNOUGH, Chief, Division of Systematic Entomology.

LIST OF PLANTS COLLECTED BETWEEN SIFTON LAKE AND ABERDEEN LAKE

- Thelypteris fragrans* (L.) Nieuwl. Scented Shield Fern.
Deschampsia caespitosa (L.) Beauv. Tufted Hair Grass.
Festuca rubra L. var. *arenaria* Fr. Creeping Fescue.
Elymus arenarius L. var. *villosus* Mey. Lyme Grass.
Carex concolor R. Br. Sedge.
Habenaria obtusata Richards Small Northern Bog Orchis.
Salix sp. Willow.
Polygonum viviparum L. Bistort.
Silene acaulis L. Moss Campion.
Stellaria longipes Goldie var. *Edwardsii* Wats. Chickweed.
Cerastium alpinum L. Mouse-ear Chickweed.
Rorippa palustris (L.) Bess. Marsh Cress.
Anemone Richardsonii Hook. Anemone.
Draba sp. (too incomplete). Draba.
Parnassia palustris L. Marsh Grass of Parnassus.
Saxifraga tricuspidata Rottb. Three-toothed Saxifrage.
Saxifraga Hirculus L. Yellow Marsh Saxifrage.
Rubus Chamæmorus L. Cloud-berry.
Rubus acaulis Michx. Arctic Bramble.
Dryas integrifolia M. Vahl. Dryade.
Potentilla sp. Cinquefoil.
Lupinus nootkatensis Don. var. *Kjellmanii* Ostf. Lupine.
Astragalus alpinus L. Alpine Milk Vetch.
Hedysarum Mackenzii Richards. Purple Loments.
Hedysarum Mackenzii var. *albiflora*. Purple Loments (albino).
Hedysarum boreale Nutt. Northern Loments.
Epilobium latifolium L. Broadleaved Willow-herb.
Pyrola grandiflora Rad. Wintergreen.
Kalmia polifolia Wang. American Laurel.
Andromeda polifolia L. Wild Rosemary, Moorwort.
Loiseleuria procumbens (L.) Desv. Trailing Azalea.
Arctostaphylos alpina (L.) Spreng. Alpine Bearberry.
Rhododendron lapponicum (L.) Wg. Lapland Rose Bay.
Vaccinium Vitis-idaea L. var. *minus* Lodd. Rock Cranberry.
Vaccinium Oxycoccus L. Small Cranberry.
Vaccinium uliginosum L. Bog Bilberry.
Vaccinium uliginosum L. f. *microphyllum* Lge. Bog Bilberry.
Statice labradorica (Wallr.) Hubb. & Blake Sea Pink.
Castilleja pallida (L.) Kunth. Indian Paint-brush.
Pedicularis lapponica L. Lapland Pedicularis.
Pedicularis sudetica L. ?. Pedicularis.
Pinguicula vulgaris L. Butterwort.
Lobelia Kalmii L. Brook Lobelia.
Erigeron uniflorus L. One-flowered Eeabane.
Saussurea angustifolia DC. Saw-wort.
Arnica alpina (L.) Olin. Alpine Arnica.
Antennaria alpina (L.) R. Br. Alpine Everlasting.
Taraxacum sp. (too imperfect). Dandelion.

(THE END)

CHRISTMAS BIRD CENSUS, 1930

CAMROSE, ALBERTA, December 25, 1930.—Camrose to Dried Meat Lake and Battle River Spruce woods, and return. 10 a.m. to 4 p.m. Clear and mild, 6 inches of snow, west wind, temperature at start 20° above, return 25°, 20 miles by motor, 5 miles on foot; observers together. Birds observed:

Hungarian Partridge, 10; Ruffed Grouse, 4; Sharp-tailed Grouse, 5; Hairy Woodpecker, 2; Downy Woodpecker, 1; Magpie, 5; Blue Jay, 8; Pine Grosbeak, 100; Common Redpoll, 500; Hoary Redpoll, 20; Snow bird, 200; Brown Creeper, 2; Black-capped Chickadee, 25. Total:

13 species and about 882 individuals. (Same observers saw Golden Eagle and Pileated Woodpecker previous day, December 24th. Our first winter record for eagle. Pileated Woodpecker approached easily within 100 feet several times. Snowy Owl and Northern Shrike seen during Christmas week.)—ARTHUR C. TWOMEY and FRANK L. FARLEY.

COURTENAY, VANCOUVER ISLAND, BRITISH COLUMBIA, December 26, 1930.—From Courtenay along the river and road to Comox, from there by road to Point Lazo, nine miles; observers together

and separate, by car and on foot. Weather, still, cloudy, good visibility. Temperature 35° to 42°. The winter to date has been very mild with little wind. The following is the list of birds observed: Western Grebe, 15, Hoell's Grebe, 10, Horned Grebe, 37; Loon, 40; Pacific Loon, 70; Red-throated Loon, 3; California Murre, 12; Marbled Murrelet, 2; Glaucous-winged Gull, 325; Thayer's Gull, 15; Short-billed Gull, 56; White-crested Cormorant, 4; Violet-green Cormorant, 71; American Merganser, 9, Red-breasted Merganser, 10, Hooded Merganser, 7; Mallard, 250; Widgeon, 200; Canvas-back Duck, 2; Ring-necked Duck, 1; Greater Scaup, 1000, Lesser Scaup, 6, American Golden-eye, 1000; Barrow's Golden-eye, 10; Buffle-head, 250, Harlequin Duck, 50, Old Squaw, 25, American Scoter, 150; White-winged Scoter, 2000; Surf Scoter, 1000; Northwest Heron, 2; Black Brant, 5; American Coot, 20; Red-backed Sandpiper, 150; Killdeer, 9; Oregon Ruffed Grouse, 1; Cooper's Hawk, 1; Kingfisher, 5; Harris's Woodpecker, 3; Gairdner's Woodpecker, 1; Northwest Pileated Woodpecker, 2; Northwest Flicker, 5; Western Meadowlark, 5; Raven, 2; Northwest Crow, 300, Steller's Jay, 2; Pine Siskin, 20; Oregon Junco, 12; Rusty Song Sparrow, 25; Oregon Towhee, 5; Seattle Wren, 7; Western Winter Wren, 4; Chestnut-backed Chickadee, 20; Western Golden-crowned Kinglet, 1, (Introduced) Pheasant, 4. Total species, 55; total individuals, 7266.—ALLAN BROOKS and THEOD PEARSE.

SUMMERLAND, OKANAGAN LAKE, BRITISH COLUMBIA, December 21, 1930.—From 8 a.m. to 4 p.m. Cloudy, with south wind. Average temperature, 30°. Light snow falling in early a.m. Snow 9 inches in hills to little or none on lake front. By car from Penticton to Trout Creek; thence on foot along four miles of lake front and adjoining fruit benches, back to pine-clad hills, being the municipality of Summerland and Experimental Station. Observers in three parties. Simpson and Young together. Birds observed: Horned Grebe, 1; Herring Gull, 3; Hooded Merganser, 2; Red-breasted Merganser, 3; Mallard, 12; American Golden-eye, 3; Bufflehead, 8; American Coot, 855 (est.); Wilson's Snipe, 5; Killdeer, 1; California Quail, 230 (est.); Pheasant, 32; Bald Eagle, 3; Pigmy Owl, 1; Hairy Woodpecker, 4; Downy Woodpecker, 1; Flicker, 43; Magpie, 38; Clarke's Nutcracker, 1; Evening Grosbeak, 95 (est.); Cassin's Finch, 10; White-winged Crossbill, 75 (est.); Hoary Redpoll, 2; Redpoll, 70; Goldfinch, 12; Tree Sparrow, 1; Shufeldt's Junco, 420 (est.); Rusty Song Sparrow, 42; Bohemian Waxwings, 260 (est.); Northern

Shrike, 5; Winter Wren, 1; Slender-billed Nuthatch, 5; Red-breasted Nuthatch, 21; Pygmy Nuthatch, 12; Long-tailed Chickadee, 21; Mountain Chickadee, 5; Golden-crowned Kinglet, 4; Townsend's Solitaire, 2; Robin, 70. Total species, 39; total individuals, 2,384. Also 75 English Sparrows.—S. A. LIDDELL, E. M. TAIT, H. M. SIMPSON and T. YOUNG, JR.

ATHENS, ONTARIO, December 30, 1930.—West of Athens to Lyndhurst and return, 24 miles by car, 9.30 a.m. to 12.30 p.m., and to Addison and along Highway 29, and return, 18 miles by car, 1.30 p.m. to 3.00 p.m. Temperature, 32° at start, 21° on return. Dull and cloudy, some snow falling in morning. Wind southwest, light to moderate in afternoon. About 3 inches of snow on the ground. The following list was observed: Ruffed Grouse, 2; Blue Jay, 2; Crow 2, Starling, 50+, Snow Bunting, 500+, Chickadee, 4. Total species, 6, total individuals, 560+. Pine Grosbeaks, Redpolls, Woodpeckers and Waxwings were unaccountably absent.—MURRAY W. CURTIS.

LONDON, ONTARIO, December 27, 1930.—This year the McIlwraith Ornithological Club took the annual Christmas Bird Census on Saturday, December 27th, the weather proving ideal for the occasion. The temperature at the start, about 8 a.m. was 32°, rising to 34° at midday and falling again to 29° at 5 p.m. Although the sky was overcast all day, the visibility was quite good and the three inches of snow on the ground made walking easy. The streams were pretty well frozen up except in the rapids, and the wind which was fairly fresh and from the west was not strong enough or cold enough to interfere with the work.

The observers, some eighteen all told, were divided into nine parties, some of them working in the morning and others in the afternoon, practically from daylight until dark. The country covered was the same as previous years, particular attention being given to the Thames valley west from the city. In the morning one party visited Wonnacott's farm while another worked west along the river from Kilworth and met the Wonnacott party at Komoka Bridge. At the same time another group went to Hyde Park by train and followed the river from that point to Byron. All these river parties found ducks remarkably scarce, with the exception of Blacks which are now coming to be looked upon as regular winter visitors. Only one Merganser, no doubt American was seen and no Golden-eyes at all. An Old Squaw which had been at the Byron bridge a week or two previously was not located. But

while ducks were scarce, Gulls were everywhere in evidence, probably 150 all told being seen which is certainly a record for London for winter and only a few below the largest number ever noted here. While motoring north and west of the city on December 20th, we had found three hawks, so a party was despatched to cover that district in the hope of finding some of them again or, perhaps, running across a Snowy Owl of which quite a few have been reported this winter. They failed to find a Snowy but picked up dead a Screech that had evidently been killed the night before. A Sparrow Hawk, noted on the 20th, was however, found perched in the same lone tree in the middle of a field, surely a most obliging bird. A complete absence of Crossbills, Grosbeaks, Redpolls and other such northern visitors helped to keep our list down so that it is slightly below 1929 and 1928, but we feel that the list given below pretty well represents the winter population of this district as the favourite haunts were all visited and if the birds had been around they would surely have been seen.

Herring Gull, 150; American Merganser, 1; Black Duck, 38, Ruffed Grouse, 1; Pheasant, 14; Sharpshinned Hawk, 3; Red-tailed Hawk, 3; Sparrowhawk, 1; Screech Owl, 2; Kingfisher, 1; Hairy Woodpecker, 1 (very scarce); Downy Woodpecker, 21; Red-headed Woodpecker, 2 (have been around all winter); Flicker, 2; Blue Jay, 82 (very common); Crow, 449; Starling, 255; Meadowlark, 1; Purple Finch, 32; House Sparrow, hundreds, but not so many as usual; Goldfinch, 40; Snow Bunting, 125 (one flock); Tree Sparrow, 106; Slate-coloured Junco, 7 (scarce); Song Sparrow, 1; Cardinal, 7 (scarce); Northern Shrike, 2 (more reported this winter than any other year on record); Brown Creeper, 13 (one flock of five); White-breasted Nuthatch, 22; Red-breasted Nuthatch, 6 (quite a while since we have had them present in such numbers in winter); Black-capped Chickadee, 47; Golden-crowned Kinglet, 24; Robin, 1. Total, 33 species; 1,459 individuals, plus House Sparrows.—MCLLWRAITH ORNITHOLOGICAL CLUB, E. M. S. DALE, Secretary.

OTTAWA, ONTARIO, December 21, 1930.—The Christmas Bird Census of 1930 in the Ottawa area was taken on December 21 by twenty observers on nine routes radiating out from the city for the most part in well established ways. Conditions were very fine and observations were made throughout the whole interval of daylight: Sunrise, 7.40 a.m.; sunset, 4.22 p.m.; temperatures, 23°, 8 a.m., 33° 1.30 p.m., and 31°, 3-15 p.m.; cloudiness decreasing from 80 to 5 per cent. average 35; southwest breezes moderating through-

out the day; snow, 3 in. to 15 in.; average 6 in.; fairly hard underneath, making the walking unusually easy. The parties, and the routes taken in NESW order were: (1) Hoyes Lloyd and A. E. Porsild, 7 a.m. to 4 p.m., north bank of the Ottawa River, east of Gatineau to Templeton and return, 16 miles by auto, 7 on foot; (2) Elizabeth Lloyd, Helen Lloyd, H. A. Lloyd, Wilmot Lloyd and Mrs. A. E. Porsild, 9 a.m. to 1.30 p.m., Rifle Ranges, cemetery, Rockcliffe village, 5 miles on foot; (3) R. M. Anderson, 10 a.m. to 12 m., Pretoria bridge, through Ottawa East, to garbage dump, along Rideau River to Riverdale Ave., 5 miles on foot; (4) J. Skillen and R. Sternberg; 8.45 a.m. to 3.00 p.m., out Heron Road, then south, then west to R.R., up track, then through bush, 18 miles on foot; (5) C. E. Johnson and C. M. Sternberg, 8.40 a.m. to 3.30 p.m., from south end of Bronson Ave., to Whyte's Bridge, C.P.R. track and back by Metcalfe Road, 10 miles on foot; (6) D. B. De Lury and R. E. De Lury, 8 a.m. to 3.15 p.m., Experimental Farm, Rideau River and Canal to Hog's Back, Black Rapids and return, 16 miles on foot; (7) W. H. Lanceley and F. H. Ostrom, Billings' Bridge, Bowesville Road, Hog's Back, Prescott Highway, returning by Merivale Road, 10.30 a.m. to 4.30 p.m., 25 miles by auto, 7 miles on foot, (8) R. Lockwood and H. Wright, 8.45 a.m. to 4.50 p.m., by R.R. and car tracks, to Aylmer, back of Aylmer, to Wychwood and Deschenes, 14 miles on foot; (9) G. Lathe and H. F. Lewis, 7 a.m. to 4 p.m., Ottawa south, to Hull, to Gatineau Point, up east side of the river, back road to Cantley, returning by main road to Farmer's Rapids, 5 miles by auto, 16 on foot.—OTTAWA FIELD-NATURALISTS CLUB, per R. E. De L.

(See next page for tabulated Ottawa returns)

PAKENHAM, ONTARIO, December 26, 1930.—9 a.m. to 4 p.m. Dull sky, mild, no wind, 3 in. snow; temperature 30° at start, 34° at return. Twelve miles on foot, observers together.

American Golden-eye, 2; Blue Jay, 21; European Starling, 27; White-winged Crossbill, 84 (est.); Redpoll, 15; Snow Bunting, 132; English Sparrow, 6; White-beasted Nuthatch, 3; Red-breasted Nuthatch, 15; Black-capped Chickadee, 10. Total: 10 species, 315 individuals.

Seen recently: 2 Grouse, December 24 and 25; Northern Shrike, December 24; Arctic Three-toed Woodpecker, December 25.

The presence of Red-breasted Nuthatch is noteworthy as they have been absent from any of our records since November, 1927. Grouse are plentiful but could not be found on census day.—EDNA G. ROSS, ALLAN ROSS and V. M. ROSS

OTTAWA CHRISTMAS BIRD CENSUS

SPECIES	ROUTES:	1	2	3	4	5	6	7	8	9	TOTALS
American Merganser										3	3
American Golden-eye									14	7	21
Canada Ruffed Grouse	1					2			1		4
Sharp-shinned Hawk							1			1	2
Goshawk								1			1
Great Horned Owl								1			1
Hairy Woodpecker			4					1	2	4	11
Downy Woodpecker	1	5				3	2	4		4	19
Arctic Three-toed Woodpecker	1										1
Blue Jay	1				2		3		7	7	20
Crow	3		75	12	21	53	243	1	6	6	414
Starling			500		14	22	20		47	5	608
Bronzed Grackle					1						1
Pine Grosbeak	13			1	4				6	3	27
House Sparrow	8		100	53	270	150	5	11	59	59	656
Purple Finch					12				7		19
White-winged Crossbill	8				9				17	9	43
Redpoll							44				44
Goldfinch				2			4			21	27
Pine Siskin	250	10		4			2		42		308
Snow Bunting								3	3	122	128
Tree Sparrow			1								1
Song Sparrow					2						2
Bohemian Waxwing							4				4
Northern Shrike					2		6				8
Brown Creeper					3						3
White-breasted Nuthatch	5	10	1		1		1		3	3	24
Red-breasted Nuthatch	19						2		22	10	53
Chickadee (Black-capped)	9	30		1	19	24	11		43	25	162
Golden-crowned Kinglet										1	1
Robin							2				2
Total individuals		319	59	677	75	363	320	289	226	290	2618
Total Species		12	5	5	7	14	15	9	15	17	31

TORONTO, ONTARIO, December 28, 1930.—The Brodie Club of Toronto organized their 6th Christmas Bird Census for Sunday, December 28th, 1930, and with six parties in the field made the usual survey of the territory in and near the city.

The weather was dull and there was quite a flurry of snow about noon, but the ground was practically bare as there has been very little snowfall during the month. Small ponds and streams were frozen sufficiently firm to bear a man's weight and there was no thawing during the day. Thermometer readings of the Toronto Observatory were: 8 a.m., 32°; noon, 32°; 4 p.m., 35°; 8 p.m., 33°. The wind varied from 11 to 17 miles and was from the southwest.

Among the birds observed were a number of quite rare winter residents but only two of exceptional interest, the Brown Thrasher and the Towhee. The former was discovered by No. 2

party in a vacant lot on Soudan Avenue in North Toronto. It was foraging among some bushes in company with House Sparrows while under observation and seemed to be a perfectly healthy specimen. The only other winter record for Toronto is from the notes of Stuart Thompson, who saw one near the Humber River on January 16, 1926. Because, however, of some slight doubt attached to this record, Mr. Thompson, with the caution of a true naturalist, has refrained from publishing it. Winter records of the Thrasher from any part of Ontario are rare indeed.

The Towhee, a well plumaged male, was found by No. 1 party in East York Township, about a mile to the northeast of the city. This bird had been seen by the writer on December 14th, and now, two weeks later, it was found within a few yards of the same place. The site chosen for its winter residence was a small ravine with open fields on one side and a thickly

wooded hill on the other. On the wooded hillside the Towhee seemed to be finding the necessary sustaining food by scratching among the fallen leaves and when approached by the census party it flew directly to the base of a hemlock which had been partly uprooted and disappeared into the dark recesses beneath the roots. This is probably its permanent shelter and it is to be hoped that no mink or weasel passes that way during the night. This is the third Toronto winter record.

The absence is notable on this year's list of such winter birds as Pine Grosbeak, Purple Finch, Siskin and Snow Bunting. Last year eleven species of native sparrows were noted, this year only six. The small numbers of practically all species, compared with other years is also worthy of mention, though the number of species is quite up to average. House Sparrows are not counted

individually as to give the numbers seen on an occasion like this might only lead to a false impression of their abundance. There may be fluctuations but there are still tens of thousands of House Sparrows in the city and as the activities of the census parties are chiefly confined to the outlying sections any birds seen by them are only stragglers from the main centre of population.

After being an easy first on the 1928 and 1929 lists, the Starling goes to seventh place, with only 57 birds recorded. This is not consistent with the year-round records of the Starling at Toronto, as they have been steadily increasing. It has been noted, this winter, however, that they seem to be more generally distributed in small numbers throughout the city rather than in large flocks in the open country, and this may be a partial explanation. Whether or not this indicates a definite trend in Starling habits in this locality remains to be seen.

¹ Can. Field Nat., 42: 23, 1930.

CHRISTMAS BIRD CENSUS OF THE BRODIE CLUB, TORONTO

SPECIES	ROUTES:	1	2	3	4	5	6	TOTALS
Great Black-backed Gull					1	2	5	8
Herring Gull		8			4	10	50	72
Ring-billed Gull						3	50	53
American Merganser					3	6		9
Red-head Duck						2		2
Scaup Duck						100		100
Golden-eye					85	40		125
Old Squaw					9	200	6	215
Cooper's Hawk						1		1
Red-tailed Hawk		1						1
Rough-legged (?) Hawk							1	1
Sparrow Hawk						1		1
Long-eared Owl		1						1
Short-eared Owl		1						1
Barred Owl				1				1
Screech Owl			1					1
Downy Woodpecker			1	1	2	2	1	7
Blue Jay			3					3
Crow			1		4	1		6
Starling		2	32	4	13	6		57
Meadowlark				1				1
House Sparrow				Abundant				
Redpoll							20	20
Goldfinch			66					66
Tree Sparrow		15	5	8	20	10	12	70
Slate-coloured Junco			3					3
Song Sparrow				2				2
Towhee		1						1
Cedar Waxwing				40				40
Northern Shrike				2				2
Brown Thrasher			1					1
Winter Wren			1	1				2
Brown Creeper		3	1	4		1		9
White-breasted Nuthatch			2			2		4
Red-breasted Nuthatch		1						1
Chickadee			14	1	7	8	1	31
Golden-crowned Kinglet			2		5			7

Total Species, 37.

Total Individuals, 925

Eighteen observers were divided into six parties as follows: (1) E. J. Deacon, R. J. Rutter—Eastern Don Valley and adjacent parts of East York Township. (2) L. L. Snyder, H. H. Brown, T. F. McIlwraith, H. B. Macklin, K. B. Jackson—Reservoir Park, Lawrence Park and northward to York Mills. (3) C. Hope, F. Smith—Cedarvale and Mount Dennis. (4) J. L. Baillie, Jr., Paul Harrington—High Park and Humber Valley north of Lambton. (5) R. V. Lindsay, F. H. Emery, M. Speers—Lake Shore from Exhibition Grounds to Sunnyside and High Park. (6) S. L. Thompson, G. Bell, L. J. Milne, J. Townson, Ashbridge's Bay and Fisherman's Island.

Some other birds of interest which have been observed at Toronto since December 1st are: Canvasback Duck, Snowy Owl, Red-headed Woodpecker, Red-winged Blackbird, Rusty Blackbird and White-throated Sparrow.—THE BRODIE CLUB, R. J. RUTTER, *Secretary*.

VINELAND, ONTARIO, December 23, 1930.—This year the local bird enthusiasts made their census on two routes: (1) Three observers, 9.15 a.m. to 1.20 p.m., traversed the side of the Escarp-

ment, several wooded valleys and followed the frozen Twenty Mile Creek through a large area of marsh; (2) Two observers, in the afternoon, walked through part of the Experimental Farm, along the lake shore and the banks of the Jordan Pond. Weather conditions were poor at first the day being dull, temperature 22°, but shortly before noon the sun began to shine brilliantly and the temperature rose to 28°. Two inches of snow covered the ground. The combined list follows: Herring Gull, 2; Ring-necked Pheasants, 4; Ruffed Grouse, 1; Hairy Woodpecker, 1; Downy Woodpecker, 1; Horned Lark, 2; Blue Jay, 4; Crow, 2; Starling, 5; House Sparrow, several; Goldfinch, 1; Tree Sparrow, 50; Slate-coloured Junco, 48; Song Sparrow, 2; Cedar Waxwing, 20; Golden-crowned Kinglet, 12. (Three unidentified sparrows, probably either swamp or song sparrows, and two unidentified Blackbirds, probably either Rusty or Red-winged Blackbirds, were seen among the reeds of the Twenty Mile Creek marsh.) Total species, 16, total individuals, 160.—G. H. DICKSON, J. A. GOLDIE, W. J. K. HARKNESS, W. E. HURLBURT and E. F. PALMER.

NOTES AND OBSERVATIONS

ELK REMAINS IN NORFOLK COUNTY.—As published information of the occurrence of elk (*Cervus canadensis*) in Ontario is so meagre, the following contribution may be of value.

My father, who was born in this county in 1833, told me that he had been told, when a young boy, by an old hunter, that the latter had seen elk in this county when he was a boy. About the year 1911 while pulling an elm stump of 30 inches diameter in a wet place on my farm (Lot 19, Concession VI, Charlotteville township) I uncovered a pair or more of elk horns. There were 2 pieces of 30-36 inches length and 3 inches diameter of the heavier part of the horn and also some shorter pieces about 2 inches in diameter. These showed the prongs, but the points were gone. I took them to the barn where they lay in an open shed for some years, but they became soft after exposure to air and I noticed only one piece a foot long a year ago. Mr. M. M. Smith of Simcoe has in his possession elk horns found within half a mile of that town and also some from Long Point Island.—MONROE LANDON.

UNUSUAL BIRD-BANDING RETURN.—*Copeia* (1930:83-84) reports that among the stomach contents of a male *Alligator mississippiensis* (Daudin) which was taken on a hook in South Carolina were five aluminium bird bands. This

“constitutes, it is believed, the first banding returns reported through such a medium, although it is well known, of course, that alligators must take a toll of certain marsh and water birds. From the action of the stomach juices the bands in question are considerably pitted. This condition, in two instances, causes difficulty in deciphering some of the figures. The [U.S.] Biological Survey has advised that these bands are from young little blue herons, *Florida cærulea* (L.) and Louisiana herons, *Hydranassa tricolor ruficollis* (Gosse), banded June 13, 1929, in a nesting colony located at Yough Hall Plantation, Charleston County. The pond containing this colony is about a mile and a half in a straight line from the spot where the alligator was taken. The intervening country consists mainly of cultivated fields, with some woods and swamp land, and while it is fairly certain that this particular alligator was in the habit of making overland journeys, it is thought that they were in another direction. For this reason and because all the bands represented different broods, it seems probable that the herons, on attaining sufficient growth, visited the flats and marshes at or near the spot where the alligator was killed.”—D.L.

NOTES ON THE ACADIAN SHARP-TAILED SPARROW (*Passerherbulus nelsoni subvirgatus*) AT

KAMOURASKA, QUEBEC.—At Kamouraska, Quebec, from Cape Taché to the Desjardins Islets, is an area several hundred yards wide and about two miles long that the waters of the St. Lawrence estuary cover only during very high tides in spring and fall. This area is covered in summer with tall plants, commonly called salt grass, and scattered over it are numerous pools of salt, muddy water.

It is among this grass that the Acadian Sharp-tailed Sparrow nests, and there it must be sought.

The male bird is easy to observe at nesting time, for he sings frequently, although his song is weak and not particularly musical. At times he may be seen perched on a dry plant-stalk or on a dead branch washed up by the tides; at other times he will rise almost vertically for several yards, to drop down again, singing, among the grass.

In autumn, however, it is very different. Young and adults, living among the grass, will almost never take flight unless they are surprised at very close range, when they fly a few yards only and are not seen again.

On June 1, 1929, in traversing this area, I did not see a single individual of this species. On June 8 I returned to the place again, but was able to discover only one singing individual. On the 23rd of June I went back once more to the same place, and in a distance of a mile I met six individuals and had also the pleasure of finding for the first time in my experience a nest containing five eggs, of which two were partially incubated.

The nest was constructed wholly of grass and was entirely concealed by dead grass arched over it in the shape of an inverted V, with an entrance to the nest on one side only.

The female Sparrow flushed from the nest close to my feet and ran on the ground for about thirty yards, then took flight and returned to perch a few yards from the nest, where it preened its plumage without giving any sign of anxiety.

The Acadian Sharp-tailed Sparrow appears to reach the extreme northern limit of its range at Kamouraska, for there are some springs when only a single individual can be found in this area, where it may have been common the year before.—**WILLIE LA BRIE.**

THE PROTHONOTARY WARBLER.—This bird has for years been looked upon as a straggler in Ontario, but this year (1930) produces hints that it is a regular breeder in the southwestern peninsula. On June 15th, accompanied by Messrs. Lindsay and Emery of Toronto and Patterson of London, we found one of these birds in full

song in the high trees of Rondeau Park. It was living right around a certain restricted location where it apparently had an attraction, doubtless in the form of a mate on her nest. Spurred by this discovery, Mr. and Mrs. McKone, Messrs. Dale, Calvert and Watson went down on the 22nd and found the bird not only where it had been seen before but found at least two other singing males in other places. Freedom from dogs and guns tends to make Rondeau Park an inviting sanctuary for the ornithologist and there is little doubt that next year it will be still more thoroughly explored.

Previous records in Canada are very scanty, although they have been more frequent in recent years. London has two and Toronto two or three, Point Pelee one and I think a couple from Hamilton. So it is quite possible that other breeding grounds may be discovered as the southwestern tier of counties is more thoroughly worked.—**W. E. SAUNDERS.**

THE ACADIAN FLYCATCHER.—Every time I have been in Rondeau Park in recent years I have heard one or more of these Flycatchers giving their explosive call and on both the 15th and the 22nd of June of this year (1930), the parties that found the Prothonotary found the Acadian also. It will be remembered that these birds have occurred apparently under breeding conditions in other parts of Kent and Welland Counties, and they are doubtless in Essex also. On the 23rd of June, 1930, a short investigation in woods southwest of Glencoe in Middlesex County disclosed a male who was apparently a resident. These records hint at the breeding of this species in at least four counties, and yet we have never succeeded in getting a single migration record for Point Pelee, which makes it appear as though the bird has some peculiar style of migration such as the Olive Side has, the latter bird being rarely seen in southern Ontario, although it is a widespread summer resident in the northern parts of the Province.—**W. E. SAUNDERS.**

A SECOND RECORD OF THE SAURY OR BILLFISH (*Scombresox saurus*) FROM THE GULF OF ST. LAWRENCE.—Through the kindness of Dr. Harrison F. Lewis, of the National Parks of Canada Branch, Ottawa, a second record of the occurrence of *Scombresox saurus* in the Gulf of St. Lawrence has been given me. A specimen 13½ inches in length was taken in a salmon net at Rocky Bay about 45 miles west of the western end of the Strait of Belle Isle. The fishermen who took it had never seen a specimen like it before. The previous record was also made by Dr. Lewis.

(*Canadian Field-Nat.* 41: 47, 1928).—J. R. DYMOND.

OCCURRENCE OF SOME SOUTHERN SULPHUR BUTTERFLIES AT VINELAND, ONTARIO.—On August 2, 1930, I captured two large Sulphur butterflies at the flowers in our garden. The weather had been quite warm for several days and this day was especially hot with a strong southwest wind blowing. Both specimens were rather battered.

The specimen, which I have at hand now, has a wing expanse of three inches with a ground colour of light yellow, though many of the scales are missing. There are marginal rows of black spots on fore and hind wings with an inner row of similar spots on the fore wings. The outer margins of the hind wings are orange. Both specimens were taken to Mr. F. P. Ide of the Department of Biology, University of Toronto. Mr. Ide concluded that they were female specimens of either the Large Orange Sulphur (*Catop-*

silia agarithe) or the Red-barred Sulphur (*C. philea*), but probably the former species. Both species are native of the southern Mississippi Valley and southwest.

On October 13, 1930, I saw another large Sulphur on the Highway about three miles west of St. Catharines. It was of a much brighter yellow colour than the specimens captured in August and the wings appeared relatively perfect. It flew down a hillside and disappeared before I could stop my car.

The Orange Sulphur Butterfly (*Eurymus eurytheme*) has been very common here this autumn. The first one was noticed on September 4, 1930, and it was seen again on September 11, 22 and in fact almost any time I covered any amount of territory in my car. On October 6th five specimens were captured in about half an hour. These all seemed in excellent condition. I noticed on several occasions that the males seemed to outnumber the females five or ten to one.—W. E. HURLBUT.

BOOK REVIEW

AMERICAN WATERFOWL: THEIR PRESENT SITUATION AND THE OUTLOOK FOR THEIR FUTURE. By John C. Phillips and Frederick C. Lincoln, with illustrations by Allan Brooks and A. L. Ripley. Houghton-Mifflin Company, 1930.

This convenient volume of 300 pages presents a sane, unemotional, and well-considered survey of its subject. The authors have not only drawn upon their extended personal experiences and knowledge and the information to be found in the literature of the subject, but have wisely sought the advice of experts in many special sub-divisions of their field, thus increasing and fortifying the authority with which they speak.

The opening chapter, dealing with "The North American Breeding Areas" of our valuable waterfowl, should be a revelation to those who "think of Canada as a vast henyard for wild ducks, geese, and swans, extending north from the Canadian Pacific Railroad to the frozen Polar seas, east to Newfoundland, and west to Vancouver Island". It is shown that far the larger part of American sporting ducks are raised in the Central Prairie region and in Alaska, and that the value of the prairie region for this purpose is being rapidly and seriously reduced by extension of agricultural operations and reduction of water areas.

Chapters on the North American Wintering Grounds and Migration follow. Without going into excessive or technical detail, the authors

succeed in giving fair and comprehensive pictures of these complex and important subjects in a form that is readily grasped. In doing this they make much use of information obtained by recent bird-banding activities.

It is unfortunate that the maps used in the three chapters above-mentioned are far from being up-to-date in their representation of provincial boundaries. Those used in the chapters on Breeding Areas and Wintering Grounds represent Manitoba in the old rectangular form that it has not possessed since 1912, and show correspondingly old boundaries for Ontario and Quebec, and are therefore at least eighteen years old. The map used in the chapter on migration shows the present boundaries of Manitoba, but still retains out-of-date northern boundaries for Ontario and Quebec. The use of such antiquated cartography is the more difficult to understand in view of the great activity of the Canadian Government in the distribution of up-to-date maps.

"Drainage and Irrigation", "Shooting as an Adverse Factor", "Poisons, Diseases, and Parasites", "Natural Enemies", and "Oil Pollution" are considered carefully as the principal adverse factors encountered by North American waterfowl at the present time. Drainage operations are wide-spread and have very serious effects in the United States, but as yet are not of great importance in Canada. The conclusion of the authors concerning lead-poisoning of waterfowl

from the swallowing of shot is rather depressing, not to say hopeless, as they think "that the disease will continue and even increase", that "The ultimate conclusions as to its effect upon the supply of waterfowl are hazardous to imagine", and that "Dr. Wetmore states that no practical suggestions can be given to alleviate the danger to wild-fowl from this cause." The inventive genius of the present day should surely be able to cope with this situation either by substituting some other weapon for the shot-gun or by making shot from some material other than uncombined lead. Failure to solve the problem means the end of waterfowl hunting in the measurably near future, and despair is never to be recommended.

The following statement about so called "vermin" seems especially worthy of commendation:

"After a careful consideration of the matter, we believe that as generally used 'vermin' includes all animals that kill other animals that man himself desires to kill. In other words by some distortion of his mental processes, man has relegated [!] to himself the right to kill and denies this to all other creatures of the earth. We would not, of course, imply that there is no such thing as vermin, for the term seems particularly appropriate for the feral house cat and the brown rat, animals that have no natural place in the economy of the wild life of our continent, and for whose presence man is solely responsible. Also we appreciate that upon game farms or reservations, devoted to the increase of certain species of game birds or mammals, the control of many species of predatory animals must be carried on by the proper authorities. But we do wish here to register our opposition to the senseless slaughter of hawks, owls, gulls, harmless snakes, and other species that only too frequently are killed on sight, merely because it is thought that they may at some time kill a duck or some other game bird."

The stand is taken "that, with the increase of shooters, the maintenance of a strictly democratic system of so-called free shooting would turn the odds against the birds to an overwhelming extent", and that "the club and preserve idea has developed as the natural outcome of a diminishing supply of game confronted by an increasing army of shooters". Reference is made to "the absurdity of the theory that there would be plenty of ducks and geese to satisfy all sportsmen if all the preserved areas were opened to the public." These are probably the most contentious points in the entire volume and they will by no means meet with universal acceptance. That the authors have marshalled their arguments well

and that existing conditions and developments on this continent show a distinct trend in the direction that they indicate cannot, however, be gainsaid.

A well-reasoned and stimulating chapter on "Conservation of Waterfowl in General" summarizes the situation as follows:

"Conservationists, the optimistic ones, may look forward to the day when we may provide for a greatly increased stock of wild-fowl, but this day is not in sight. The best that we can do, faced as we are with an ever-lessening area of optimum feeding and breeding grounds, is to ensure the maintenance of what stock we have left. Even this would be, in our opinion, a very considerable feat of accomplishment."

Comment may be made that we can do even better than this when we, as a species, learn to control our own species as well as our fellow-species.

There follows a chapter on "Waterfowl Food-Plants" and another entitled "Methods of Taking Ducks, with some Remarks on the Ethics of the Various Practices". The latter contains an interesting calculation leading to the conclusion that in the United States there are from 1,000,000 to 2,000,000 duck shooters, whose investment in special equipment used in connection with this sport is from \$100,000,000 to \$200,000,000.

An Appendix contains a list of such wild Swans, Geese and Ducks as are, in the authors' opinion, entitled to be considered "North American Game Waterfowl", with their common names and ranges and some notes on their present status and their body weights.

The excellent illustrations of waterfowl in flight, by Allan Brooks, and the headpieces by A. L. Ripley, add much to the attractiveness of what is, in every way, a well-made volume.

There is a mathematical error of some moment on page 135, where it is concluded, from a consideration of the Mallard population, that a production of four or five mature young Mallards per pair of adults will result in a population in the fall migration practically double that of the preceding spring migration. This, of course, should be treble, not double, and the difference, when applied to most of the game ducks of North America, is a large one.

In considering the different artificial mortality rates of different species as shown by bird-banding returns, the authors do not take into account the undoubted failure of some killers of banded birds to report them, nor the probable regional variation in the proportion of such failures to the total of banded birds taken. This variation may be due to regional differences in education, habit of

mind, and extent of illegal shooting, and may be large enough to distort the basic facts when comparison is made between the artificial mortality rates of species such as the Mallard and the Black Duck, which in large part are shot in very different areas. It is the reviewer's opinion also that, other things being equal, waterfowl migrating coastwise, where complete safety from shooting is always close at hand, a short distance seaward, always have lower mortality rates from shooting than do those migrating over inland areas, where such areas of safety are few and comparatively small. This will affect comparisons between mortality rates of species that differ in the proportions in which their migrations are coastwise or inland.

The statement on page 227 that "The Norbeck-Andresen Bill was signed by President Coolidge in May, 1928" is an error. The signing of the bill, an important event in the history of conservation in North America, took place on February 18, 1929.

It seems regrettable that, in the excellent sum-

marized account of waterfowl food-plants, their preferred habitats, and the methods of introducing them, the calciphiles, with the exception of *Chara*, are not distinguished as such, for many of these plants do require a supply of calcium and attempts to introduce them where this is not available, depending only on the information given by this work, may be expensive failures.

On page 280 the statement is made, concerning the Canadian Government, that "They have already shown their disapproval of the automatic shotgun by banning its use in some Provinces", but the fact is that the Regulations under the Migratory Birds Convention Act, of Canada, forbid the killing of migratory game birds by the use of an automatic gun anywhere in the Dominion, and have done so continuously since 1920.

Every person interested in our wild Ducks and Geese, whether as hunter, conservationist, ornithologist, nature-lover, or agriculturist, should read this much-needed work with care, and *think* about the basic problems so ably discussed in its pages—H.F.L.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by authority of the National Parks of Canada Branch, Department of the Interior, Canada

RETURNS UPON BIRDS BANDED IN 1922

CALIFORNIA GULL, No. 700,471, banded by Frank L. Farley, at Gull Island, in Bittern Lake, 12 miles west of Camrose, Alberta, on June 21, 1922, was shot at a place sixty miles north of Prince Albert, Saskatchewan, on September 19, 1929.

RETURNS UPON BIRDS BANDED IN 1923

GANNET, No. 296,540, yg., banded by William M. Duval, at Bonaventure Island, Quebec, on September 18, 1923, was found in a stable at Grand Mira, Cape Breton, Nova Scotia, about September 8, 1929. When found the bird was unable to fly and died shortly after it had been fed on clams.

BLACK DUCK, No. 297,390, banded by H. S. Osler, at Lake Scugog, Ontario, on October 8, 1923, was shot at Christian Island, Georgian Bay, Ontario, on October 20, 1929.

CANADA GOOSE, No. 202,128, caught at Kingsville, Ontario, during the first week in May, 1923, by Jack Miner, banded by Hoyes Lloyd at Ottawa, Ontario, on June 7, 1923, free to migrate by fall of 1923, was killed at a place north of Fort George, James Bay, Quebec, during the fall of 1926.

HERRING GULL, No. 309,461, juv., banded by Harrison F. Lewis, at Coacocho, Saguenay County, Quebec, on August 11, 1924, was shot at George's Cove, Newfoundland Labrador, on August 28, 1929.

RETURNS UPON BIRDS BANDED IN 1924

BLACK DUCK, No. 323,327, banded by H. S. Osler, at Lake Scugog, Ontario, on October 4, 1924, was shot at East Brewster, Massachusetts, on October 1, 1929.

CROW, No. 227,831, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on July 20, 1924, was killed by a dog at a place two miles east of Muscow, Saskatchewan, on July 1, 1929.

RETURNS UPON BIRDS BANDED IN 1925

MALLARD, No. 309,656, banded by F. W. Robl, at Ellinwood, Kansas, on February 9, 1925, was shot at a place eight miles north of Shoal Lake, Manitoba, on September 28, 1929.

MALLARD, No. 324,026, banded by L. V. Walton, at Cuivre Island, Firma, Missouri, on March 11, 1925, was shot at Kelvington, Saskatchewan, on September 15, 1929.

MALLARD, No. 324,036, banded by L. V. Walton, at Cuivre Island, Firma, Missouri, on March 16, 1925, was shot at a place twelve miles west of Kelvington, Saskatchewan, on October 26, 1929.

MALLARD, No. 309,767, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925, was shot at Lake Etta, Kidder County, North Dakota, on September 17, 1929.

RETURNS UPON BIRDS BANDED IN 1926

GREAT BLACK-BACKED GULL, No. 418,-

724, banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was caught in a fish net at a place ten miles off Low Point, Sydney Harbor, Nova Scotia, during the month of September, 1928.

GREAT BLACK-BACKED GULL, No. 418,782, juv., banded by Harrison F. Lewis, at Boat Islands, Saguenay County, Quebec, on August 7, 1926, was shot at Cape St. George, Newfoundland, on September 30, 1929.

MALLARD, No. 409,020, banded by F. C. Lincoln, at Bath, Illinois, on January 6, 1926, was shot at Punnichy, Saskatchewan, on October 1, 1929.

MALLARD, No. 409,574, ad., f., banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was shot at Ponass Lake, Saskatchewan, on October 4, 1929.

MALLARD, No. 388,588, juv., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 29, 1926, was shot at Hardesty, Texas County, Oklahoma, on November 2, 1929.

MALLARD, No. 421,995, banded by D. H. Bendick, at Grathside Farm, Leduc, Alberta, on October 23, 1926, was shot at Hely River, Yuma County, Arizona, on December 23, 1928.

MALLARD, No. 421,998, banded by D. H. Bendick, at Grathside Farm, Leduc, Alberta, on October 23, 1926, was killed at Snake River, fifteen miles below Grand View, Idaho, on January 6, 1929.

BLACK DUCK, No. 418,043, banded by C. R. Weinberger, at Oakdale, New York, on April 7, 1926, was shot at Megantic Lake, Quebec, on September 2, 1929.

BLACK DUCK No. 457,537, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was shot at Port Clinton, Ohio, on November 4, 1929.

BLACK DUCK, No. 457,887, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was reported as killed during the fall of 1926, at a place north of Fort George, James Bay, Quebec. This is a doubtful record because it shows that this bird was killed far north of the place where it was banded and during the same fall.

BLACK DUCK, No. 464,166, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was caught in a muskrat trap at North Brook, Ontario, on April 8, 1929, and died later.

BLACK DUCK, No. 464,178, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot on the Ohio River, Brush Creek Island, Kentucky, on January 24, 1928.

BLACK DUCK, No. 464,242, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1926, was shot at Pigeon River, three miles north of Omeme, Ontario, on September 26, 1929.

PINTAIL, No. 380,044, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on November 8, 1926, was caught at Burstall, Saskatchewan, on June 15, 1929.

LESSER SCAUP DUCK, No. 464,338, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was shot at Bainesville, Ontario, about November 19, 1928.

RING-NECKED DUCK, No. 464,339, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was shot at Deer Bay, Peterboro County, Ontario, on October 10, 1929.

COOT, No. 380,458, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on November 8, 1926, was caught in a fish net at Lesser Slave Lake, Alberta, on September 3, 1929.

SLATE-COLORED JUNCO, No. 184,535, banded by Mrs. J. S. Chamberlain, at Amherst, Massachusetts, on April 8, 1926, was killed by a cat, at Lequille, Nova Scotia, about April 15, 1929.

RETURNS UPON BIRDS BANDED IN 1927

CALIFORNIA GULL, No. 544,388, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 22, 1927, was killed at a place fourteen miles southeast of Edmonton, Alberta, on October 12, 1929.

CALIFORNIA GULL, No. 544,449, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 22, 1927, was found at Cheyenne, Wyoming, on September 16, 1929.

CALIFORNIA GULL, No. 544,675, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 22, 1927, was shot at Pincher Station, Alberta, on September 24, 1929.

CALIFORNIA GULL, No. 544,939, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 22, 1927, was found dead at Nanton, Alberta, on October 1, 1929.

COMMON TERN, No. 432,845, banded by W. B. Purdy, at Gull Island, St. Clair Flats, Michigan, on July 17, 1927, was found dead at Rondeau Provincial Park, Morpeth, Ontario, on September 17, 1929.

MALLARD, No. 602,364, banded by F. H. Rose, at Moiese, Montana, on September 26, 1927, was shot at Lake Saskatoon, Grande Prairie, Alberta, on September 2, 1929.

MALLARD, No. 555,605, ad., m., banded by F. H. Rose, at Moiese, Montana, on October 12, 1927, was shot at Lesser Slave Lake, Alberta, on October 25, 1929.

MALLARD, No. 594,224, banded by F. H. Rose, at Moiese, Montana, on November 1, 1927, was shot at Humboldt, Saskatchewan, on September 21, 1929.

MALLARD, No. 594,457, banded by F. H. Rose, at Moiese, Montana, on November 4, 1927, was shot at Little Bow River, southwest of Vulcan, Alberta, some time between November 4, 1927, and October 14, 1929.

MALLARD, No. 595,571, banded by F. H. Rose, at Moiese, Montana, on November 12, 1927, was shot at a place thirty-five miles northwest of Calgary, Alberta, on September 16, 1929.

MALLARD, No. 595,609, banded by F. H. Rose, at Moiese, Montana, on November 12, 1927, was shot at Buffalo Lake, near Mirror, Alberta, on October 4, 1929.

MALLARD, No. 595,667, ad., f., banded by F. H. Rose, at Moiese, Montana, on November 12, 1927, was shot at a place four miles north of High Prairie, Peace River District, Alberta, on November 7, 1929.

MALLARD, No. 595,747, ad., m., banded by F. H. Rose, at Moiese, Montana, on November 13, 1927, was shot at Kootenay Flats, near Nelson, British Columbia, on October 31, 1929.

MALLARD, No. 597,056, banded by F. H. Rose, at Moiese, Montana, on November 23, 1927,

was shot at Fort Saskatchewan, Alberta, on October 8, 1929.

MALLARD, No. 465,920, f., banded by R. H. Bruce, at Rockwood Park Sanctuary, St. John, New Brunswick, on November 26, 1927, was shot at Hampton, Kings County, New Brunswick, on September 27, 1929.

MALLARD, No. 465,936, m., banded by R. H. Bruce, at Rockwood Park Sanctuary, St. John, New Brunswick, on November 28, 1927, was shot at Hampton, Kings County, New Brunswick, on September 17, 1929.

BLACK DUCK, No. 557,606, banded by W. B. Large, at Rochester, New York, on December 4, 1927, was shot at Lake St. Peter, Quebec, on September 20, 1929.

PINTAIL, No. 555,781, im., banded by F. H. Rose, at Moiese, Montana, on October 20, 1927, was shot at Lesser Slave Lake, Alberta, on October 22, 1929.

CHIMNEY SWIFT, No. 191,124, banded by R. B. Glover, at Milton Junction Wisconsin, on May 18, 1927, was found dead at Cobourg, Ontario, on September 2, 1929.

CROW, No. 456,522, banded by W. E. Saunders and Jack Miner, at Kingsville, Ontario, on January 20, 1927, was killed about two miles from place of banding, on January 6, 1930.

RETURNS UPON BIRDS BANDED IN 1928

BLACK GUILLEMOT, No. 560,106, yg., banded by Oliver L. Austin, Jr., at Nunarsuk Island, Newfoundland Labrador, on August 11, 1928, was killed at Port au Port, Newfoundland, on July 21, 1929.

BLACK GUILLEMOT, No. 365,633, yg., banded by Oliver L. Austin, Jr., at a Cliff at Cunningham Island southeast of Grady, Newfoundland Labrador, on August 20, 1928, was killed at Eagle River, Sandwich Bay, Newfoundland Labrador, on August 27, 1929.

COMMON MURRE, No. 302,674, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on August 9, 1928, was shot at Harbor Buffett, Placentia Bay, Newfoundland, on February 12, 1929.

COMMON MURRE, No. 302,681, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on August 9, 1928, was killed at Flowers Cove, Newfoundland, during the month of March, 1929.

BRUNNICH'S MURRE, No. 560,073, ad., banded by Oliver L. Austin, Jr., at Nunarsuk Island, Newfoundland Labrador, on August 11, 1928, was shot at Shambler's Cove, Bonavista Bay, Newfoundland, on November 1, 1929.

GLAUCOUS-WINGED GULL, No. 233,000, nestling, banded by Theed Pearse and G. D. Sprot, at Milenatch Island, Gulf of Georgia, British Columbia, on August 11, 1928, was caught at the First Narrows of Burrard Inlet, British Columbia, on or about December 15, 1928.

GREAT BLACK-BACKED GULL, No. 560,264, yg., banded by Oliver L. Austin, Jr., at a small inlet on the southeast side of Sandy Island near Ford's Harbor, Newfoundland Labrador, on August 10, 1928, was found dead in a herring net at Lennox Island, Port Hill, Prince Edward Island, on May 1, 1929.

HERRING GULL, No. 408,087, banded by W. B. Grange, about June 18, 1928, at Sister Islands, Green Bay, off Ephraim, Door County,

Wisconsin, and killed at Muscowpetung Indian Reserve, Qu'Appelle Valley, Saskatchewan, on September 16, 1929.

CALIFORNIA GULL, No. 555,181, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, fifteen miles northwest of Camrose, Alberta, on June 23, 1928, was found at Point Gabrillo Light Station, Mendocino, California, on July 22, 1929.

CALIFORNIA GULL, No. 555,236, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, fifteen miles northwest of Camrose, Alberta, on June 23, 1928, was shot at La Grande, Oregon, during the month of October, 1929.

DOUBLE-CRESTED CORMORANT, No. 303,791, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was killed at Baton Rouge, Louisiana, on October 5, 1929.

DOUBLE-CRESTED CORMORANT, No. 302,399, juv., banded by Harrison F. Lewis, at Lake Island, Cape Whittle, Saguenay County, Quebec, on August 2, 1928, was shot at Webb's Cove, Deer Island, Stonington, Maine, on October 8, 1928.

DOUBLE-CRESTED CORMORANT, No. 302,528, juv., banded by Harrison F. Lewis, on Egg Rock, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 4, 1928, was drowned in a fish net at Currituck Sound, North Carolina, —reported on January 23, 1929.

DOUBLE-CRESTED CORMORANT, No. 302,564, juv., banded by Harrison F. Lewis, at a rock near Hay Stack Island, Wolf Bay Sanctuary, Saguenay County, Quebec, on August 8, 1928, was shot at Troise Island, on the northeast coast of Newfoundland, during the summer of 1928.

MALLARD, No. 496,324, banded by Paul O. Willson, at Brighton, Colorado, on January 15, 1928, was killed at Edmonton, Alberta, on May 6, 1929.

MALLARD, No. 420,948, banded by F. W. Robl, at Ellinwood, Kansas, on February 9, 1928, was shot at a place twenty miles north of Melita, Manitoba, on March 7, 1929.

MALLARD, No. 405,264, banded by T. E. Musselman, at Quincey, Illinois, on March 13, 1928, was shot at Humboldt, Saskatchewan, on October 19, 1929.

MALLARD, No. 456,652, banded by John Broeker, at Portage des Sioux, Missouri, on March 16, 1928, was caught by a dog at Gurneyville, Alberta, on July 29, 1929.

MALLARD, No. 557,027, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at Melville, Saskatchewan, on November 4, 1929.

MALLARD, No. 379,952, banded by J. A. M. Patrick, near Willowbrook, Saskatchewan, during the month of August, 1928, was killed at Fonehill, Saskatchewan, on September 4, 1928.

MALLARD, No. 379,963, banded by J. A. M. Patrick, near Willowbrook, Saskatchewan, during the month of August, 1928, was killed at Fonehill, Saskatchewan, on September 4, 1928.

MALLARD, No. 388,608, f., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 20, 1928, was killed at Spring Creek, 18 miles west of San Angelo, Texas, on January 29, 1929.

MALLARD, No. 388,623, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 23,

1928, was shot at Badger Lake, north of Arlington, South Dakota, on October 13, 1929.

MALLARD, No. 388,625, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 24, 1928, was shot at Orchard, Nebraska, on December 28, 1928.

MALLARD, No. A600,001; f., banded by George J. Bills, at Sauvies Island, Oregon, on September 5, 1928, was shot at Mission City, British Columbia, on October 15, 1928.

MALLARD, No. 597,789, banded by F. H. Rose, at Moiese, Montana, on September 22, 1928, was killed in the vicinity of Sturgeon Lake, near Calais, Alberta, on July 10, 1929.

MALLARD, No. 598,190, im., m., banded by F. H. Rose, at Moiese, Montana, on September 24, 1928, was shot at Wynndel, British Columbia, on October 19, 1929.

MALLARD, No. 388,660, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 30, 1928, was killed at Hereford, Texas, on December 27, 1928.

MALLARD, No. 466,073, f., banded by R. H. Bruce, at the Guy H. Humphrey Sanctuary, Hampton Station Marsh, Kings County, New Brunswick on October 7, 1928, was shot on the shore of the State of Rhode Island, near the boundary of Massachusetts, shortly before December 12, 1928.

MALLARD, No. 466,078, f., banded by R. H. Bruce, at Guy H. Humphrey Sanctuary, Hampton Station Marsh, Kings County, New Brunswick, on October 7, 1928, was shot at Victoria Beach Annapolis County, Nova Scotia, on November 30, 1928.

MALLARD, No. 555,461, banded by F. J. Keller, at Antioch, Nebraska, on October 14, 1928, was killed at Baptiste Lake, Alberta, on April 24, 1929.

MALLARD, No. 557,165, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 15, 1928, was shot at Farragut, Iowa, on October 15, 1929.

MALLARD, No. 557,133, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was shot at Burlington, Iowa, on November 15, 1928.

MALLARD, No. 557,135, f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was shot at De Witt, Arkansas, on November 1, 1929.

MALLARD, No. 557,136, f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was killed at Terrebonne Parish, Louisiana, on December 30, 1928.

MALLARD, No. 557,140, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was shot at Last Mountain Lake, fifty miles northwest of Regina, Saskatchewan, on November 22, 1928.

MALLARD, No. 557,141, f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was shot at Saline River, Arkansas, on November 28, 1928.

MALLARD, No. 557,155, m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 17, 1928, was shot at Cherokee, on the Salt Fork of the Arkansas River, Oklahoma, on November 28, 1928.

MALLARD, No. 557,100 banded by Bert Lloyd, at Davidson, Saskatchewan, on October

25, 1928, was killed at Carthage, South Dakota, on December 10, 1928.

MALLARD, No. 557,206, ad., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 26, 1928, was shot at Shickley, Nebraska, on November 9, 1929.

MALLARD, No. 557,208, ad., m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 27, 1928, was shot on the Arkansas River, Kay County, Oklahoma, on December 29, 1928.

MALLARD, No. A622,012, ad., f., banded by H. Agersborg, at Meredosia Bay, Illinois, on November 20, 1928, was shot at the Pine Creek Indian Reservation, Lake Winnipegosis, Manitoba, during the month of October, 1929.

BLACK DUCK, No. 497,406, banded by A. Rotch, at Brewster, Massachusetts, on December 31, 1928, was shot at Grondines, Quebec, on September 29, 1929.

PINTAIL, No. 601,783, banded by E. W. Ehmann, at Oakland, California, on January 17, 1928, was shot in the Yukon Territory, on July 19, 1929.

PINTAIL, No. 601,963, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on January 17, 1928, was shot at Czar, Alberta, on September 24, 1929.

PINTAIL, No. 332,789, ad., m., banded by F. W. Robl, at Ellinwood, Kansas, on February 11, 1928, was shot at Big Quill Lake, near Kandahar, Saskatchewan, on October 26, 1929.

PINTAIL, No. 600,277, banded by Wm. P. Sparks, at Waco, Texas, on February 14, 1928, was shot at Mildmay Park, Saskatchewan, on September 15, 1929.

PINTAIL, No. 600,618, ad., f., banded by F. W. Robl, at Ellinwood, Kansas, on March 1, 1928, was shot at Edmonton, Alberta, on October 1, 1929.

PINTAIL, No. 208,413, banded by Fred Bradshaw, at Lucky Lake, Saskatchewan, on July 28, 1928, was shot at Los Banos, California, on January 14, 1929. This bird was picked up at Lucky Lake, afflicted by "duck disease" and absolutely helpless. It was taken one hundred and twenty-five (125) miles to Regina, given fresh water for a few days and liberated in Wascana Lake, Regina.

PINTAIL, No. A602,636, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 25, 1928.

LESSER SCAUP DUCK, No. 388,657, juv., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 29, 1928, was shot at Moreno Dam, San Diego County, California, on December 16, 1928.

CANADA GOOSE, No. 466,025, banded by R. H. Bruce, at St. John, New Brunswick, in the late summer of 1928, was killed by flying against the cabin of a boat at Hilliard's Timber Pond, Portland, New Brunswick, on August 24, 1929. This bird was imported as a gosling from Newfoundland and was later given to the Rockwood Park Sanctuary, St. John, New Brunswick.

SCREECH OWL, No. 209,792, juv., banded by G. W. Knechtel, at a place one and one-half miles north of Kitchener, Ontario, on May 18, 1928, was killed at a place twelve miles north of Guelph, Ontario, on October 26, 1928.

BLACK-HEADED JAY, No. 506,927, im., banded by T. T. and E. B. McCabe, at Indian-

point Lake, Barkerville, British Columbia, on September 22, 1928, was recovered at Canim Lake, British Columbia, on October 1, 1928.

BRONZED GRACKLE, No. 522,377, ad., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on May 20, 1928, was shot at Frankslake, Saskatchewan, on September 3, 1929.

PINE GROSBEAK, No. 424,599, banded by Paul Kuntz, at Winnipeg, Manitoba, on November 24, 1928, was taken in the same locality in which it was banded, on November 25, 1928, and died during the day.

ROBIN, No. 467,945, ad., m., banded by T. T. and E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on April 26, 1928, was found at Slaton, Texas, on February 9, 1929.

RETURNS UPON BIRDS BANDED IN 1929

GLAUCOUS-WINGED GULL, No. 299,703, banded by G. D. Sprot, at Cobble Hill, Vancouver Island, British Columbia, on August 3, 1929, was shot at Ruskin, British Columbia on February 8, 1930.

MALLARD, No. 231,439, banded by Allen Green, at Oakville, Iowa, on January 7, 1927, was caught in a muskrat trap at Big Lake, Manitoba, on May 1, 1929.

MALLARD, No. 202,436, yg., banded by Fred Bradshaw, at Quill Lake, Saskatchewan, on June 10, 1929, was shot at Guernsey, Saskatchewan, on October 1, 1929.

MALLARD, No. 362,001, yg., banded by Frank L. Farley, at Miquelon Lake, near Camrose, Alberta, on June 12, 1929, was shot at Wauneta, Nebraska, on November 11, 1929.

MALLARD, No. 235,865, banded by R. H. Carter, on a slough one and one-half miles north of Muscow, Saskatchewan, on July 14, 1929, was shot at a place seventeen miles southeast of Broadview, Saskatchewan, on October 26, 1929.

MALLARD, No. 326,318, m., banded by F. R. Butler, at Elk Lake Game Farm, Saanich, Vancouver Island, British Columbia, on August 29, 1929, was shot at Thedis Lake, Vancouver, Island British Columbia, on October 15, 1929.

MALLARD, No. 388,668, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 2, 1929, was shot at Perryvale, Alberta, on November 1, 1929.

MALLARD, No. 388,692, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 7, 1929, was shot at Park Court, Alberta, on October 27, 1929.

MALLARD, No. 388,699, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1929, was shot at Lac Ste. Anne, Alberta, during the fall of 1929.

MALLARD, No. 388,803, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1929, was killed in a trap by a stray dog, in the same locality in which it was banded, on August 20, 1929.

MALLARD, No. 388,806, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1929, was shot at Chico, California, on December 9, 1929.

MALLARD, No. 388,807, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1929, was shot at Copan, Oklahoma, on November 14, 1929.

MALLARD, No. 388,816, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1929, was shot at Labadieville, Louisiana, on December 29, 1929.

MALLARD, No. 388,822, f., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 9, 1929, was shot at Waterloo, Montana, on November 11, 1929.

MALLARD, No. 388,823, f., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 9, 1929, was shot in Lee County, Texas, on January 13, 1930.

MALLARD, No. 388,839, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 21, 1929, was shot at Kadoka, South Dakota, on November 7, 1929.

SHOVELLER, No. 209,329, juv., banded by J. A. Briggs, at Edenwold, Saskatchewan, on July 30, 1929, was shot some time between July 30, 1929, and October 11, 1929,—reported by a resident of Edenwold, Saskatchewan.

SHOVELLER, No. 209,330, juv., banded by J. A. Briggs, at Edenwold, Saskatchewan, on July 30, 1929, was shot at Edenwold, Saskatchewan, on September 16, 1929.

SHOVELLER, No. 368,265, banded by Philip Siemens, at Hepburn, Saskatchewan, on August 11, 1929, was shot at Waldheim, Saskatchewan, on September 20, 1929.

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**THE CANADIAN
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CONTENTS

	PAGE
Contributions to the Knowledge of Extreme North-Eastern Labrador. By Bernhard Hantzsch	49
Roadside Markers. By E. M. Kindle	55
The Relation of Canada Geese and Brant to Commercial Gathering of Eel-Grass in the St. Lawrence Estuary. By Harrison F. Lewis	57
Canada's Heritage of Wild Life—Some Economic Aspects. By Miss Florence A. Brown	63
Notes on the Home Life of the Virginia Rail. By Henry Mousley	65
Seiches. By C. H. O'Donoghue	67
Amphibians and Reptiles of the Athabaska and Great Slave Lakes Region. By Francis Harper	68
A Wolf at the Door! By Hoyes Lloyd	70
Notes and Observations:	
The Value of Detailed Bird-banding Records. By Harrison F. Lewis	70
Least Bittern on the Island of Orleans, Quebec, P.Q. By R. Meredith	71
Winter Records of Towhees in Toronto. By R. D. Usher	71
Lewis's Woodpecker (<i>Asyndesmus lewisi</i>) in Central Alberta. By Frank L. Farley	71
New Map of Canada	71
Correction	71
Book Reviews:	
Our Great Outdoors. Mammals. By R.M.A.	72
Guide to the Study of Fresh-water Biology. By Douglas Leechman	72

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No. 3

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

"Beiträge zur Kenntnis des nordöstlichsten Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume 8, 1909, pp. 168-229. Volume 9, 1909, pp. 245-320.

(Translated from the original German text in the Library of Congress, Washington, D.C., by M. B. A. Anderson, M.A., Ottawa, 1928.)

Original pagination given in the text.

[P. 168]

THE purpose of the following work is to present a short, comprehensive description of the extreme north-eastern parts of Labrador, about north of latitude 59°30' N. It reviews the few publications, which give original information concerning this region, but pictures chiefly the travels, investigations, observations and inquiries of the writer during a stay in that district in 1906. In spite of brevity and lack of completeness it may possess justification for publication, because those districts are not easily reached and are, therefore, seldom visited from a scientific standpoint. The few white people living there have hardly any object in publishing a description of the district in which they live.

My journey to those districts was to serve first of all as practical preparation for a larger expedition to Baffin Island, and then natural history investigations, especially such as concerned the avifauna. My ornithological results¹ have been published in the April and July numbers, 1908, *Journal für Ornithologie* (Professor Dr. Reichenow). I use some of the descriptions from this in the present work.

The course of the journey was as follows. On July 2nd, 1906, I left the docks of London² on board the mission ship *Harmony* [P. 169]. Our course lay down the Thames and then along the south coast of England. We sighted the last European shores with the Scilly Isles, and then

set our course W.N.W. into the open Atlantic. We had adverse winds most of the time, so that on many days we did not advance as much as one hundred nautical miles, and we could rarely sail. But a strong southeast storm blew on July 19th, and inside of twenty-four hours we advanced over two hundred nautical miles. Our four-hundred-ton ship, which had formerly sailed North Russian waters and had then had steam engines installed, proved to be an excellent sailing-vessel. In spite of this, however, she was overtaken by the dark onrushing waves. Late in the evening of July 21st we caught our first sight of moving ice-floes, not much farther than one hundred nautical miles from the coast of north-eastern Labrador. The next morning and afternoon the ship had to break through a broad belt of ice, in order to reach open water again after turning aside to S.E. The temperature of the air was about +3° C. [37.4°F.], the wind blew gently from the S.W., thin fog covered sea and ice, and settled on the rigging of the ship, so that large drops of water dripped incessantly on the deck. We were hindered during the following days by fog, wind, rain and ice from making observations, so that we had to wait for clearer weather, moving slowly, stopping or even drifting along with the currents. According to a later statement by the captain, Mr. J. E. Jackson, we did not drift towards the south during these days, as was to be assumed from the maps but rather towards the north. According to this there seems to be a current along the coast of Resolution Island, which juts so far out, that is opposed to the great Arctic current which moves southward. This phenomenon may explain [P. 170] the well-known abundance of driftwood on Resolution Island, which may come from Hudson Bay and

¹ "Contribution to the Knowledge of the Avifauna of North-Eastern Labrador," Bernhard Hantzsch. Translated by M. B. A. Anderson and R. M. Anderson from "Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten Labradors," *Journal für Ornithologie*, Leipzig, Volume 56, 1908. *The Canadian Field-Naturalist*, Jan., Feb., March, Apr., May, Sept, Oct., Nov., Dec., 1928. Jan., Feb., Mar., 1929.

² Upon request permission was granted me by the Brethren's Society for Furtherance of the Gospel among the Heathen (S.F.G.) in London (that is, the society which has been caring for the support of the Labrador mission for more than a hundred years) after kind recommendation by the board of directors of the Moravian brothers in Berthelsdorf at Herrnhut in Saxony, to travel on the little steamer under Captain J. E. Jackson from London to Labrador and from there to Newfoundland.

Ungava Bay, as it consists mostly of short stalks, branches and twigs. Such narrow adverse currents are found frequently in similar localities. Often indeed they afford the only possibility, even if a dangerous one, of passing certain promontories and straits in an opposite direction to the main current influenced of course by the tides. The coastal formation or islands situated in front of the coast induce movements of this nature. On the evening of July 24th we sighted land at last rather near us, the higher parts of which were entirely veiled in clouds. The coast was presently identified as North-Eastern Labrador and so the next morning we steamed northward. Countless icebergs were floating about on the ocean. Occasionally we saw thirty at one time. Pack-ice was to be found only here and there though on the coast the fog lifted gradually, and the supposition of the captain that the coast was that of Resolution Island became more probable and, after the appearance of the sun about noon, a certainty. When the snow-covered heights of Loks Land appeared in the distance at the northern end of Frobisher Bay, we turned round and journeyed south to Hudson Strait.

Resolution Island was discovered and apparently named in 1578 by one of the first explorers in those parts of the ocean, Sir Martin Frobisher, but up to the present it has never been explored more carefully. In earlier times this island with its abundance of animal life and wood was said to have been visited regularly by Eskimos (*cf.* Kohlmeister and Kmoch, *Journal of a Voyage etc.*, London, 1841, p. 41); now this seldom takes place, because even the natives fear the strong and incalculable currents along these coasts. The whole island looks like a deserted, dark, mountain world, which rises up from the coast rather precipitously in the northeastern part, but quite gradually in the south. At the time of our visit there was still an abundance of old snow in all the gullies, but the limit of the snow does not reach apparently even up to the highest parts in the interior. The northerly east coast along which we travelled, possesses many low islands stretched out in front of it, which [P. 171] are not shown on the accompanying sketch because of their small size and proximity to the land. I could see with the glasses that they were thickly covered with heaths, here and there with grasses and plants also, and on the whole made a not unfavourable impression. Northwest from the precipitous Cape Resolution there are about six islands arranged in a chain formation, which extend far out into the sea, seem to have a continuation in flat reefs and therefore might be dangerous for coast navigation. This chain of

islands, however, is said to mark a harbour located on the main coast which Captain James Blandford, with the steamer *Nimrod*, sought in August, 1898, for shelter from the ice and storm. As a participant in this voyage, Mr. Julius Lane in Killinek, told me that the place showed a depth of forty or fifty, but in the middle only nine, fathoms. Not very far south from Cape Black Bluff, close to the shore, a dome-shaped small island rises up, which is covered in its upper part by bright green grass, which attracts attention even from afar. On the whole northeastern coast of Labrador there is no similar "Green Island." The extraordinarily fresh growth of grass owes its existence to the guano of the countless sea-birds, especially Kittiwakes, which nest in great numbers on the rocky, steep precipitous slopes of the mountain and use the upper part of it as a frequent resting place, a sight which can be observed on almost all northern bird mountains.

After turning about at Cape Black Bluff we came again into thick ice at the northern entrance to Hudson Strait, which was identified as bay-ice from Hudson Strait [P. 172], namely Ungava Bay, on account of its quality and its frequently dirty brown colour, and which was driving out towards the ocean. Occasionally there were small heaps of smooth stones on the cakes, still more frequently traces of seals and other animals, which had rested there. A. P. Low says that the north of the mouth of Hudson Strait at this time of year shows much more ice than the south. (*Cruise of the Neptune*, 1906, p. 7). During our stay at this locality after a fortunate break through the above mentioned belt of ice, we soon came again into more open water; indeed the whole north of Hudson Strait, as far as we could see, appeared to be rather free of ice; only a narrow strip had formed firmly quite near the land. South from that open belt the ocean was filled with ice as far as Button Islands and Labrador, which according to the change of tides packed together firmly in an interminable expanse or separated again and left long open leads. With changing fortune we now drove about until August 4th between Resolution Island, Meta Incognita, Akpatok, and the northeast of Ungava Bay without being able to break through the broad ice field. The open water observed in the north of Hudson Strait seemed to flow towards the inside and to bring with it the icebergs from Davis Strait, namely from Grinnel glacier in the south of Frobisher Bay northwest of Resolution Island; the real south coast of Baffin Island is said to possess no glaciers (A. P. Low, *l.c.*, p. 67). The remaining part of Hudson Strait during our stay showed a current from west to east, that is,

towards the open ocean. This current was on the whole steady, though influenced by winds and tides. This movement of the water was so strong, that even in calm weather, the ice could be seen moving slowly along the coast. Our ship was naturally carried along with it. In the northeast of Ungava Bay the current is also directed towards the outlet of Hudson Strait and to such an extent that at night we drifted forty nautical miles north, the same distance which we could cover by day with much trouble in order to escape the squeezing pressure of the ice in Hudson Strait. It is easy to understand, how the main current directed towards the outside forms very dangerous whirlpools at Resolution Island [P. 173] when it meets the northern current going towards the inside. The Eskimos do not venture to cross the strait at the present time, even in water quite free of ice. Gray Strait between Button Islands and Labrador has strong and adverse currents likewise, which change according to tides and wind, but as a rule move from the outside to the inside. At least this strait was free from ice earlier than Hudson Strait and Ungava Bay. A broad open strip formed along the coast apparently because of the water flowing inward, which we could not reach before August 4th. Icebergs come into the inside of Ungava Bay from Gray Strait also, and the powerful giants which had settled near Killinek may have come this way as a rule. I do not wish to go into a detailed discussion of ice conditions for the different years. As far as may be known from the different publications by visitors to this district, entrance into Gray and Hudson Straits is rarely possible before the last third of July. The safest time for navigation is between the middle of August and end of September. Later in the year the ocean remains free of ice as a rule for four to six weeks longer, but thick fog, as well as violent autumn storms, united with driving snow, make a sojourn in those waters dangerous.

Our stay in the ice-covered sea was not monotonous by any means. Many a time our senses were captivated, when the surrounding country lay before us in the cold, clear morning light, when the gentle morning breeze skipped about on all the glittering ice cakes and played with the waves which, rippling mysteriously, whispered fairy-tales to one another. Or when we sat on deck in the warm midday sunshine and gazed longingly over toward the distant dark land, which we could never reach. Then the air above the vapour-covered water vibrated, now and then a melting ice-cake fell apart in countless pieces and a round seal would rise to the surface with

big curious eyes, to stare suspiciously at the huge dark ship.

And [P. 174] when finally the sun was about to go to rest, then once more it kissed all the thousand white, green and blue ice cakes and breathed over them with a memorable, infinitely delicate, yellow red. The open spaces of water lay between in deep dark blue shadows. But that was not always the case. The sun sank, dark clouds arose phantom-like in the sky, the wind arose from its sleep and, howling, hunted across the wide expanse of sea and land. The ship began to groan and tremble under the heavy blows of the hard ice, and with great difficulty succeeded in escaping the mighty icebergs, which without ceasing, slowly but surely moved along, doubly eerie in the night of raging storm.

The parts of the sea are dangerous, where the swell of the water becomes very marked, as we observed it especially northwest of Button Islands. This phenomenon is said to represent the after effect of violent storms in neighbouring localities, here especially in the open ocean, and to depend upon the nature of the floor of the ocean. Even in quiet weather the water moved in powerful, long, parallel folds, formed deep valleys and high round crests and presented the appearance of a hilly landscape. The loose ice-cakes lying near one another are carried up and down and strike against the ship with powerful force especially in the wave valleys—still more noteworthy were the movements of the ice at the change of the tides. The greatest difference between high-tide and low-tide in these waters is nine metres [about thirty feet]. While the ice-cakes as a rule shove against one another and open regularly and slowly, all at once they move forward very quickly in wide straits. Often the different strips take a different, even an opposite direction, affording excellent opportunity for the study of the theory of ocean-currents; at last they strike together, bank up against one another, turn about in a circle and go to pieces under the force of the collision. In a few minutes the ship, which had been lying in open water, is closely beset by the ice-cakes, which on every side tumble over and shove against one another with a crashing noise. It does not seem then as if we were on the ocean, but in a wild land of ice. This dangerous confusion [P. 175] at the change of the tides, which is one of the most remarkable phases of nature which I have ever seen, lasts perhaps half an hour. Then the ocean quietens down, and the ship has again escaped for the present the greatest danger of being crushed. Fortunately during our stay in the ice the ice-cakes were already rotten and broke to pieces often at the first shock. Now

and then the captain had the ship fastened to an especially large ice-cake, which was moving along but slowly, but the strong ropes often tore loose with a dull crack, and it was difficult or impossible to get another hold with the other ice anchors. The temperature of the air, which I read daily at eight o'clock in the morning, two o'clock in the afternoon and nine o'clock in the evening, varied very little, that is, only between 0° and $+3^{\circ}\text{C}$. [32°F . and 37.4°F .]. Once, on August 2nd, it reached the unusual height of $+8^{\circ}\text{C}$. [46°F .] but on the same beautiful day sank to 0°C . [32°F .] toward evening. At noon of this day there was much dripping from all the ice masses towering up above us, large cakes fell to pieces by themselves; in other cases the clear, crystal bright ice became murky and opaque. At night the temperature fell repeatedly a little below freezing point, so that the wet ship's ropes became hard and the fresh water ponds on larger ice-cakes, from which we often renewed our water supply, in the morning showed a thin coating of ice. The temperature of the sea water was usually a little under 0°C . [32°F .]. The winds came principally from S.W. or W. seldom from S.E.; on July 30th we had a storm from N.E. Fog frequently prevailed. Often rain fell, usually only in fine drops. On the evening of July 26th some streaks of lightning were perceived in the cloud-covered sky, but no thunder followed. We observed no Northern Lights at this time. Almost daily though, especially on clear mornings and forenoons, the horizon was changed by mirages, which had to be closely examined at times, in order to recognize them as such. Over the real land or sea first of all an indistinct, inverted picture appeared, often indicated indistinctly only by trembling, perpendicular lines, connected with this a clearer third [P. 176] stratum, which represented the locality concerned in its natural position. Perhaps the phenomenon changed, became sharper in outline or waveringly more indistinct, but was to be seen usually for hours at a time. When it broke up especially toward evening, the upper stratum arose like a cloud, but only indicated higher above the horizon without being in direct contact with the pictured district by means of a middle stratum. Occasionally there were present in such observations real clouds, which had detached and raised themselves from the higher mountains of the land. Repeatedly we could see the uppermost stratum of the mirage and often found out from that, whether there was ice, open water or land on the distant horizon. Thus we sighted the island Akpatok—that is to say, where there are Akpat (*Uria lomvia*) in great numbers—only in mirage, and recognized at the beginning of

August because of this mirage, that there must be open water near the land behind the immense ice belt, which separated us from the Labrador coast. The accompanying sketches can indicate the phenomenon only in outline; it would lend itself to representation in colours better. That the clearness of the air at times was extraordinary, and permitted the most distant localities to be recognized distinctly, deserves also to be mentioned.

Because of the unexpectedly long crossing back and forth in the northeast of Ungava Bay the coal supply at our disposal had almost been exhausted. The upper deck was covered by the freight of the ship, which was especially large, [P. 177] because a fine mission house was to be erected in Killinek. Therefore when on August 4th the ice between us and the land appeared to be somewhat looser, the break through was forced for the last time at the expenditure of the greatest energy and caution on the part of the captain and his crew. Bravely the ship fought against the masses of ice; every narrow lead, every loose place between the cakes was utilized; here and there though, where the passage was completely blocked, the ice had to be shoved aside and broken to pieces with full steam. Finally, after a battle lasting perhaps for five hours, the victory was won and we sailed in the open water. How proudly our good ship, unharmed, steamed toward the land after the accomplishment, which seemed to us like a deliverance. We crossed one more very tumultuous ocean current, the continuation of the opposite current rushing through Gray Strait in the south, which in many places shot along as fast as a mountain torrent, at others bubbled and seethed as if the water were boiling. Here and there at the edge of it deep whirlpools appeared, in the neighbourhood of which the water was quite smooth. About nine o'clock we cast anchor in the inlet of Port Burwell, which was still covered closely with ice.

The neighbourhood of the present mission station of Killinek may have been inhabited by Eskimos from ancient times. This fact does not come from information from the inhabitants handed down to posterity, but finds its confirmation in the numerous huts and graves, long since fallen to pieces, which are present in part also in localities uninhabited to-day, such as Button Islands. Whether the size of the native population in earlier times was considerably smaller, as the Eskimos themselves think, or not, cannot be proved. The deserted state of districts formerly inhabited may not justify this conclusion, since at the present time they no longer seek out the best hunting places, but seek association with white people. Ancient dwelling sites have been

found in the most northern part of the district; for example near Cape Chidley from where connection was made with Button Islands with their abundance of animals and wood, and according to tradition, even as far as Resolution Island. A more distant locality preferred was that of [P. 178] MacLelan Strait (Ikkerasak) and the Tunnuatsuk Peninsula, mapped southeast of Port Burwell, which I shall describe later. From both of these main dwelling places they took long journeys down to Ungava Bay to the south of it or along the Labrador coast as far as Aulatsivik and Nackvak, and when, in the second half of the eighteenth century, mission stations were erected there, Nain, 1771, as far as even these. How much our little Eskimo race in the most extreme north of East Labrador mingled with the inhabitants of the more southern districts, or even of Baffin Island, is uncertain. According to the accounts of old women, alliances with the inhabitants of the southern and even western Ungava Bay may have always taken place.

Concerning the intercourse of the first European discoverers of these regions with the natives little is known. In general the natives seem to have behaved in an unfriendly way toward the strangers, perhaps by reason of the unhappy occurrences which they had experienced when coming into contact with the Indians or even with the Indians themselves. The viking Lief Erickson was perhaps the first one to come in touch with the inhabitants of Labrador. As early as 1004 his brother Thorwald was slain by the natives of the newly discovered districts. For centuries nothing more was heard concerning the legendary lands. Not until 1497 did the Venetian, John Cabot, come to Labrador; in 1501 Gasparo Cortoreale, who named the region Terra Labrador, stole fifty-seven Eskimos to use as slaves, and then himself perished, along with his ship. In 1517 Sebastian Cabot, the son of the one mentioned above, seems to have sailed with English ships up Hudson Strait as far as Foxe Channel. Later explorers had less success. In 1576, however, Sir Martin Frobisher arrived in the district, and investigated South-Eastern Baffin Island on his famous three journeys of 1576-78. In 1588 John Davis came to our more limited district. He found the entrance to what was later known as Hudson Strait and named the most north-eastern cape of the apparent mainland in honour of John Chidley though, to be sure, the Cape was not definitely located. In 1610 Hendrik Hudson navigated the ocean-strait named in his honour and [P. 179] before he discovered Hudson Bay, came to the north-eastern part of Ungava Bay and the Island of Akpatok (Desire Provoketh). As early

as 1612 Sir Thomas Button sailed through Gray Strait between Cape Chidley and the islands named after him; in the following years still other ships visited the district. Then discoveries ceased there, apparently for almost two centuries. In 1811 the two Labrador missionaries Kohlmeister and Kmoch of Okak navigated for the first time in a large boat with four Eskimo families the strait known in later times as MacLelan Strait. Their attention had been drawn to these districts by some Eskimos, who had come here from Nachvak and Killinek. Fortunately they reached the south of Ungava Bay and returned in the autumn to Okak by the same route, keeping close to the coast. According to their reports³ the main settlement of the Killinek people of that time was on the above mentioned Tunnuatsuk land.

In the later decades of the nineteenth century navigation to this district gradually became more active; especially vessels of the Hudson Bay Company, Scottish whalers, Newfoundland fishing vessels and occasionally even some expedition ships visited the district. Regular traffic did not begin until toward the end of the century. The present harbour of Killinek was discovered by Commander Gordon, an observation station erected there in 1885 and given the name Port Burwell (A. P. Low, *Cruise of Neptune*, 1906, p. 7). Gradually some Eskimo families took up residence, at least temporarily, at the place visited by the white people. Since the beginning of the nineties the firm of Job Brothers of St. Johns, Newfoundland, sent a steamer annually into these waters, especially on account of the codfish catch. That experienced Captain, James Blandford, discovered several small, but sheltered, harbours in the district and carried on trade with the inhabitants at Cape Chidley. [P. 180] Now and then other fishing vessels came up the Labrador coast, such as that of Captain Monroe, who died about 1896 in Port Burwell and was buried there. A high rock pyramid, visible for a long distance, south of the present buildings, marks the place. In 1898 four small wooden houses were erected by the firm of Job Brothers in Port Burwell and thereby a settled trading station was established which received the name Blandford Station or also Bishop Jones Village (compare missionary publication of the United Brethren, 1901, p. 96.) The agent for this station was Mr. Julius Lane, who still lives in Killinek. The Eskimos named the place Kikkertaujak (= penin-

³ Journal of a Voyage from Okak on the coast of Labrador to Ungava Bay, westward of Cape Chidley. Undertaken to explore the coast, and visit the Esquimaux in that unknown Region by Benjamin Kohlmeister and George Kmoch, missionaries of the Church of the Unitas Fratrum or United Brethren. London, 1814.

sula); on the maps it is usually called Port Burwell. From now on the neighbourhood was visited repeatedly by missionaries of the United Brethren from other Labrador stations. In spite of this at the beginning of the new century a missionary of the English Colonial and Continental Church Society, Mr. Stewart, came here, who, however, did not understand the language of the Eskimos and therefore exerted little influence. In 1902 the station was offered for sale by the Newfoundland firm to the London Society for the Furtherance of the Gospel, and in 1904 was acquired by this society. The Rev. Mr. Stewart went to Ft. Chimo in the south of Ungava Bay, a missionary, S. Waldmann, of the United Brethren was named leader of the new Moravian mission station, the only foreign settlement in the district, which now changed its name back to Killinek. This Eskimo word means "those who live farthest toward the outside," that is to say most northern in Labrador, but is a term which the inhabitants applied originally to their dwelling places at Cape Chidley or in a wider sense to the whole island neighbourhood north of Ikkerasak.⁴ [P. 181] Gradually different Eskimo families became accustomed to pass the autumn and winter regularly at the station, especially as they found there many profitable means of support. They received, under favourable conditions, the loan of large nets for the autumn catch of seals and traps for the winter catch of foxes, but could not exchange these much-needed hunting implements for European products, to which they had accustomed themselves only too quickly. The fact that some of the most intelligent people also strove for spiritual teaching, which was offered only in a slight measure before the station was taken over by the mission company, increased the number of members of the community. During the winter of 1904-5, according to the statement of the missionary, Mr. Waldmann, forty-four Eskimos stayed at Killinek and also erected in that place three houses of stone, earth and wood to which they came back in the following winter after their

summer hunting trips. In the autumn of 1905, the missionary, Mr. Waldmann, left Killinek on the mission steamer, in order to spend leave of absence in Germany after long years of work in Labrador, and to give his attention to the construction of the new mission house planned for the station. The missionary, Mr. W. Perrett, took his place until the next year. Hence I had the favourable opportunity of speaking with Mr. Waldmann in the winter of 1905-6 here in Saxony, and later the pleasure of travelling to Killinek with him and his charming wife, along with two younger brothers of the church appointed for the mission service, as well as two mission brides. After our arrival there, the unloading of the portable wooden house furnished by an English firm caused great trouble. [P. 182] Ice, storm and rain often hindered effective work for days at a time, so that the departure of the *Harmony* could not take place until August 22nd. Port Burwell was not entirely free of ice however as late as September 22nd. In the autumn of 1906 only the stone foundation of the new mission house was finished, especially as the unskilled natives were not of very great help. In the winter of 1906-7 the number of inhabitants in the community amounted to eighty-seven persons, among whom were forty children; but at Christmas time people came from Aulatsivik also (Labrador coast). With these the number of Eskimos rose to one hundred and five persons. Other families are expected from the south of Ungava Bay (Mission publication of the Moravian brothers. *Missionsblatt der Brüdergemeine*, 1907, p. 271), since they can live more pleasantly in the neighbourhood of Killinek under the direction of high-principled missionaries, who are supported both by the church and the government, than in dependence on private contractors, who are liable to the government for custom duties and taxes and in the end have to obtain as favourable trade profits as possible. The building of the mission house was carried on busily up to September, 1907, so that as early as the fifteenth of this month the first divine service was held in it (*ibid.*, 1908, p. 13). In the winter the house was ready for occupation. On March 1, 1908, the first fifteen natives were received into the church, twenty candidates for baptism received instruction from the missionary, Mr. Waldmann (*ibid.*, p. 341). At the end of August of that year the Governor of Newfoundland, His Excellency William McGregor, who had already been there in 1905, visited the station for a second time, and expressed a very favourable opinion about the mission and natives (in letter of 24th September, 1908). Killinek gives promise of great growth. The contentious

⁴ This disregard for the older name Port Burwell is unpleasant. In general though the principle must be upheld that the right of geographic nomenclature belongs to that publication which is the first to name a locality so that it can be located from another quarter certainly, a circumstance which was the case here. For this reason I contend for example the name Grenfell Channel or "Tickle" used for MacLellan Strait is not justified, since the older name permits it to be known clearly what is meant. (Compare Report of an Official Visit to the Coast of Labrador by His Excellency the Governor of Newfoundland, during the month of August, 1905, St. Johns, N.F.L. 1906, p. 13). If it is wished to connect the name of a worthy man with a locality, then it should relate to a place which possesses no other name or at the most a native name. (The physician, Dr. Wilfred Grenfell, is superintendent of the Royal National Mission to Deep Sea Fishermen and is one of the best informed persons in respect to the Labrador coast.) To introduce new names arbitrarily in place of older ones, is not justified without foundation and new map publication.

question whether the district is to belong politically to Canada or to Newfoundland has not yet been decided according to the official statement kindly given me by the governor. It would be desirable to have all the Labrador missions of the Moravian Brothers under the same government. According to the explanation of the Canadian government official, Major Moody of the Canadian Mounted Police, however, Canada claims it as her property. They do not intend to collect taxes from the mission property, [P. 183] as the Newfoundland government has never done so either in the case of the Labrador missions (*Missionsblätter*, 1908, p. 13). As a return the mission supports church and school without pay and takes care of other institutions of public benefit. It is said that a lighthouse is to be erected at Port Burwell on a projecting rock, also a government building south of the present station, which is intended as a centre for all customs, which are obtained from ships of private companies. As explained, they wish all persons, who import into Canadian Arctic regions any sort of goods, to pay beforehand the fixed duty in Port Burwell, something which may not be so easily accomplished in practice. Certainly our station is the most suitable place for the Canadian North-Eastern districts as it commands the whole hinterland of Hudson Strait and, in a certain sense also, the Western Davis Strait Harbour and entrance are reported as favourable for such a

purpose, and free of ice proportionately longer, than all other Canadian harbours coming into this question. Perhaps the young station is going to develop in such a way that, after a number of years, it is going to offer quite a different picture to the one I present in the following.

On August 5th we landed and I found accommodation in the mission house, such as it was. Later, after the sailing of the *Harmony*, half of a small wooden building on the hill was to be given over to me, a spacious room on the ground floor. At the present time an Eskimo from Nain was still living there with his family. He had caused himself to be brought to Killinek about a year before as a so-called national helper in order to assist the heathen there to Christianity and to good ways. But he found little sympathy, in spite of the fact that he was a gentle, kindly man, therefore he felt lonely and forsaken, became ill and weak, so that they considered it best to send him back to Nain again. There I saw him again in October merry and happy. They say that homesickness is often so strong with the Eskimos, that they become ill or even die from it.

The desire now seized me to utilize the summer with its long days in a rather long excursion down the Ungava Bay coast [P. 184]. However, I did not get my boxes until some days later, so that I investigated the neighbourhood of the station first of all.

(To be continued)

ROADSIDE MARKERS

By E. M. KINDLE



ROAD MAPS are useful as every traveller knows, but finger boards, pointing him to the desired road, are even more useful. Natural history guide books are likewise valued by the wise naturalist, but roadside markers directing him to notable features in the geology or geography of a region are still better. The Ottawa Field-Naturalists' Club has recognized the value of such devices in guiding the attention of the public to features of natural history interest by placing two markers in the vicinity of McKay Lake near Ottawa during the past summer. These markers star for every passerby two significant events in the recent geological development of the charming landscape which has McKay Lake for its dominant feature.

The skill of individual members of the club in certain lines has enabled it to use a type of marker which may possibly resist the ravages of time nearly as well as the lake itself. The markers

used are cement duplicates of a glacial boulder,—the lettering appearing on a face made flat to receive it. The lettering impressed in the cement is the work of Mr. Arthur Miles. For the cement facsimiles of a glacial boulder which carry brief references to phases of the lake's history, the Club is indebted to Mr. C. M. Sternberg, Mr. J. Skillen and Mr. Proulx.

The annual variation in the level of McKay Lake amounts to no more than a few inches. But a bed of white marl crowded with fresh water shells which borders the southern and eastern shore at a level approximately 20 feet above the present lake indicates that it once maintained for a considerable period a level about 20 feet higher than the level of the historic period. One of the two markers established this year directs attention to the marl bed of this old lake shore formed when the lake had an area about twice that of the present lake. All lakes, whether they are 10

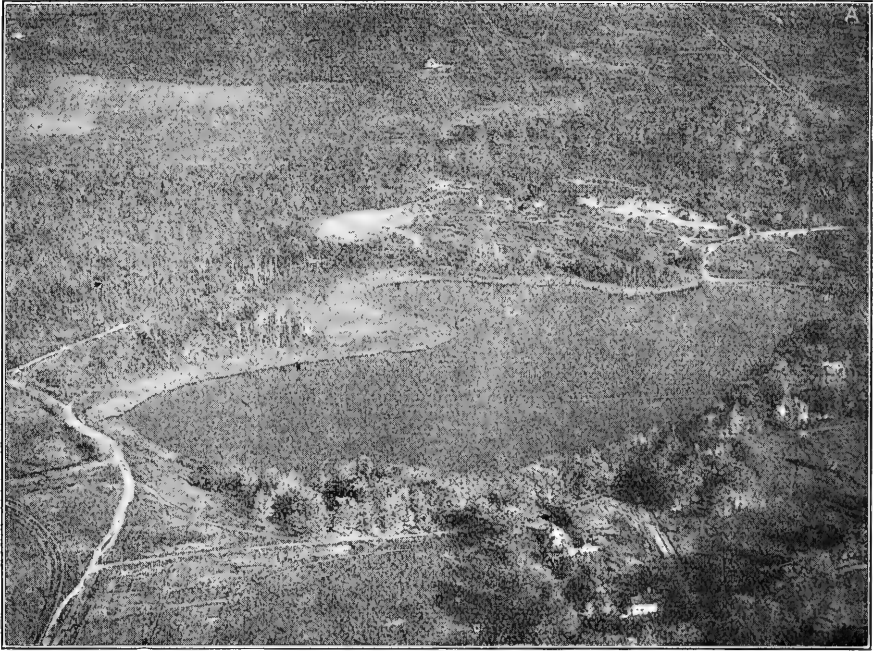


FIG. 1. *General view of McKay Lake showing marl bed and sand pits.*

feet or 1,000 feet deep, are transient features of the landscape, destined to extinction by deepening of the outlet stream and consequent drainage, climatic changes or by filling with the lake's own deposits. The 20 foot drop from this lake's old level is due to the first named agency.

A second marker which is placed beside the highway skirting this lake, where the wise traveller may stop to admire the lake's beauty, advises him that it is relatively youthful as compared with many of its sister lakes in the Laurentian hills north of the Ottawa valley.



FIG. 2. *Marl bed and underlying sands and gravels.*

Nearly all the lakes north of the Ottawa valley came into existence as the great continental ice cap drew back toward the north, leaving many of the pre-glacial valleys, which it had overspread at the beginning of the Ice Age, blocked in various places with moraines. This conversion of graded stream valleys into lakes by the irregular dumping of ice-transported debris produced thousands of the Ontario and Quebec lakes, but not all of them. After the birth of these glacier-begotten lakes, a depression of the Ottawa and St. Lawrence valleys brought the Ottawa valley a few hundred feet below sea level, and the marine clays and sand were laid down, producing the generally level terraces which are conspicuous features nearly everywhere along the Ottawa and St. Lawrence valleys. When the region was finally uplifted again, a few depressions, resulting perhaps from tidal rips or eddies, interrupted the otherwise level plains of submarine origin and these formed a second and considerably younger series of lakes than those which in the higher lands had persisted from the time of the withdrawal of the ice. McKay Lake belongs to the younger sea-born lakes, and one of the recently placed markers directs attention to the difference in age between the glacier-born and the sea-born lakes of Ontario.

It is believed that the information which such roadside markers may give the passerby will add much to the interest of the vacation trip of the auto tourist. The geologist would certainly welcome such information, displayed as geological finger-boards directing him to significant features

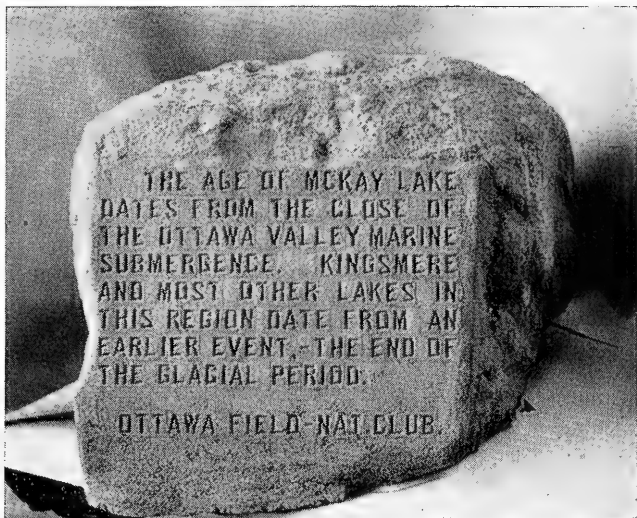


FIG. 3. Roadside marker at McKay Lake, Ottawa.

in areas unfamiliar to him. The writer, if he were driving from Canada to the southern states would like to find on the highway followed a roadside marker indicating just where the continental ice cap stopped (and started on its retreat to Greenland) after covering more than half of North America. Many of our fellow naturalists would doubtless be glad to encounter geological finger boards pointing to the limits of Neptune's conquest a few thousand years ago, when the sea submerged Parliament Hill. The writer hopes that during the year the columns of *The Canadian Field-Naturalist* may be able to report the placing of a marker on the Kingsmere road indicating the exact position of the highest Pleistocene sea beach formed during the last marine submergence of the Ottawa valley.

THE RELATION OF CANADA GEESE AND BRANT TO COMMERCIAL GATHERING OF EEL-GRASS IN THE ST. LAWRENCE ESTUARY*

By HARRISON F. LEWIS

THE inhabitants of the village of Isle Verte, Quebec, which is situated on the southern shore of the St. Lawrence estuary about 130 miles below Quebec City, have carried on a commerce in dried eel-grass (*Zostera marina* L.) for the past 30 years. This plant, which is a familiar sight on most sheltered north temperate seashores, growing from

about half-tide mark to a depth a few feet below low-tide mark, covers large, but definitely limited, areas of tidal flats near Isle Verte. Its dried leaves and stems are quite widely used in industry, especially for insulation for buildings, and for upholstering furniture. When farmers who own water frontage in the vicinity mentioned found that there was a market for the plant, apparently they first gathered the extensive windrows of dead and broken leaves that naturally drifted ashore,

*This article may be had in French, on application to the Commissioner, National Parks of Canada, Ottawa.

especially after severe storms. Such gathering of eel-grass that has drifted ashore is still a common practice in many places, but at Isle Verte it was long ago replaced by more aggressive methods, which were developed, no doubt, because of a rather brisk demand upon the circumscribed local supply and because a better quality of material was obtained by harvesting the plant direct from pure stands than by taking what the sea had cast ashore mingled with coarser sea-weeds and other flotsam.

The present method of harvesting eel-grass at Isle Verte is to anchor a scow at high tide in a selected position over the tidal flats, and await the fall of the tide; then, when the water has become sufficiently low, to mow the eel-grass near the scow with scythes, gather the mowed material into the scow, and proceed to shore with the loaded craft on the rising tide. The flats being extensive and the run-off of the water among the eel-grass plants being much hindered and delayed by the plants themselves, there is generally not less than six inches of water on the greater part of the flats, even at low tide, and this water supports the plants sufficiently to permit the blade of the scythe to be thrust among them for mowing, which would not be possible if the water all ran off and left the weak, flexible leaves and stems prostrate on the mud. Harvesters formerly mowed a given stand of eel-grass not oftener than once in two or three years, but of late years some of them at least have apparently been mowing the same areas annually. When the eel-grass has been brought to shore, it is carted into mown fields, where it is spread and turned until dry, after which it is baled and stored for shipment. Harvesting this plant is carried on from June to September. The actual harvesters generally sell to local dealers who ship to all parts of the continent. The eel-grass growing near Isle Verte is the variety *angustifolia* Hornem., which, having narrower and finer leaves than those of the typical variety, is somewhat more valued for upholstery.

A few years ago dried eel-grass sold in Isle Verte for \$40.00 a ton, and at that time the principal local dealer in the material shipped as much as 3600 tons a year. At present the price is about \$20.00 a ton and, at this price, the dealer just referred to shipped only about 600 tons in 1929. The price is only one-half of what it was, and the local shipments are only about one-sixth as great as formerly.

The rootstocks or rhizomes of eel-grass form a very important food of Canada Geese and Brant. According to W. L. McAtee, in charge of Food Habits Research for the United States Biological Survey, "The Brant feeds almost exclusively on

eel grass and Canada Geese, when in waters supplied with it, take considerable quantities also." The tidal flats in front of Isle Verte and the waters of the St. Lawrence River in that vicinity are a great natural feeding and resting place for many thousands of Canada Geese, and for hundreds, if not thousands, of Brant, on their spring and fall migrations, and there they have doubtless eaten eel-grass rhizomes from time immemorial.

In March, 1929, Messrs. François Couveron and John Lévesque, of Isle Verte, petitioned the Dominion Government to permit them and other farmers in that vicinity to hunt wild geese in the spring of each year, in order to drive these birds away from the growing eel-grass, because they claimed that the geese, by eating eel-grass rhizomes in spring, were reducing the stands of this plant, and that this was the factor responsible for the decline in the annual eel-grass harvest in the neighbourhood of Isle Verte.

Having been instructed by the Commissioner of the National Parks of Canada to report on this petition, I visited Isle Verte on November 14, 1929, April 24, May 14, and September 5, 1930, and examined the areas from which eel-grass is harvested and interviewed the petitioners and other interested parties. It would be very desirable to make much more extended and frequent observations when endeavouring to solve a problem of this character, but as this has not been practicable in this instance, this report has been prepared to cover the information gathered.

There is no question but that Canada Geese and Brant, when present in large flocks at Isle Verte, as they are each spring and fall, eat large quantities of eel-grass rhizomes, as they have done from time out of mind. The rhizomes of this plant are a very important staple article in their diet. The question is whether or not such feeding is sensibly injurious to commercial harvesting of the plant. If it is, the matter is serious, for eel-grass is a food of geese and brant in arms of the sea on the Atlantic coast of North America from Labrador to South Carolina and on many other coasts as well, and it is now being gathered for commercial use in many places.

To answer a question of this kind correctly requires a knowledge of the habits of the plant and of its methods of growth and reproduction, as well as a knowledge of the habits of the birds. Search of the literature has shown that there is still a great deal of uncertainty about some important details in the life history of eel-grass, although the main outlines of its morphology and phenology have been worked out and are most interestingly presented in a recent paper by Pro-

fessor W. A. Setchell, of the University of California.

Briefly, eel-grass, which is a spermatophyte or seed-bearing plant, although often popularly looked upon as a moss or an alga, reproduces both by its seeds and by vegetative multiplication of its rhizomes. The rhizomes are rooted at a slight depth in sand or mud and bear a number of narrow, green, ribbon-like leaves, commonly one to four feet long, which, when surrounded by water and unaffected by waves or currents, tend to stand vertically, but which lie prostrate if left dry by the falling tide. The activities of this plant are very strictly governed by the temperature of the water immediately surrounding it. When that temperature is below 50° F., or above 68° F., or when it is falling from some point above 68° F., there is practically no activity on the part of the plant. When the temperature, in spring, rises past 50° F., vegetative activity begins, and the plant grows and develops until the temperature of 59° F. is reached, when vegetative activity largely gives place to reproductive activity and the plant flowers and matures its seed. If a temperature as high as 68° F. is eventually reached, this causes cessation of all activity.

At Isle Verte the water temperature among the eel-grass on April 24, 1930, was 31° F. to 32° F., which indicates that no growth of any kind had taken place that spring up to that time. Such leaves, 12 to 16 inches long, as were borne by the plants seen there on that date must have grown in the previous summer. On May 14, 1930, temperatures of 53° F., 54° F., and 57° F. were found in water among the eel-grass on the flats at Isle Verte at low tide, the day being fine. The air temperature at the same time was only 45° F., and the higher temperatures in the water on the flats was doubtless due to direct insolation. Such temperatures indicate that, in that locality, eel-grass is able to begin vegetative growth prior to the middle of May. At what date the water temperatures here reach 59° F., permitting the beginning of reproductive activity, is unknown, and whether the water temperature here in summer reaches or exceeds 68° F., is uncertain. It would seem likely that it would do so temporarily in shallow pools exposed to full insolation on the flats at low tide on fine summer days, but whether or not this would be sufficient to check reproductive activity, in view of the probable prompt lowering of temperature by the rising tide, is also uncertain. The water temperature on these flats at low tide at dusk on September 5th, 1930, a cloudy day, was 60° F., indicating that reproductive activity, unless it had been previously checked by temperatures exceeding 68°

F., was still possible at that date. R. H. M'Gonigle reports a surface temperature of only 51.8° F. at Isle Verte pier on September 27, 1923, indicating that reproductive activity of eel-grass in that vicinity must then have ceased and that the plant was about to enter its winter condition of rest.

I have examined all the specimens of eel-grass preserved in the National Herbarium and found the following only with ripe seeds:

<i>Place</i>	<i>Date</i>
Brackley Point, P.E.I.....	August
Yarmouth, N.S.....	August 22
Bass River, Kent Co., N.B.....	August 10
Pointe au Maurier, Saguenay Co., P.Q.....	August 23
Great Bras d'Or, N.S.....	August 28

It therefore appears entirely probable that, along the shores of eastern Canada, this plant drops its seeds chiefly in August.

The seeds germinate on the soil of the flats where they lodge and develop small, simple seedlings, with two opposite fascicles of roots below, a short, slender stem without elongated internodes, and, at the upper end, the first bud, or "turion", with 6 or 7 leaves. This development probably occupies all of the first growing season of the young plant. In the second growing season there is further vegetative activity, with elongation of about 7 internodes of the turion, loss of leaves along the elongating portion, development of a new terminal turion at the tip of the elongated rhizome with 6 or 7 large leaves, and development of two, or sometimes more, lateral turions or shoots, each smaller than the terminal turion. There is no reproductive activity in the plant's life history up to this point. In the third growing season the older portions of the rhizome die and are abjoined, leaving the terminal turion and the two lateral turions as three separate plants. The terminal turion, under appropriate conditions of temperature, develops flowers and matures fruits, and then, apparently, dies and drifts away, although it is not certain that it perishes in localities where the water temperature never exceeds 68° F. Meanwhile what were the two lateral turions develop vegetatively as the primary turion did in the previous growing season, and at the end of the third growing season from germination each of them shows a terminal turion with elongated internodes and two smaller lateral turions, each with two axillary buds. In the fourth growing season each of these plants acts as the original plant did in the third growing season, the terminal turions producing seed and the lateral turions developing vegetatively. This process, under ideal conditions, goes on indefinitely, not only maintaining the species, but doubling the

number of individual plants each year without dependence upon seed production. This constitutes the plant's method of vegetative reproduction, and is probably its chief method of maintaining stands once established, while seeds are the principal means of colonizing new areas.

Detailed inquiry on the ground as to the exact complaints and requests of the petitioners has given the following results:

The eel grass harvest is smaller than it was formerly. This they attribute to

1. The fact that the plants are now only about 20 inches high when cut, whereas it is claimed that they were formerly four feet high.

2. A thinner growth of the plant in the stands.

3. The extension of bare spaces, occurring frequently among the eel-grass and apparently suitable for its growth, but not occupied by it at all

All of these occurrences they attribute to the fact that Canada Geese and Brant in large numbers feed on the rhizomes of the eel-grass in the spring. They claim that, relatively at least, such feeding is a new factor, because these birds were formerly kept off the flats by spring shooting, and also because the birds are becoming much more numerous from year to year under the protection afforded them by the Migratory Birds Convention.

Their desire now is to have each land-owner concerned in the harvest of eel-grass at Isle Verte given an individual permit to fire at Canada Geese on the eel-grass flats in the spring and to kill not more than five of them in one year under any one such permit. They claim that this would keep the birds off the areas that are harvested, thus preventing all damage, while permitting them to feed on the outer beds of eel-grass that are not mowed because they are never bared by the tide.

Let it be noticed first that decrease in the market price of eel grass may be largely responsible for the decreased amount harvested at Isle Verte. The price has fallen to half of what it was formerly and the decline in the amount harvested and shipped has accompanied this fall in price. Independent local opinion at Isle Verte is to the effect that the relationship between the price and the quantity of eel-grass harvested is very close and direct, and that a price of \$20.00 a ton fails to induce many potential eel grass gatherers to take the trouble to harvest, dry, and bale the material.

The alleged decrease in size of the plants from a general height of 4 feet to one of 20 inches cannot conceivably be attributed to the work of Geese and Brant. These birds cannot by any means eat all the adult plants on these flats and

leave only the young ones of the second season. Their unsystematic feeding habits, if they thin out the plants in any area, should give those that remain an opportunity to grow larger than those in unmolested stands, rather than smaller.

The decrease in size of the plants is probably due chiefly to systematic mowing, often practiced annually over the same area. Examination of such mowed areas shows that, while seedlings in their first season's growth largely escape injury by the scythe, older plants are cut through the rhizome below the lateral turions. Apparently this does not kill the plants, as such material gathered at Isle Verte on an area mowed three weeks previously shows small new leaves surrounding the cut end of the rhizome but there can be little doubt that plants that have received such a severe setback will not be able to develop fruiting stems in the following season, but will proceed with vegetative growth, much like the second season's growth of plants from seed. In accord with this are the results of examination of eel-grass plants collected at Isle Verte on September 5, 1930, from an area that had been mowed in 1929. These plants show a height of about 20 inches but no sign of flowers or fruits, or of having ever borne flowers or fruits. As plants of eel-grass in the fruiting stages are markedly larger than plants showing vegetative growth only, other conditions being equal, there is no doubt that when annual mowing prevents the development of fruiting stems of the majority of the plants in a given stand, the average height of the stand in the latter part of the summer will be considerably less, from this cause alone, than it otherwise would be.

Prof. Setchell, in a letter dated May 22, 1930; has pointed out that mowing operations might seriously reduce the small stored supply of carbohydrates in the eel-grass plants. This would probably restrict growth of such plants in the following season to some extent, resulting in a lower average height for the stand. Both of these factors limiting growth are the direct result of annual mowing operations.

There is possibly a third factor operating at the same time to restrict growth of eel-grass plants at Isle Verte. Residents there complain that, for some years past, wintry weather has continued late in the season and warm spring weather has been late in coming and, when it did come, has developed quickly. They state that these conditions are in marked contrast to the earlier, more protracted development of spring that they observed prior to recent years. As vegetative growth of eel-grass takes place only during that period in spring and early summer when the

surrounding water is warming from 50° F. to 59° F., former protraction of this period may have resulted in greater growth and larger plants, while its shortening, if it actually occurs, as it probably would under conditions such as are reported, may tend to restrict vegetative growth and cause the eel-grass plants to be shorter.

Elevation of the general level of the flats, due to deposition of silt or to elevation of the entire region, would probably reduce the height of the eel-grass stands, but I have no evidence of such elevation and local residents claim that they are unable to observe it.

As to the complaint that existing stands of eel-grass are thinner than they used to be, that is, that they contain fewer plants per unit of area, it is difficult to obtain any definite facts to support the complaint. An area that Mr. John Lévesque, one of the petitioners, indicated to me as being too thinly covered with plants appeared to me to be very densely covered with them. He said that he considered the plants to be too few there because he found that the yield from such an area was too light, but there is nothing to show that the light yield was not due entirely to the shortness of the plants, and not to lack of abundance of individuals. Two counts of plants on measured areas, selected as typical, and about two miles apart, gave 269 to the square foot in one case and 276 to the square foot in the second case. These results agree surprisingly well, average 272.5 plants to the square foot, and indicate a fairly dense growth.

Thinning may, however, occur as the inevitable result of close annual mowing. It has been shown above how this probably prevents seed formation, and if it is so close as to sever the main rhizome below the lateral turions, as it appears to be in the examples studied, it must also prevent vegetative reproduction. Individual plants dying from various causes in such an area (and it will be shown that close mowing probably raises the mortality rate due to winter conditions) cannot therefore be replaced except from occasional plants that escape the scythe or by seed brought to the mowed area from elsewhere, and this condition may result in thinning.

Bare spaces, from a yard to several rods in diameter, occur frequently among the eel-grass on the flats. The soil in such areas is apparently similar to that on either side of them and entirely suitable to growth of eel-grass and yet the plant is absent. On some parts of the flats such bare spaces constitute more than 50% of the surface over large areas. It is possible that some of these bare spaces are due to the feeding activities of Geese and Brant, although the lack of system in

the birds' feeding habits makes this very doubtful. On April 24 and May 14, 1930, my inspections of conditions at Isle Verte, made under immediate direction of the complainants and at periods selected by them, when the damage was alleged to be greatest, failed, as they themselves admitted, to reveal any damage by birds of any consequence whatever. Most of the bare spaces are probably due to ice action. The flats become covered in winter with heavy ice, two to three feet thick, which in April breaks up, drifts about, and finally drifts away. Mr. Charles Morency, a commercial eel-grass harvester, situated at Trois Pistoles, 11 miles east of Isle Verte, explains what happens as follows:

"If it happens that the ice takes its departure in a gale when the tide is not very high the result is that the ice drags away and pulls up the root [rhizome] of the eel-grass and plows furrows [in the bottom], and it requires a season for the plant to re-establish itself."

Prof. Setchell has also, in his letter of May 22, 1930, pointed out a likely method of establishment of these bare spaces when he says, "The mowing operations might seriously cut down the carbohydrate supply of the *Zostera* plants and this supply is so small, so far as storage is concerned, that it may do very serious damage in starving out and killing off the rhizomes, which have a rather serious time to winter over in your colder waters." Formation of bare spaces in this way, as a direct result of mowing, easily explains any increase in such areas in recent years.

This inquiry into the detailed complaints made by eel-grass harvesters of Isle Verte, upon which their petition for spring shooting was based, indicates, then, that, in so far as decrease in the amount of eel-grass actually harvested there is concerned, it is probably much affected by the price offered, and, in so far as decrease in the amount of eel-grass available for harvesting is concerned, it is not proven but is probably actual, and, if it occurs, is apparently due chiefly to the practice of mowing the eel-grass, particularly where mowing is carried on annually over the same area, and can be caused only in a very slight degree, if at all, by the feeding activities of Canada Geese and Brant.

The suggestion has been made that suitable plots of eel-grass should be selected and marked off, and that one of these should be left unmowed, one should be mowed annually, one should be mowed every two years, and one should be mowed every three years, in order to determine experimentally the results of such mowing operations. This is an excellent plan, and it is to be hoped

that it will be carried out, but unfortunately it is outside the possibilities of this present inquiry.

Prof. C. H. Ostenfeld, late Director of the University Botanical Garden, of Copenhagen, Denmark, kindly sent me a letter, dated September 25, 1930, in which he described conditions relating to the eel-grass industry in Denmark. His remarks are as follows:

"*Zostera marina* is quite common here in the shallow water along the coasts of my country and is used there as a manure sometimes also to fill mattresses and other implements and for packing purposes, but it has as far as I know never been used so much that the beds of it are mowed. The amount of it is so great, that to our purposes the masses loosened in the autumn and thrown ashore have been large enough.

"I have, therefore, no experience with regard to the effects of mowing, on the other hand the activities of Geese, which also with us on their migrations assemble in large numbers in our waters, have had no restricting influence so far.

"Personally I should think that the birds are not responsible for the diminution of the amount of *Zostera* with you; I should think that the mowing and all the injuries of the plants connected with this mowing are the causes, and should suggest that a restriction of the mowing in one way or another would help the growing of *Zostera* on your tidal flats. I do not know the temperature the year round of the water over the sand flats, but I think that your winter is more severe than ours, and that, of course, has that influence on *Zostera*, that it does not have the same vigour as it has here in Denmark. As we have practically no tides with us, *Zostera* lives in the water and is only quite exceptionally exposed to the air. It is green the whole year round and does also grow (but slowly) in the winter."

In conclusion, comparison with conditions in two other areas where Canada Geese feed extensively on eel-grass rhizomes may be presented.

Mr. Charles Morency, of Trois Pistoles, Quebec, only 11 miles from Isle Verte, states that he has been harvesting eel-grass by mowing for about 20 years and obtains an average of 50 tons a year, although the amount obtainable varies. He has no complaint to make about the eel-grass supply or the effect upon it of the feeding activities of Canada Geese; on the contrary he says, in a letter dated September 23, 1930: "In the Trois Pistoles River, where the Geese occur in such

great number, far from observing that the Geese destroy the eel-grass, we even prove it to be better [than elsewhere]."

Mr. Robie W. Tufts, Chief Federal Migratory Bird Officer for the Maritime Provinces, has sent me the following interesting account of conditions in two harbours on the south-west coast of Nova Scotia:

"The harbours of Port Joli and Port le Herbert, in Shelburne and Queens [Counties], Nova Scotia, are the resort of some 20,000, more or less, wild geese, which have visited this section from December to late March since the memory of man. These shallow waters were created a sanctuary for these birds about fifteen years ago and it is believed by interested observers on the ground that the congregation of these birds is slowly increasing year by year. In fact it is now believed that the harbours will not support greater numbers, for, by the time the birds are ready to leave for the north, which, as, above stated, is usually the last week in March, the flats appear to be virtually stripped of eel-grass and the birds are feeding along the shores among the rocks, where of course they are in more or less danger at all times from poachers. In spite of this great concentration of birds on a relatively limited feeding area (Port Joli being a mile and a half long by a mile wide and Port le Herbert two and a half miles long by one-half mile wide approximately) each autumn when they return the flats are covered with a luxuriant growth which shows no impairment whatsoever as a result of being so completely stripped the previous winter."

These comparisons agree with the finding made at Isle Verte itself, that Canada Geese do not seriously injure stands of eel-grass by their natural methods of feeding on them, and there is therefore no reason to permit spring shooting to alter their normal feeding habits.

It is suggested that areas where the eel-grass production shows a decline should not be mowed oftener than once in every two years, at most.

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CANADA'S HERITAGE OF WILD LIFE—SOME ECONOMIC ASPECTS

By MISS FLORENCE A. BROWN

CANADA'S wild life is of inestimable value, both from a sentimental and from a financial viewpoint. Education along the lines of conservation is teaching the people of Canada more and more to appreciate the fact that the wild fur-bearing animals, the game animals, and the birds are a heritage to be enjoyed, to be used, and to be passed on to posterity in undiminished numbers. The world without wild animals roaming the forests and plains and without birds to fill the air with song would be a sorry and unromantic place. However, the object of this paper as presented from the statistician's point of view, is to deal not with romance but with the value in dollars and cents to Canada of its wild life. Of that wild life, the most important part are the fur-bearing animals. The fur trade has always played an important part in Canada's history, and to it is due the early colonization of the country. Champlain, for example, was the purchasing agent of a fur trading company, and so later on were Sir Alexander Mackenzie, who first crossed the continent in quest of furs, and Sir James Douglas, the first Governor of what is now British Columbia. Beaver was the pelt most highly prized in early times, and was of such importance in the seventeenth century that it was made the Canadian currency. The export to France about this time amounted yearly to from 15,000 to 20,000 pelts. To-day the annual production of raw furs amounts to between three and four million pelts, with total value ranging from 15 to 20 million dollars. Beaver is no longer of paramount importance to the fur trade, as its value of output now represents only about 11 per cent of the total annual raw fur production of the country, and though the value of the beaver is about \$2,000,000 per annum it has been supplanted as first in order of value by muskrat and silver fox. This latter fur has come into prominence owing to the rapid expansion of the fox farming industry. Fur farming is the outcome of the increasing demand for furs of high quality, and the pelt of the ranch bred animal is becoming an important factor in the annual crop of furs. Indeed, in the years to come the fur trade may have to look to the fur farm to supply the larger part of the furs. Four years ago the number of pelts from ranch-bred animals represented only five per cent of the total raw fur production of the Dominion, but in 1929 the proportion had risen to twelve and a half per cent. Indeed the statistics which are available for the last decade, show that the number of fur-

bearing animals on fur farms has increased from 8,000 in 1919 to 260,000 in 1928, and their value from \$3,200,000 in 1919 to \$16,400,000 in 1928. Then there are the industries complementary to the fur trade, *viz.*, fur dressing and fur goods manufacturing, which are carried on in Canada on a large scale. In 1928, the latest year for which statistics of these industries are as yet available, there were 12 establishments in Canada, engaged in the dressing and dyeing of fur skins and the total number of skins treated in that year was 7,974,020. There has been a continual increase during the past three years in the number of skins treated, and it is probable that the statistics for the year 1929 will show a further increase. A large number of the skins treated in fur dressing establishments are of foreign origin, including mole, opossum, goat, Persian lamb and rabbit. Finally, the fur goods industry, which manufactures men's and women's fur coats, fur collars, cuffs, neckpieces, fur trimming, etc., showed a value of production in 1928 of \$20,756,071, gave employment to over 3,000 people, had a salary and wage bill of nearly four million dollars, and used furs and other materials to the value of nearly 14 million dollars. The number of establishments in operation was 225.

The fisheries of the Atlantic coast were the first lure which attracted Europeans to the shores of Canada, and they still play an important part in the economic life of the Dominion, more particularly in the Maritime Provinces and British Columbia. At the present time they furnish employment to some 80,000 persons and have an annual production valued at some 55 million dollars. But apart from these commercial fisheries, which are carried on mainly for gain, there are the inland fisheries which are carried on for food or for sport. Many a pioneer settler has kept the wolf from the door by fishing, and many a cottager has reduced his vacation expenses besides getting a good deal of fun by adopting what is called the method of direct acquisition. Further many others come long distances for the express purpose of catching such famous game fish as the salmon of the Restigouche, the black bass of the Ontario and Quebec Highlands, and the trout of the Nipigon. Incidentally the wealthier among these devotees of Isaac Walton give employment to several hundred guides during the summer season.

The wild animals and the fish of the interior waters of Canada are now, in the Eastern provinces and British Columbia, and will soon be

PROVINCIAL GOVERNMENT GAME AND FISHERIES RECEIPTS FOR THE YEAR 1929
(Subject to Revision)

<i>Sources of Receipts</i>	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Total
FISHERIES:										
Fishing and Angling Licenses.....			\$77,882.00	\$46,043.75	\$326,833.35				\$46,672.81	\$497,431.91
Leases of Lakes and Rivers.....				133,025.25						133,025.25
Royalties on Fish.....					15,765.12					15,765.12
Other Receipts.....			18,113.78		6,595.48					24,709.26
Total Fisheries.....			\$95,995.78	\$179,069.00	\$349,193.95				\$46,672.81	\$670,931.54
GAME:										
Royalty on Furs.....					\$110,091.70	\$31,434.45	\$67,595.24	\$46,222.46		\$331,727.48
Game and Fur Dealers' Licenses.....			2,360.00	35,135.00	84,643.45		17,345.84	1,393.00		140,877.29
Game Licenses.....			62,299.59	37,785.00			33,173.25	69,895.24		406,126.65
Guides' Licenses.....			320.00		5,862.00					6,182.00
Leases of Territories.....				65,860.25						65,860.25
Non-resident Licenses.....					69,380.00					69,380.00
Resid. Deer Licenses.....					64,983.63					64,983.63
Resid. Moose Permits.....					7,458.00					7,458.00
Trappers' Licenses.....					51,190.00		22,392.85			73,582.85
Other Game Receipts.....			551.00	13,933.67	3,255.25	47,000.00	25.00	5,249.04		102,649.32
Total Game.....			\$32,635.36	\$223,232.92	\$396,864.03	\$78,434.45	\$140,532.18	\$122,759.74	\$202,973.57	\$1,268,827.47
Total Game and Fisheries.....			\$32,635.36	\$402,301.92	\$746,057.98	\$78,434.45	\$140,532.18	\$122,759.74	\$249,646.38	\$1,939,759.01

in all the nine provinces, the property of the province. The provincial treasuries benefit accordingly, both directly and indirectly. The direct revenue derived by the provinces from licenses, royalties, etc., is not large. In 1929 the total for all the nine provinces was only \$1,939,759, of which \$670,932 is credited to fisheries and \$1,268,827 to game. The large items in the latter were the royalty on furs, which amounted to \$331,727, and the amount paid for game licenses, \$406,127. Ontario was the leading province in the matter of direct revenue from fish and game with a total in 1929 of \$746,058, followed by Quebec with \$402,302. The foregoing does not include revenue from licenses, etc., in the Northwest Territories, the total for which in 1929 was about \$65,000. A table is attached, which shows, by provinces, the revenue derived in 1929 from each of the several kinds of licenses, royalties, etc. The great bulk of those who take out hunting and fishing licenses are part-time or casual workers, the census of 1921 showing only 2,201 persons, including eight women, whose main occupation was recorded as hunter or trapper. The total number is exclusive of the Northwest Territories, as figures for that area are not available.

The wild life of Canada is undoubtedly a leading factor in attracting tourists to the Dominion, and the tourist trade is an immense source of income to Canada. We sell to the foreign tourist, board, lodging, and the products of our industries to the value of many millions of dollars each year. The United States tourist, thousands of whom visit Canada annually, is allowed to bring into his own country imports to the value of one hundred dollars, free of duty, and undoubtedly the value of goods thus exported

from Canada reaches a very large sum each year. Estimates have been made by the Dominion Bureau of Statistics of the expenditure of tourists from other countries in Canada, based on information supplied by numbers of selected tourists and the figure for 1929 is placed at \$299,188,000. It is of course impossible to estimate what proportion of this was spent by sportsmen who visited Canada to hunt and fish, but the amount was probably considerable. The forests and streams of our provinces offer unsurpassed attraction to sportsmen, not only in the game and fish which they provide, but in the beauty of scenery, excellence of climatic conditions, and in rest and quiet "far from the madding crowd." The fame of the National Parks of Canada is world-wide and tourists both from home and abroad are visiting them in increasing numbers each year. The tourist in Western Canada seldom fails to visit Banff or Jasper. The game preserves maintained by the various provinces are also regarded as beauty spots by the tourist. Then in addition to the sum spent by foreign tourists, there is the amount spent by Canadian tourists, of which the Bureau has no record. Reports, however, show that Canadians spent outside of Canada 111 million dollars, and it is probable that they spent much more at home in holiday and business trips. Altogether it would seem that it is the "out-of-doors" with all that this implies, that is the magnet for the foreign tourist in Canada and for the Canadian tourist at home.

Finally there is the value to the agriculturist of the insectivorous birds, which, in feeding on the crop-destroying insects, save Canada annually millions in dollars, the value of crops which would be lost if the insect hordes were allowed to advance unchecked by these feathered friends of mankind.

NOTES ON THE HOME LIFE OF THE VIRGINIA RAIL*

By HENRY MOUSLEY

THESE short notes refer to a pair of Virginia Rails that for two years at least, 1927 and 1929, have made their home in a small bog or swamp on the outskirts of Verdun. How much longer that may be possible is problematical, seeing that an army of workmen is now engaged in laying pipes of various descriptions with a view, apparently, to converting this little swamp into highly desirable lots for small villas, as the estate men will no

doubt describe the site at some future date.

Other interesting birds that have found a home here during the past four years, are the Wilson's Snipe, and Rose-breasted Grosbeak, besides innumerable Yellow Warblers, Sparrows, Starlings, Red-winged Blackbirds, and the like.

The first nest of the Virginia Rail was found on June 17th, 1927, in a tuft of sedges in a very wet place, which at that date contained ten eggs, but which later on came to grief from some cause or another, but not before my friend, Mr. Napier Smith, had taken pictures of the incubating bird.

*Read before the Province of Quebec Society for the Protection of Birds, Montreal, Oct. 14, 1929 (illustrated).

Whether the birds nested there in 1928, I am unable to say, but in 1929, on June 6th, another nest was found, also containing ten eggs, but built in a somewhat drier situation, although only a few yards distant from the one of 1927. On this occasion photographs of the nest and eggs only were taken, but two days later (June 8th) I spent five hours at the nest, obtaining several interesting pictures of the incubating bird. As far as I can remember, the camera was set up about four feet from the nest, for which I was to suffer later, as it took four hours before the female became accustomed to it and would venture on the nest. The first picture taken shows the front of the nest partially concealed by a screen of long grasses, the female always leaving by the back door as it were. After taking this picture, another view was obtained with these grasses removed, thus allowing the eggs to be seen, and the female when sitting on them. During these proceedings, the female was not far off, and having finally adjusted the shutter to give an exposure of one-fiftieth of a second, I retired with the release to some bushes about thirty feet away, in high hopes of some early pictures, as the female had given me the impression of not being particularly shy. However, this was not the case, as it was four hours before she ventured on the nest. At first I thought it was myself that was causing the trouble, as I took no especial pains entirely to conceal my whereabouts, both birds often being in close proximity to my hiding place, when they could hardly have failed to see me. However, as time went on, I could see it was really the nearness of the camera to the nest that was responsible for the shyness of the female. Often she would approach close to the nest, and then go round and round it always as it were with her eye on that dread camera. This went on for nearly four hours, during which time she, and the male bird at times, would keep up an almost incessant series of little pig-like grunts. By this time, I was getting about worn out, and had almost decided to give the business up. Only those who

have made home life studies will know my state of mind, and what I felt like when, on taking a last look at the nest, I saw the female actually walking onto it. All the discomforts of the past four hours—it was very hot—were forgotten in that one moment, but it was of short duration, for she was off again in a second. However, nothing happened, and the dread camera remaining as motionless as ever, she made another attempt, and this time remained a little longer before walking off again. Finally, she came on almost with a rush, and this time just as she was in the act of pulling up the grasses over the front of the nest, again to form the blind, I released the shutter, and obtained a picture of her with a blade of grass actually in her mouth. On her next visit—ten minutes later—she went through the same procedure as before, only on this occasion I refrained from releasing the shutter, until her head was almost obliterated by the grasses she had lifted up. Upon her again leaving the nest—on my appearance to re-set the shutter—these grasses fell down and partially covered the eggs, of which I took a picture before the removal of the grasses once more. At her next, and subsequent visits, no attempt was made to re-erect the blind, the last three pictures showing her covering or endeavouring to cover the eggs.

The rapidity with which these pictures were taken—one every ten minutes—goes to prove that once the bird had overcome its fear of the camera, it cared little or nothing whether I came into the limelight or not, which of course I had to do after each picture was taken in order to re-set the shutter. In more than one instance I noticed she had retired no further than just beyond the edge of the nest. Considering she had behaved so well at the finish, I now decided to leave her in peace, hoping that eventually the brood would be brought off in safety, a thing much to be doubted in view of the fact that this little swamp is overrun with boys, whose depredations have been only too evident on several occasions, by broken eggs or pulled down nests.

SEICHES

By C. H. O'DONOGHUE

MY friend Dr. Kindle called attention to the very interesting phenomenon of Seiches in the last issue of *The Canadian Field-Naturalist* and commented on the silence on this topic in text-books of geology. However this may be, it is a common phenomenon, very well known to limnologists and one that has received a considerable amount of attention in Europe. Indeed the word itself comes from Lake Geneva where the phenomenon was well known back in the middle ages. I have myself noticed it in Lake Winnipeg several times in the summer of 1918; in Lake Brereton, Man., in 1922; in Lake Louise, Banff National Park in 1925; in Maligne Lake, Jasper National Park in 1926 and in Fox Lake, Ont., in 1927.

A seiche is a standing or stationary oscillation of the whole lake and is observable as a rhythmic rise and fall of the water surface not due to any obvious cause such as wind, rain, snow, etc. The vertical movements are accompanied by more obscure horizontal movements. On days when the air is still and the surface of the lake to the naked eye apparently motionless, this phenomenon can be observed readily by the following means. Drive a rule or suitably graduated stick into the bottom of the lake in a sheltered position and watch it from time to time or continuously. The water will be seen to rise and fall rhythmically, the distance between the highest and lowest points is termed the range, half of this the amplitude and the time between one peak and the next the period. This is only a rough and ready method applicable under limited conditions but various instruments are available and a number in use which keep this and other records in an accurate manner. Unless deliberate watch is kept seiches are overlooked save when they are exceptionally large or occur in special circumstances such as the one recorded by Captain Morris and quoted by Dr. Kindle

Although known for centuries the first time a seiche was recorded with an attempt at scientific accuracy was in 1730 by Fatio de Duillier, a Swiss engineer. Marked seiches occurred in a number of the lakes in Scotland on the 1st of November, 1755, that in Loch Lomond having a period of about 10 minutes and a maximum amplitude of $2\frac{1}{2}$ feet. These became well known since they coincided with the earthquake in Lisbon with which striking disaster they become associated in the public mind. It is possible that this may have prompted Captain Morris to remark "This

phenomenon often happens" when he encountered a striking manifestation of it less than nine years later. Since that time an enormous number of records have been obtained in various parts of the world and an extensive literature on the subject has grown up. Seiches with a 15-hour period have been recorded by A. J. Henry (U.S. Weather Bureau Bull. J. No. 262, 1902) in Lake Erie.

Since Lake Geneva is the home of the word it is fitting that it should still be the classic centre of the investigations. A splendid self-registering limnograph was set up at Sécheron in 1877 by Plantamour and has been operated ever since. Its records are supplemented by those taken at other stations on the lake. Any one interested in this truly fascinating subject would do well to consult Forel's magnificent monograph "Le Léman", Vol. II, 1895, Lausanne; Halfbass "Der heutige Stand der Seiches—Forschung", *Zeitschr. Ges. Erdk.*, 1907; for the mathematical aspects Chrystal "Hydro-dynamical Theory of Seiches" *Trans. Roy. Soc. Edin.*, Vol. xli, 1905, and lastly the same author's article in "Bathymetrical Survey of the Scottish Fresh-Water Lochs" by Murray & Pullar, Vol. 1, 1910. These will provide a satisfactory background and indicate lines of work. Many persons with summer cottages on the lakes with which Canada is so bountifully provided have opportunities of accumulating data on this subject and I should like to support most heartily Dr. Kindle's plea that they do so. If their work could be co-ordinated by some central body such as the Ottawa Field-Naturalists' Club it should not be difficult by means of simple instruments and the synchronisation now made possible by radio to obtain records over a relatively wide area that might prove of considerable value. Dr. Kindle is to be congratulated on having brought to light a record that has, I think, escaped previous workers.

To turn now to quite another matter, I should like to direct particular attention to the last work mentioned above, which is one of great usefulness and yet does not seem to be sufficiently widely known. It is the first volume of what is probably the most complete bathymetrical survey of the lakes of any country that has yet been made. It contains much fundamental information on limnological subjects and last but by no means least it includes an exhaustive "Bibliography of Limnological Literature" compiled by J. Chumley of the Challenger office which is practically complete down to 1908.

AMPHIBIANS AND REPTILES OF THE ATHABASKA AND GREAT SLAVE LAKES REGION

By FRANCIS HARPER



THE following notes have resulted from two trips to this region. In 1914 I accompanied a party from the Geological Survey of Canada, in charge of Dr. Charles Camsell, which had for its principal object the exploration of the Tazin and Taltson Rivers. In May and early June we traveled down the Athabaska River from Athabaska Landing to its mouth. On June 30 we left Lake Athabaska at about its northernmost point and then journeyed by way of the Tazin and Taltson Rivers to Great Slave Lake, which we reached on August 15. From this lake we returned homeward by way of the Slave and Athabaska Rivers, completing the trip in early October.

The 1920 trip was made under the auspices of the United States Biological Survey, with the support of Dr. John C. Phillips. My associates in the field were Hamilton M. Laing and J. Alden Loring. In early April we left Edmonton by rail for the "End of Steel" near McMurray, and in May proceeded down the Athabaska River to its delta, remaining in this vicinity till late July. We then traveled eastward on Lake Athabaska as far as Poplar Point and the MacFarlane River and returned to the west end of the lake in late August. On September 30 we began our homeward journey, reaching McMurray on October 9 and Edmonton on November 10.

During the course of the general biological investigations made on both trips, some attention was paid to herpetology. Only four species of amphibians and a single species of snake were recorded by Preble (1908, pp. 500-502) from the Mackenzie Basin. The present paper contains some additional notes on the distribution and seasonal activities of the same forms, three of which, however, appear under names somewhat different from those employed by Preble.

Most of the localities mentioned may be found on one or the other of two maps accompanying papers by Camsell (1916) and myself (1931).

Bufo hemiophrys Cope.—DAKOTA TOAD.—On May 15, 1914, I collected two of these toads in a muddy pool on the wooded slope between the business district of Edmonton and the Saskatchewan. On May 18 I saw one at Rochester and two in a small pool by the river at Athabaska Landing. Here I heard their trilling at night. The species was again noted in voice on May 25 along the Athabaska several miles above Little

Buffalo River, and on May 31 near the mouth of Firebag River, where it was common.

On May 18, 1920, I heard a single toad trilling along the east branch of the Athabaska Delta, at a temperature of about 40°-45° F. On August 10 two very small specimens were collected by Hamilton M. Laing on the sandy bank of the MacFarlane River near its mouth.

Under the name of *Bufo lentiginosus woodhousei*, Preble (1908, p. 501) records toads in this region north to Fort Smith. It seems reasonable to assume that all belong to the same species as the two specimens which I collected at Edmonton in 1914. These are 69 and 63 mm., respectively, in length from snout to vent. They agree closely with the description of *Bufo hemiophrys*, especially in such diagnostic characters as the cranial crests and the metatarsal tubercles. The parotoids are broadly oval, averaging about 11 × 8 mm. The larger specimen is distinctly, the smaller one indistinctly, spotted on breast and belly. The identification of the toads of this region as *hemiophrys* means a considerable extension of the known range of the species, hitherto given as North Dakota and Manitoba.

Pseudacris septentrionalis (Boulenger).—NORTHERN SWAMP CRICKET FROG.—In 1914 I heard the castanet-like trilling of this species at Edmonton on May 15 and 16, and on the former date collected some eggs (which were identified by Dr. A. H. Wright) in a muddy pool on a wooded slope beside the Saskatchewan. On May 17 I discovered some of the authors of the chorus in a vegetation-filled pool in a wet, bush-bordered meadow on the outskirts of the city. When I reached the edge of the pool, they became silent, but after a few minutes I saw half a dozen of the little creatures sticking their heads above the water and trilling more or less continually, with distended throats. Two were readily captured when I waded into the pool for them.

Choruses of this frog were heard, especially during the evening and night, at Athabaska Landing, near Grand Rapids, near Steepbank River, near Pierre au Calumet, and at other points along the Athabaska River, May 18 to 31. It was quite abundant on the Athabaska Delta, and another specimen was taken there. During this period (late May and early June) the thermometer frequently went close to the freezing point, and once or twice thin ice formed on quiet water overnight. I heard the species commonly

at Chipewyan, June 10 to 19. On August 25 I collected a specimen along the shore at Resolution, and on the following day I detected the note of *Pseudacris* on the Slave River delta.

All four specimens agree satisfactorily with Boulenger's description (1882, p. 335) of the type from Great Bear Lake, except that the tympanum is not "nearly as large as the eye"; it is scarcely half the diameter of the eye. In all of them the heel falls a little short of the tympanum when the posterior limb is extended forward along the side.

In 1920 the trilling of this species was first heard at La Saline at dusk on May 11. For the next six weeks it was recorded commonly and almost daily. In the meantime we traveled down the Athabaska and camped on its delta from May 18 to 24 and from June 2 to 22. The trilling was also heard on Goose Island, May 27, along the Rivière des Rochers, June 29, and at Egg Lake June 30. By this time the spring song season was evidently over. From May 14 to 24, when the species was heard every day, the minimum temperature I recorded was 31° and the maximum 68.5°. Though probably the most abundant amphibian of the region, this little creature is so elusive that an individual collected at Egg Lake on July 14 was the only one I actually saw during the entire season. It was sitting on a rock about a foot from the water. On September 2 (with the temperature probably about 60°) I heard a hoarse and listless autumnal trilling at several points along the Quatre Fourches Channel. I recorded what seemed to be the notes of *Pseudacris* on the evening of September 22 (when the temperature was about 48°) on the Athabaska Delta, and even as late as October 21 (when the temperature was above freezing) on Stony Mountain south of McMurray.

Rana canibrigensis Baird.—NORTHERN WOOD FROG.—In 1914 this frog was first found on May 21 several miles below Swift Current Rapid on the Athabaska. In June it appeared very abundant on the Athabaska Delta, and common in the Quatre Fourches marshes and in the woods near Chipewyan. The species was observed in small numbers on Lake Athabaska near the mouth of Charlot River, at Hill Island Lake, and near Kolehthe Rapids on the Tazin River. On July 31 specimens about three-quarters of an inch long were abundant along the Taltson River just above its junction with the Tazin. Individuals were seen a few miles below Tsu Lake, and at the mouth of Pierrot Creek on the Taltson River. At Resolution Wood Frogs were abundant, August 22 to 26, and I saw a great many, both dead and alive, in some surveyors' excavations, from which they could not escape after having fallen in. A

number of others were observed along the Slave River between the delta and Pointe Ennuyeuse, August 26 to 30.

Specimens were taken at the following points: Athabaska River below Swift Current Rapids; Athabaska Delta; Lake Athabaska near Slate Island; and Resolution.

In 1920 the species was in voice at La Saline, May 11 to 14; between this point and the Athabaska Delta, May 14 to 16; on the delta itself, May 17 to 23 and June 2, 9, and 14; and on Goose Island, May 24 to 30. On May 16 and 17, near the head of the delta, the chorus was tremendous. The clucking notes of an individual are commonly given three or four in a series: *crut, crut, crut, crut*. The last of the spring notes were heard on June 14, but there was an autumnal recrudescence of song, with two or three notes in a series, on the Athabaska Delta daily from September 19 to 22. During these September days the temperature ranged in the neighbourhood of 50° when the notes were heard.

In May, during the height of the spring chorus, the species was rarely seen, but in June, along the main branch of the delta, and in July, at Egg Lake, a good many individuals were seen, both in marshes and on land. They were fairly easy to catch even in the water, for if they ducked beneath the surface, they seldom stayed down, but almost immediately came up again a little farther on.

Specimens were taken on the Athabaska Delta; on Lobstick Island, off Chipewyan; at Egg Lake; and on Lake Athabaska near Oldman River, and at Poplar Point. Others were noted at Fair Point, August 21, and along the Quatre Fourches Channel, September 2 and 3. The last one of the season was seen on the Athabaska Delta on September 25.

Rana pipiens Schreber.—LEOPARD FROG.—In 1914 three or four large Leopard Frogs were seen on July 2 at a muskeg pond just south of Thuicho Lake, and a similar number on August 5 at Natla Rapids on the Taltson River. A specimen was collected in each locality. Others were noted at a rapid on the Taltson about 9 miles below Tsu Lake, August 10, and on the Slave River below McConnell Island, August 28. All of these records appear to represent extensions of the previously known range of the species.

During the entire season of 1920 I did not meet with the species anywhere.

Thamnophis sirtalis parietalis (Say).—WESTERN GARTER SNAKE.—On May 17, 1914, during a walk of a mile or so along the north side of the Saskatchewan at Edmonton, I came across six Garter Snakes and collected one. The north

bank of the river was then sunny and warm, though ice masses still clung to the steep and shady south bank. The specimen was identified by Dr. Alexander G. Ruthven, who remarked that "It is darker in color than usual, but the northern specimens of both *T. sirtalis* and *T. sirtalis parietalis* run to darker colors than the southern ones."

James Daniell, of Chipewyan, spoke of finding many of these snakes under pieces of limestone near Birch River. He also mentioned their occurrence on Birch Mountain and near Fort

Smith. In 1920 Jack Stark reported the species at Peace Point.

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A WOLF AT THE DOOR!

(metaphorically, not mammalogically, speaking)

By HOYES LLOYD, Chairman, Publication Committee.



ON FEBRUARY 1, 1931, The Ottawa Field-Naturalists' Club had approximately a membership of 539. Curiosity impelled me to sort these members geographically and the result was as shown in the table below.

It takes about 80 paid up memberships for a year to pay for printing and distributing one number of *The Naturalist*. We print nine numbers. Thus it would take 720 members, or 181 more than we have, to pay for the printing of one volume of *The Naturalist*. The burden of printing *The Naturalist* as well as the burden of finding a way round this apparently insuperable

financial difficulty falls upon the Council of the Club. The old Club has more than fifty years of background. It has put all its hard-won resources behind *The Canadian Field-Naturalist* so that there would be a Canadian place of publication, a journal of record, for Canadian Natural History. It has done this and borne the heat of the day in the labour of getting out the paper and doing the business routine. The Ottawa workers appreciate all that the affiliated clubs have done and merely wish to place these facts before them and the outside members, and to urge them to keep up the good work, especially in the matter of sending the treasurer some new members.

ONTARIO		P.E.I.	N.S.	N.B.	Que.	Man.	Sask.	Alta.	B.C.	N.W. T.	Y.T.	U.S.	Other Foreign and British	Total
Ottawa	Rest of Ont.													
92	120													
212		0	7	6	67	21	17	20	40	3	1	124	21	539

NOTES AND OBSERVATIONS

THE VALUE OF DETAILED BIRD-BANDING RECORDS.—The following extract from a recent personal letter from Dr. Wilbur K. Butts of Milliken University, Decatur, Illinois, is published as a statement reflecting the actual practical experience of a research worker relying to a large extent upon data obtained by the bird banding method. Dr. Butts is the author of "A Study of the Chickadee and White-breasted Nuthatch by Means of Marked Individuals", which was his thesis for the Ph.D. degree at Cornell University, and which is now being published serially in *Bird-Banding*, beginning with the

number for October, 1930. His statement is an indication of the real value to such research workers of the instalments of the Official Canadian Record of Bird Banding Returns, as they are being published in *The Canadian Field-Naturalist*:

"It would indeed be a pity if *The Canadian Field-Naturalist* finds it necessary to cut down the amount of space given to bird-banding returns. For the investigator who is making life-history studies of some particular species of bird it is extremely valuable to have all the information possible regarding banding records. The records published in *The Canadian Field-Naturalist* are

more useful as far as they go, than those published by the United States Biological Survey, since they contain more details."—HARRISON F LEWIS.

LEAST BITTERN ON THE ISLAND OF ORLEANS, QUEBEC, P.Q.—On September 13th, 1920, when in company with my friend, Mr. W. Basil Chamberlain, of England, I was shooting Snipe in a marsh at Ste. Famille, on the north shore of the Island of Orleans, in the St. Lawrence River, near Quebec, I shot at what I thought was a Rail but when I picked it up saw it was not a Rail, but a bird that was strange to me, and Mr. Chamberlain identified it as a Least Bittern (*Ixobrychus exilis* (Gmelin)). Subsequently, on consulting descriptions of this species, I was satisfied that this identification was correct. At a later date I showed a photograph of this bird to Dr. Harrison F. Lewis, who, of course, recognized it at once. I note that the late C. E. Dionne states (*Les Oiseaux de la Province de Quebec*, 1906, p. 119) that he had seen only four specimens of this species killed in the vicinity of Quebec City.—R. MERE-DITH.

WINTER RECORDS OF TOWHEES IN TORONTO.—In ten years observation of birds, I have two records of the Towhee occurring at Toronto in winter. During November and December, 1922, four birds; two of either sex, were observed in a patch of mixed woods near North Toronto and they were seen up to the end of January, 1923. They were obtaining food by scratching through the snow to the dead leaf litter—also eating Chokecherry and Elderberries, and on January 13 four or five were seen in the tops of Beech trees in company with Blue Jays, apparently easting the nuts, or possibly buds. The usual loud *chewink* and a lazy *tsee-ee* note were heard.

My other record is a single bird in brushy woods at York Mills on December 12, 1926.

Two records near King, Ont., this summer may be of interest.

On July 27 two pure white Little Blue Herons were observed by a small lake and were watched for some time with glasses at fairly close range. They stayed for three days.

On August 17 a male Golden-winged Warbler was seen with other small birds in mixed hardwoods—the writer's first record of this warbler.—R. D. USSHER.

LEWIS'S WOODPECKER (*Asyndesmus lewisi*) IN CENTRAL ALBERTA.—While motoring on the south-eastern side of Big Hay Lake, on Sunday, October 12th, 1930, in company with Mr. C. S. Bailey of Camrose, a Lewis's Woodpecker flew across the road in front of the car, and was immediately recognized as such. By the time the car was stopped it had alighted on a branch of a leafless poplar, less than 75 yards from the car, and allowed a close approach and inspection. Although I had my glasses in hand it was unnecessary to use them, so confiding was the bird. Being quite familiar with this woodpecker in its natural habitat in the mountains of British Columbia and the State of Washington there could be no doubt as to its identity.

Lewis's Woodpecker has been observed several times, and I believe collected by Mr. T. E. Randall in the Sullivan Lake country, about 100 miles southeast of Big Hay Lake, but its proper status in Alberta must be considered a rare straggler from the mountains. The bird observed at Big Hay Lake is the only one I have seen in Alberta, and it might constitute a northern record for its appearance in the province.—FRANK L. FARLEY.

NEW MAP OF CANADA.—A very interesting map of Canada in colours on a scale of one hundred miles to the inch, that indicates the country's resources, main railways, forests and agricultural areas, has been issued by the National Development Bureau, Department of the Interior at Ottawa.

The map affords a comprehensive idea of the location of Canada's mines; water power, developed and undeveloped; fisheries; various types of farming, and other outstanding resources. It is of such convenient size as to be suitable for ready reference, and should prove of value to educationalists, business men, and, in fact, to all those who are connected with, or interested in, the development of Canada's resources.

Copies of the map may be obtained free of charge by adults from the aforementioned Bureau.

CORRECTION.—Mallard No. 231,439, banded by Allen Green at Oakville, Iowa, on January 7, 1929, (not January 7, 1927, as recorded in *The Canadian Field-Naturalist*, Vol. XLV, No. 2, page 48), was caught in a muskrat trap at Big Lake, Manitoba, on May 1, 1929.

BOOK REVIEWS

OUR GREAT OUTDOORS. MAMMALS. *By C. W. G. Eifrig, Instructor in Nature Study, River Forest, Illinois. Rand, McNally & Company, New York, Chicago, San Francisco, 1928. pp. xiv, 255, illustrations 177.*

This little book on mammals is the first of a series of nature study books announced by the Rand McNally Company. Others are to follow, one on birds, another on the remaining vertebrates, one on the invertebrates, and finally one on plants. The author was formerly a resident of Ottawa and was well known as an active member of the Ottawa Field-Naturalists' Club and a keen field student of ornithology and botany, which studies he enthusiastically pursued when permitted by the duties of his pastorate, and we are well assured that he made good use of his eyes and ears while making long buggy and sleigh trips to visit small settlements in the back districts. Prof. Eifrig was a charter member of the American Society of Mammalogists, and was recently honoured by election as a member of the American Ornithologists' Union, of which he had been an Associate for twenty-eight years.

This book is not intended as a complete manual of mammals, but will be useful to teachers and as an interesting and instructive reading book for pupils in the schools. It consists mainly of biographies and short sketches of mammals, treating most of the common North American species, and others which should be known for their peculiar structure of body, mode of life, manner of getting food, and adaptation to environment. For good pedagogical reasons, the author has wisely given most space to the mammals of North America, as it is important to know something about our animal neighbours. A rather good feature, which is different from most American popular nature books, is the introduction of a few notable forms of mammal life from foreign countries, pointing out their relationship to our familiar mammals.

While the book is written in a fairly simple style, the author has succeeded in packing large amounts of reliable information into a small space in an entertaining way. In the many cases where it has been necessary to condense the statements, the author has been successful in the very difficult feat of generalizing without serious errors, and few statements can be seriously criticized. It is hardly correct to say that the Arctic hare is white throughout the year, for, except in the extreme north of Greenland, the

Arctic hare has a more or less complete change into a dark summer coat. We also question the advisability of quoting a statement on the usefulness of long-tailed shrews which seems to be largely theoretical. It is known that these shrews will kill one another and sometimes kill a mouse when confined together. While shrews may clean up an occasional nest of young mice, it is extremely doubtful whether they destroy many adult mice at large. The statement is made that on a hundred-acre farm four shrews to the acre might dispose of 3,800 mice a year, or almost a thousand to a shrew. The larger short-tailed shrew (*Blarina*) is a stronger hunter than the long-tailed shrew, but shrews feed largely on grubs and larvæ, and it is well known that some species of mice and voles are found in large numbers on the same ground with plenty of shrews, and have waves of periodic fluctuation in numbers regardless of carnivorous enemies.

Suggestions are given in the Appendix for teachers desiring to use the book for material for stories to younger children, and as source for compositions. A glossary of the more technical terms is given, and a good bibliography for use in selecting school and teacher libraries in nature study, particularly books on mammal life. The book is well worth having and even the old naturalist may find something of interest and bring some of his half-forgotten mammal lore up to date.—R.M.A.

GUIDE TO THE STUDY OF FRESH-WATER BIOLOGY.
By James G. Needham and Paul R. Needham. Pp. 81, pl. 24. C. C. Thomas, Publisher, Springfield, Illinois. 1930.

Any pond-life enthusiast who sees a copy of this very useful little work will most urgently desire to obtain a water-proofed copy, for he will be sure to slip it in his field collecting-set, and just as sure will he be to get it wet sooner or later in the day. Two very useful purposes are served by this guide: the easy and quick recognition of common specimens caught in fresh water; and very practical hints to the man who wants to know how to go about collecting in, and studying, various bodies of moving and standing water. Analytical keys and very numerous plates are the principal features which strike one on casual examination; it is only a more careful perusal that allows one to realize the amount of experience and understanding that has gone into its compilation. Altogether it is a book well worth having; two amateur microscopists have already tried to "borrow" my copy!—DOUGLAS LEBCHMAN.

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CONTENTS

	PAGE
Five Years' Progress in the Bird Sanctuaries of the North Shore of the Gulf of St. Lawrence. By Harrison F. Lewis.....	73
Reminiscences of the Home Life of the Black-billed Cuckoo. By Henry Mousley.....	78
Observations on Canadian Freshwater Crustacea Made in 1927-29. By Frits Johansen.....	80
The Pilot Black-snake in Ontario. By Robert V. Lindsay.....	83
Contributions to the Knowledge of Extreme North-Eastern Labrador. By Bernhard Hantzsch.....	85
Obituary—James H. Emerton. By Norman Criddle.....	90
Notes and Observations:	
<i>Bufo cognatus cognatus</i> from Alberta. By E. B. S. Logier.....	90
Fresh-water Mussel and Coot Kill Each Other. By A. Higgs.....	90
Hawk Found in South America was Apparently Banded in Canada.....	91
The Clay-coloured Sparrow at Hawkestone, Simcoe County, Ontario. By L. L. Snyder.....	91
Bob-white Quail Liberated in Alberta. By J. A. Munro.....	91
White-throated Sparrow in Winter. By J. Murray Speirs.....	91
Unusual Behaviour of Woodcock in Autumn. By Victor E. Gould.....	91
Book Reviews.....	92

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No. 4

FIVE YEARS' PROGRESS IN THE BIRD SANCTUARIES OF THE NORTH SHORE OF THE GULF OF ST. LAWRENCE

By HARRISON F. LEWIS



IN 1925, on recommendation of the Minister of the Interior, Canada established by Order-in-Council, under authority of the Migratory Birds Convention Act, ten sanctuaries for sea birds on the north shore of the Gulf of St. Lawrence. Each of these sanctuaries consisted of two or more islands conveniently situated for purposes of protection and already supplying nesting sites to large numbers of sea fowl, together with the adjacent waters. As soon as possible after the establishment of these sanctuaries, each one was supplied with a part-time warden who was a resident of the vicinity, and appropriate posters were put up at landing-places and other suitable points about the periphery of each reserved land area to indicate to all comers that all hunting, gathering of eggs, or other molestation of wild birds was prohibited there. Since that time there has been practically no break in the actual protection of any of these sanctuaries by warden service and it is of interest to inquire what changes, if any, are to be discovered in the bird populations that annually nest in them.

As a basis for obtaining information of this kind, and as a matter of record, a census of the sea bird populations nesting or presumably nesting within these sanctuaries was taken in 1925, the year of their establishment, and was published in *The Canadian Field-Naturalist* for November, 1925, page 177. It was stated at that time that the figures given were as accurate as it had been possible to make them and that they were in part the result of careful counts and in part of conservative estimates, made by the present writer. A slight, but unfortunate, type-setter's error occurred in the publication of these figures, for the total number of Eiders in all the sanctuaries, which reads as 6,540 in the published report, should have read 6,450; a difference of 90.

During the summer of 1930 I revisited each of these sanctuaries and made a new census of the birds nesting or apparently nesting in each one of them. This work was done very carefully and

actual counts of the birds present or of their nests or nest cavities or eggs were made whenever possible. In those cases where, because of the large number of birds involved, or for other reasons, it was necessary to have recourse to estimates, these were made with great care and with as large a basis of definite count as possible, the method of making partial counts and obtaining the final total estimate by carefully judged multiplication of these being commonly employed for work of this character. As an indication of the care given to making the census, it may be mentioned that three and one-half days of hard labor were devoted to taking the census in St. Mary Islands Bird Sanctuary, and two days were spent by two men in counting the occupied Puffin burrows on Perroquet Island, in Bradore Bay, while from one-half day to one day was spent in census-taking in each of the other sanctuaries. All the sanctuaries except Betchouane Bird Sanctuary and Birch Islands Bird Sanctuary are practically devoid of forest, which makes the work of taking such a census much shorter and easier than it would be otherwise. There is no doubt that, owing to more time being available and to my increased personal familiarity with the ground to be covered and with the work to be done, the census of 1930 was more complete and exact than that of 1925. Where this appears to affect the comparison to be presented, appropriate comment will be made later.

In reaching the totals to be presented to you it has happened in several instances that the results of accurate counts in some parts of a sanctuary are added to the results of estimates covering the remaining parts. For instance, the total of 256 Herring Gulls recorded in Wolf Bay Sanctuary is made up from my notes, which show a count of 36 birds on one island, an estimate of 80 birds at another island, and another estimate of 140 birds at a third island. As some criticism of this method of uniting estimates and the results of counts in one total is current, it may be well to point out that it makes for the greatest obtainable

SEA-BIRDS BREEDING IN SANCTUARIES ALONG
SANC

BIRDS

	BIRCH ISLANDS		BET-CHOUANE		WATSHISHOW		FOG ISLAND		WOLF BAY	
	1925	1930	1925	1930	1925	1930	1925	1930	1925	1930
A. Red-throated Loon.....							4	6		
B. Puffin.....			300	516					3000	6950
C. Black Guillemot.....		6				14	60	88		16
D. Common Murre.....							64	2586	314	208
E. Razor-billed Auk.....			300	210	60	20	20	20	2150	5636
F. Kittiwake Gull.....				6						
G. Great Black-backed Gull.....	12	8	24	16	220	276	80	152	122	166
H. Herring Gull.....	60	306	200	550	200	166	80	210	100	256
I. Ring-billed Gull.....							210	26		
J. Caspian Tern.....							60	90		
K. Common Tern.....		570	200	120	500	490	56	10		
L. Arctic Tern.....		30	40		50	20	6			
M. Double-crested Cormorant.....							750	694	280	392
N. Red-breasted Merganser.....		6				4				
O. Black Duck.....							2		2	
P. Green-winged Teal.....							2	2		
Q. American Eider.....	620	1076	300	1002	3850	3964	400	760	100	474
TOTAL.....	692	2002	1364	2420	4880	4954	1794	4644	6068	14098
R. GAIN OR LOSS.....		+1310		+1056		+74		+2850		+8030
S. Spotted Sandpiper.....		2		4		18		10		16
T. Semipalmated Plover.....								14		
GRAND TOTAL.....		2004		2424		4972		4668		14114

accuracy, if it is necessary to use estimates at all, and this is true whether or not the possible error in the estimates exceeds that number, of known accuracy, that is added to them. For if the estimates used contain a certain possible error, forming a certain proportion of their total, then, by adding one or more accurate numbers, containing no error, to them, we increase the sum total without increasing the included possible error, and must therefore reduce the proportion of such possible error to the whole. The only valid objection to forming a sum total by adding together estimates and the results of accurate counts is that, if the fact that the sum total is composed partly of estimates is not stated, the sum, not being in round numbers in most cases, may give a false appearance of complete accuracy, but this is easily avoided by mentioning the fact that estimates have been used as a partial basis for the results given.

A comparison of the results of the censuses of 1925 and 1930 in the ten bird sanctuaries on the north shore of the Gulf of St. Lawrence is shown in detail in the accompanying table.

Most of the sanctuaries show very satisfactory increases in their bird populations in the five-year period under consideration. It will be noted,

however, that Watshishow Bird Sanctuary shows an increase of only 2 per cent. This Sanctuary consists of a straggling series of small, bare islets, with the surrounding waters, and has a total length of about 11 miles. It is principally important as our best sanctuary for Eiders, of whose nests I have found as many as 95 at one time on one islet in this reserve, but it also contains many Gulls and Terns. The small increase in the bird life in this sanctuary in the past 5 years is probably due to the fact that, on account of its large size and its numerous excellent harbors, in which passing boats frequently take shelter, it is unusually difficult to protect.

Cape Whittle Bird Sanctuary shows an actual decrease of 73 per cent of the bird population present in 1925, and is the only one of the sanctuaries not to show an increase. While it has been guarded like the others, it has been notably unfortunate, and the decrease in its bird population is due to two very conspicuous happenings. A flour-laden freight steamer was wrecked in the western end of the sanctuary, close to the most important nesting island, in the late summer of 1928, but it remained partly above water until the following winter. Within a few days after the wreck took place, hundreds of fishermen in

NORTH SHORE OF GULF OF ST. LAWRENCE
TUARIES

	CAPE WHITTLE		ST. MARY ISLANDS		MECATTINA		ST. AUGUSTINE		BRADORE BAY		TOTAL		Gain or Loss	% Gain or Loss
	1925	1930	1925	1930	1925	1930	1925	1930	1925	1930	1925	1930		
A.			10	12	2	2	8	6			24	26	+2	+8%
B.			1250	2446					51000	52650	55550	62562	+7012	+13%
C.			130	196	100	280	30	150			320	750	+430	+134%
D.	3062	900	3600	4204					200	150	7240	8048	+808	+11%
E.	400	120	3500	3362	50	120			4100	5000	10580	14488	+3908	+37%
F.												6	+6	∞
G.	70	24	150	360	250	200	40	100			968	1302	+334	+35%
H.	30	26	200	718	100	300	50	110			1020	2642	+1622	+159%
I.					60	50		300			270	376	+106	+39%
J.											60	90	+30	+50%
K.											756	1190	+434	+57%
L.											96	50	-46	-48%
M.	334										1364	1086	-278	-20%
N.						20		2				32	+32	∞
O.	2										6		-6	-100%
P.											2	2		
Q.	80	10	500	454	400	300	200	146			6450	8186	+1736	+27%
	3978	1080	9340	11752	962	1272	328	814	55300	57800	84706	100836	+16130	+19%
R.		-2898		+2412		+310		+486		+2500		+16130		
S.		2		28				4		4		88		
T.				8		10		2		6		40		
		1082		11788		1282		820		57810		100964		

motorboats assembled from far and near to obtain as much of the flour as they could and for weeks thereafter salvaging operations, generally of a very noisy character, were going on about the wrecked vessel on every fine day. In spite of the constant oversight of bird wardens, specially detailed to guard the birds in the vicinity at this time, the birds were naturally much disturbed by this occurrence, and a great many of them moved to quieter areas. Then, beginning in the autumn of 1928 and continuing throughout the summer of 1929, the Department of Marine built a new lighthouse and fog alarm station on the largest island in the eastern end of the sanctuary. This meant that 20 to 30 men lived on the island, which is very small, for months at a time, while blasting, drilling, and other noisy operations were carried on. Consequently, most of the nesting birds left that vicinity also. As the sanctuary has only a very small land area, divided into two groups of islets, a western and an eastern, and as these were both very seriously disturbed by the above-mentioned unavoidable occurrences, the resident bird population was greatly reduced. The sanctuary is still maintained, in the expectation that, now that conditions have become more quiet, it will regain

much of its former abundance of bird life. A distinct tendency in that direction is already evident.

Fog Island Bird Sanctuary, which has a varied sea-bird population of about a dozen species, including the only colony of Caspian Terns on this coast, shows a very strong gain in population of 159 per cent in the 5 years of its existence. This is an actual and very creditable gain, and one that is readily recorded with fair definiteness, for it consists chiefly in an increase in the number of Common Murres that raise their young here, and the number of them recorded in this case contains no estimated part, but is based upon actual counts of the eggs in place. Since each breeding pair of Murres has but one egg at a time, the number of birds breeding in one of their colonies is at least twice the number of eggs found. Of course, this method of discovering the number of Murres breeding in a place is practicable only when they lay their eggs in plain view on the bare rock, as they do here, instead of in cracks and crevices, as they do in some other colonies. In Fog Island Bird Sanctuary the Murres lay their eggs among the nests of a large colony of Double-crested Cormorants on a rocky islet just east of Fog Island itself. The Cormorants have

been there each year for a long time, but the Murres have come only in recent years. They were first observed there in 1925, when 32 eggs, representing 64 birds, were counted. Since then the number of Murres' eggs in this colony has increased every year, until in 1930 I counted personally 1,293 eggs, representing 2,586 Common Murres. This increase is due in large part to the strict prevention of molestation of this colony of Double-crested Cormorants, among whose nests the Murres apparently like to place their eggs. Such a great increase in the Murre population in this sanctuary cannot be entirely due to local reproduction, in view of the fact that a pair of these birds does not raise more than one young one in a year. Some of the increase must represent the shifting of birds from elsewhere into the sanctuary.

In the case of Wolf Bay Bird Sanctuary, among whose bird population Puffins and Razor-billed Auks are the most abundant species, there has doubtless been an excellent actual increase in numbers of breeding birds since 1925, yet I must add that I suspect that this is an instance in which the census of 1925 did not do justice to the number of birds then present, and that part of the apparent increase shown is really due to the fact that the census of 1930 was much more complete and was guided by increased experience in work of this character, particularly under the conditions existing in this sanctuary, where thousands of the birds nest among large heaps of boulders and broken rocks, which makes it very difficult to determine their numbers.

Mecatrina and St. Augustine Bird Sanctuaries have comparatively small bird populations because they are on a part of the coast where destruction of bird life in the nineteenth century and in the early part of the twentieth century was particularly severe. They show, however, a very fair proportionate increase for the five years of protection. The exceptionally large proportionate increase recorded in the case of St. Augustine Bird Sanctuary is largely due to a fine colony of Ring-billed Gulls, numbering about 300 birds, that has recently moved into this sanctuary from elsewhere.

On the two small islands, Perroquet and Greenly, which make up the land area of Bradore Bay Bird Sanctuary, at the western end of the Strait of Belle Isle, there are more nesting sea-birds in the proper season than in all the rest of these sanctuaries put together. Most of the birds here are Puffins, some of which nest on Greenly Island, which was made famous by the landing there, in 1928, of the German trans-Atlantic aeroplane *Bremen*, but most of which nest on Perroquet Island. On the

latter island, by dividing the surface into long narrow areas marked off by stakes pushed into the turf, we are able to count the Puffin burrows in use. In 1925 we counted thus 22,102 burrows, while our similar count in 1930 showed 21,575, indicating a slight decrease. The increase of these birds on Greenly Island more than made up for the slight decrease on Perroquet Island, so that the sanctuary as a whole shows a modest gain for the five-year period.

For the ten sanctuaries taken as a whole the increase in numbers of breeding birds, from 1925 to 1930, is 16,130 or about 19 per cent.

The following paragraphs present brief comments concerning each of the non-passerine species recorded in the censuses of these sanctuaries.

The numbers of the Red-throated Loon (*Gavia stellata*) are nearly stationary. The figures given for the resident population of this species in 1930 are the result of accurate counts and are believed to be complete.

The Puffin (*Fratercula arctica arctica*) shows a moderate gain in numbers.

In the case of the Black Guillemot (*Cephus grylle grylle*) I believe that the population present in 1925 must have been larger than is indicated by the figures given in this report, and that the subsequent increase that resulted in the population of 750 birds recorded, almost entirely as the result of careful counts, in 1930 was not actually as great a change as the figures indicate.

The Common Murre (*Uria troille troille*) shows only a moderate increase, the large gain in Fog Island Bird Sanctuary being nearly all off-set by a large loss in Cape Whittle Bird Sanctuary.

The Razor-billed Auk (*Alca torda*), or Tinker, is somewhat more numerous in the sanctuaries than is the Common Murre, and the figures obtained indicate a greater increase for it. I believe that some of this indicated increase for this species is actual, but that some of it is due to underestimates made in 1925.

Kittiwakes (*Rissa tridactyla tridactyla*), were found guarding three fresh nests, without contents, in Betchouane Bird Sanctuary, on June 8, 1930.

The Great Black-backed Gull (*Larus marinus*) shows a moderate gain.

On the north shore of the Gulf of St. Lawrence, Herring Gulls (*Larus argentatus*) nest in comparatively small, scattered groups, instead of in large colonies such as are found around the mouth of the Bay of Fundy and elsewhere. They have made a very real and substantial increase in numbers in the sanctuaries under discussion, and I believe that this increase is very correctly reflected by the tabulated figures.

The Ring-billed Gull (*Larus delawarensis*) does not show very strong attachment to its nesting-places. Very slight disturbances, by man or by other predatory species, may cause an entire colony of these birds to move from one nesting-place to another, perhaps miles away. Consequently, groups of these Gulls may appear as breeders in a sanctuary at any time or may suddenly leave, so that, while the figures shown happen to record a gain in the five-year period considered, this is the chance result of such shifting of colonies and I do not attach much significance to it.

The little colony of Coues's Caspian Terns (*Sterna caspia imperator*) on Fog Island, which is the only colony of this species known in Canada east of Georgian Bay, is increasing slowly under rigid protection of its nesting-ground, where it has suffered no known losses in the past five years, except those of a few young killed by inclement weather. Banding returns have shown certain losses of birds from this colony when on their migration.

The Common Terns (*Sterna hirundo*) in the sanctuaries are making a real and satisfactory increase in numbers. Colonies of this species shift about almost as readily as Ring-billed Gulls, but seem somewhat more appreciative of the protection afforded by the sanctuaries and, once settled in one of them, tend to remain there.

The figures presented in the case of the Arctic Tern (*Sterna paradisæa*) are believed to be conservative, but are very unsatisfactory, and are set down only to complete this account as well as possible, since this species undoubtedly nests in some of the sanctuaries. The unsatisfactory character of these figures is due to difficulties experienced in field identification of this species. Arctic Terns nest in small numbers in some of the colonies of Common Terns along the north shore of the Gulf of St. Lawrence, as may be ascertained by positive identification of an occasional individual under favorable circumstances, but I have found it quite impossible to distinguish all the Arctic Terns in a large flock of flying Terns of both species and thus determine their numbers satisfactorily. It is certain that they are very much less abundant here than the Common Tern.

The Double-crested Cormorant (*Phalacrocorax auritus auritus*) shows a loss in numbers of 273, a greater decrease in the five-year period than that of any other species included in these censuses. While it is generally unprotected in this region, it is given the full benefit of the protection of the sanctuaries when it chooses to nest in them, as it does now in two of those under discussion. The loss recorded is attributable partly to the

disturbances in Cape Whittle Bird Sanctuary, and partly to killing outside the sanctuary areas, both on the north shore of the Gulf of St. Lawrence and along the migration route of these birds.

Red-breasted Mergansers (*Mergus serrator*) nest along the north shore of the Gulf of St. Lawrence, both on islands and on the mainland. The numbers that happen to be resident in the sanctuaries may vary from year to year, and I do not know that such variations possess any special significance. We happen to have found none in the sanctuary areas in 1925, while we found 32 there in 1930.

The case of the Black Duck (*Anas rubripes* subsp.) in these sanctuaries is very similar to that of the Red-breasted Merganser; that is the species nests on the mainland near the coast and also, to some extent, on the coastal islands. The change recorded is, it is true, just the opposite of that recorded for the Merganser, for, whereas 3 pairs of Black Ducks were found nesting in the sanctuaries in 1925, none were found there in 1930, but this has no significance that I know of; it is the result of chance.

The Green-winged Teal (*Nettion carolinense*), of which a single pair nests in Fog Island Bird Sanctuary, is the only species to show no change from one census to the other. Their number is probably not constant, for it is almost certain that two pairs nested in this sanctuary in 1928.

The most numerous and characteristic Duck in these sanctuaries is the American Eider (*Somateria mollissima dresseri*), which has made a gain of about 27 per cent in the five years under review. These birds hatch large numbers of young annually, but such factors as destruction of young by Great Black-backed Gulls and killing of grown birds in other parts of their range by oil pollution and by gunning doubtless play a large part in retarding increase.

The shore-birds, the Spotted Sandpiper (*Actitis macularia*) and the Semipalmated Plover (*Charadrius semipalmatus*), nest in some of these sanctuaries. No count of the numbers so nesting was made until 1930, when 88 Spotted Sandpipers and 40 Semipalmated Plovers were recorded. Adding these numbers to the total of 100,836 breeding sea-fowl recorded in the ten sanctuaries, we obtain a grand total of 100,964 non-passerine protected birds nesting in these reserved areas. In spite of all opposing factors, some of which operate in this region and some in other parts of the ranges of the species concerned, this bird population has made an increase in numbers of about 19 per cent in the five years during which its nesting grounds have been maintained as

sanctuaries. While a more rapid increase may be wished for, the results actually obtained in a region where decrease of bird life was the rule for centuries offer ground for encouragement to

conservationists and form one more vindication of the method of the protection of wild life by the establishment of complete sanctuaries of limited extent.

REMINISCENCES OF THE HOME LIFE OF THE BLACK-BILLED CUCKOO*

By HENRY MOUSLEY

MY FIRST experience of the home life of the Black-billed Cuckoo began on July 20th of the year 1929, when, in a large wood at Chambly, some twenty miles south of Montreal, I found a nest containing one egg as well as two young birds varying greatly in size and feathering. Just previous to locating this nest, I had discovered a record plant of that rare little fern the Lance-leaved Grape Fern (*Botrychium angustisegmentum*) 25 cm. in height, thus exceeding by 2.5 cm. the extreme height given in Gray's Manual of Botany, when our attention—I was in the company of Mr. L. M. Terrill at the time—was directed to a peculiar wheezing or hissing kind of noise rendered in a gradually increasing volume.

Moving in the direction of the sound, it was somewhat of a surprise at last to find that it proceeded from the younger of the above two cuckoos. The light was not very good at the time—it was 7 p.m.—nevertheless, we obtained some very fair pictures of the nest and its contents. It was interesting to note the upright statuesque pose of the elder of the two birds—not unlike that of a bittern or cedar waxwing—which seems characteristic of the species, for I obtained a similar picture some weeks later, showing this identical pose, and came across another by Mr. Lynwood M. Chance in the July issue of *American Photography*, not only showing this same thing, but likewise depicting the second young bird in the "porcupine" stage before the bursting of the feather sheaths. The two photographs are almost identical, even to the bill of the standing bird being in close proximity to a twig which in each instance passes close to the nest. During our stay of half an hour the younger bird was very restless and apparently hungry, continually opening its mouth—the cavity of which seemed to me to be of a bright rather than a dull red as described by Prof. Herrick—whilst giving vent to the peculiar hissing notes already described. The elder bird on the contrary remained motionless the whole time—except once when it jumped out of the nest on the too near approach of my friend—never uttering a single note, although the parents

—I think both were present—were continually calling in nearby trees or shrubs. Owing to the distance from home, this nest was not visited again, but fortunately another one containing two eggs was found by Mr. Terrill on August 22nd near St. Lambert, which was easier of access—being only six miles south of Montreal—although not nearly so conveniently situated, being seven feet six inches up in a small birch tree, whilst the previous one was only four feet above the ground in a small shrub, making photographing it an easy matter. It was not until three days later, or on August 25th, that I was able to visit this second nest when, instead of eggs, two very ugly, blind, and nearly naked black-skinned nestlings, met our gaze. They, apparently, had only emerged from their shells—at varying times—that very day, as they left the nest seven days later—also at varying times—as all self-respecting cuckoos should. They were very silent and sluggish the whole time we were with them although I have pictures showing one of them with its mouth wide open, but this pose was obtained only through compulsion. Their dull black skins were sparsely sprinkled with snow-white "hairs" the feather tubes of a down which never unfolds, as we are told by Prof. Herrick.

The legs and bill were blue-black, the former being exceptionally strong, enabling them as I found out later, to cling very tenaciously to one's fingers or any other support they came in contact with, or when falling during the climbing stage—which lasts about a fortnight—to grasp and pull themselves upright again, even by one leg alone, with the help of the bill like the young Hoatzin of the Amazons, to which the Cuckoos are regarded by some authorities as related.

The next time I visited them was on September 1st, when I narrowly missed seeing that wonderful change from the "porcupine" or "mailed" stage as it has been called into the full plumage of a cuckoo. In this species, as some of you no doubt are aware, the feathers remain sheathed up to the time when the young bird is ready to leave the nest, at which juncture the sheaths burst liberating their contents and the young bird often in the course of six or seven hours becomes fully feathered and able to leave the nest. No better accounts

*Read before the Province of Quebec Society for the Protection of Birds, Montreal, Oct. 14, 1929 (illustrated).

of this singular and wonderful change can be found, I think, than those of Prof. Francis H. Herrick, the *Life and Behaviour of the Cuckoo* in the *Journal of Experimental Zoology* for September, 1910, and Dr. A. H. Cordier's *Birds, Their Photographs and Home Life*, 1923, from which I quote the following:—"At the end of seven days the young Cuckoo (yellow-billed) resembled a porcupine more than a bird. I now cut the limb holding the nest and brought it to the ground. Within three feet of it I then put up the umbrella tent that I might at close range observe minutely the rapid transition of a porcupine-looking object into a fully feathered beautiful Rain Crow. I entered the tent with my camera at 9 a.m. Soon the parents renewed their feedings. What anxious, expectant and sizzling moments I spent in that tent that August day, for five or six hours, no one can imagine unless he has endured the same. Did I enjoy it? Every second was a thrill of pleasure, of new experience and added knowledge. The first picture was made at nine o'clock. This shows the young by the unhatched egg; the horny, sheathed feathers were fully two inches long, making the bird look like a porcupine. About ten thirty the sheaths began to burst, and with each split a fully formed feather was liberated. This process took place with such rapidity that it reminded me of the commotion in a corn popper or a rapidly blooming flower. All the while I was within three feet of the bird, and could see every new feather, as it blossomed, so to speak. At three p.m., six hours after the first picture was taken, I made another photograph, showing this same bird in the full plumage of a Cuckoo, except the long tail. This was one of the most remarkable transformations in so short a time that I have ever witnessed in any living, blooded thing.

"Thirty minutes after its transformation the young bird left the nest and posed three feet from it for a last picture. I then emerged from the tent, looking like one who had been imprisoned in the hot room of a Turkish bath, but thoroughly satisfied and rather proud of having had such a rare opportunity of actually seeing at close range a Cuckoo's appearance change from that of a repulsive porcupine to that of a beautiful bird whose feathers presented lovely delicate blue greys and varying browns".

Certainly, I was not so fortunate as Dr. Cordier, for I did not witness this rapid transformation from such close quarters for when I arrived at the nest only one young bird could be seen standing up in it, in the same statuesque upright position

already referred to. It was whilst photographing it that I fortunately happened to look up into the branches of a nearby tree and there sure enough was the other young bird, which must have just left the nest previous to my arrival. This I secured and placed on a small twig some distance below the one in the nest, where it stood perfectly still and erect, with the head not quite so upturned as on the previous occasions described. It was then that I noticed a difference in the two, the one on the twig being smoother, fuller plumaged and more lively, whilst the one in the nest looked dejected, with a ragged and thinner plumage. This improved as time went on and more of the feather-shafts burst, and eventually after some hours the bird assumed a more natural and easy pose.


In the meantime the other young bird had left the perch on which I had placed it, and after performing several climbing feats with small flights interspersed, in the vicinity of the nest, eventually disappeared, and I was unfortunately unable to locate it again. This decided me to remove the other from the nest and photograph it if possible before it became too lively. In this, I think I was not only successful, but somewhat fortunate, the resulting picture showing the feathering of the bird not quite so far advanced as in Dr. Cordier's picture, several of the shafts not yet having burst, especially those of the tail, whilst some may have been bursting at the time the pictures were being taken, judging from the fluffy appearance of some parts, more especially above the tail. After having taken several pictures, I replaced it in the nesting tree, having been with it about five hours. During nearly the whole of this time one of the parents—most probably the female—remained in the immediate vicinity, giving vent to a monotonous *Kuk-Kuk* which was anything but soothing to one's nerves, but apparently had no effect upon the young bird in the nest which remained for the most part of the time absolutely erect and motionless the same as I found it on arrival. At that time the female had a large smooth green caterpillar in her beak which was evidently intended for one of the young, but upon catching sight of me, she promptly devoured it herself—a thing most birds do if surprised near their nests with food in their mouths. I had high hopes of securing a picture of her feeding the young, but she never attempted this, although I do believe she enticed the elder one away from the immediate vicinity of the nest, and there fed it, this accounting for my having lost it, as previously mentioned.

OBSERVATIONS ON CANADIAN FRESHWATER CRUSTACEA MADE IN 1927-29

By FRITS JOHANSEN

1927

I. OTTAWA:

 WING to my absence in Europe, no observations were made during the months of April and May. When I returned to Ottawa in the middle of June, the fairy-shrimps (*Eubbranchipus gelidus*) had disappeared, their season being past.

When visiting Graham Bay Station near Britannia, Ont., on June 19th, I noticed that in the pool upon the pasture (see May 28, 1922) there were still some clam shrimps (*Limnetis gouldii*) left swimming around in the muddy water here. I secured 10 specimens, nine of which had a size of 2½-3 mm., and one 4 mm. long. Not having any container with me, I kept them in a piece of paper, and when in the evening I placed them in water most of them were still alive, which shows their tenacity of life.

A week later (June 26) I was at Tenaga on the Gatineau River, Que., and in the pond on the fields on the west side of the river, where I have collected *L. gouldii* in previous years, some were still swimming around. I secured about 10 specimens, of a size between 3 and 4 mm.; the females now carried eggs. In the beginning of July, I visited both the pools at the mountain road outside of Hull, Que. (July 1), and the pools at Billings Bridge, Ont. (July 4), at both of which places I have secured *L. gouldii* previously; but I found no signs of them now, though some of the pools still contained a little water.

II. HUDSON STRAIT:

From the middle of July until the end of October this year (1927) I was attached as Biologist to the Canadian Hudson Strait Expedition, thus having an opportunity to observe the freshwater life (an almost virgin field) on both sides of Hudson Strait. On Nottingham Island, which lies on the northern side, at the west end of the Strait and where I was from August 4th to 17th inclusive, I found six kinds of Entomostraca, namely two kinds of Cladocera (*Daphnia pulex* and *Eurycerus lamellatus*, identified by Dr. C. Juday, Madison, Wis.); a red brown Copepod (*Diaptomus* sp. ?); the circumpolar tadpole-shrimp, *Lepidurus arcticus*; and two kinds of fairy-shrimps, viz., the circumpolar *Branchinecta paludosa*, and the Canadian-Greenland Arctic species, *Artemiopsis Stefanssonii*. In a shallow rock pool on "Meta Incognita" (the outer part of Lake Harbour),

Baffin Land, on the north side of the middle of the Strait, I found, on August 23, three kinds of Entomostraca, viz., the microscopic Cladocer *Chydorus sphaericus* (identified by Dr. C. Juday); a yellow-brown Ostracod (*Cyprinotus incongruens*, identified by Dr. Tressler, Madison, Wis.); a Copepod (probably female *Diaptomus bacillifer*, identified by Dr. C. D. Marsh, Washington, D.C.); and a female *Branchinecta paludosa*.

At Wakeham Bay, Ungava, on the south side of the middle of the Strait, I stayed from August 24 to September 10th, inclusive, and from October 5th to 15th inclusive, collecting 4 kinds of Entomostraca, viz., two Cladocera (*Daphnia pulex* and *Eurycerus lamellatus*, identified by Dr. Juday), a Copepod (*Diaptomus Eiseni*, identified by Dr. G. Marsh), and the fairy-shrimp *Branchinecta paludosa*.

Finally, I collected at Port Burwell, on the south side at the eastern end of the Strait, from September 12th to October 3rd inclusive, 6 kinds of Entomostraca, viz., the Cladocer, *Daphnia pulex* (identified by Dr. Juday); the Ostracod, *Cyprinotus incongruens* (identified by Dr. W. L. Tressler); the Copepod, *Diaptomus Eiseni* (identified by Dr. C. Marsh); the tadpole-shrimp *Lepidurus arcticus*; and two fairy-shrimps, *Branchinecta paludosa* and *Artemiopsis Stefanssonii*. No clam-shrimps (Conchostraca) have ever been observed in the Hudson Strait area. A few remarks about the interesting finds of freshwater Entomostraca in Hudson Strait in 1927 follow.

Artemiopsis Stefanssonii.—I can see no important difference between my specimens from Hudson Strait 1927, and the ones I collected in ponds at Bernard Harbour, Dolphin and Union Strait, N.W.T., in 1915-16, and have described and figured in 1922 (Report Canadian Arctic Expedition 1913-18, Vol. VII, Part G, pp. 26-31, Ottawa). The specimens from various ponds and lakes on Nottingham Island 1927, had a length of about half a centimeter (the females largest and with eggs), though many of the specimens from the first collection (August 6) were immature. A month later I collected about 1 cm. long specimens of both sexes in certain ponds upon the main island forming the (inside of the) harbour at Port Burwell; also here the females carried eggs and were copulating freely with the (smaller and paler) males. We thus have three localities (all in the Canadian Arctic) for this interesting fairy-shrimp; and to them I am able to add a fourth,

namely, the west coast of Greenland (about lat. 70°N.), after having examined, in the Zoological Museum, Copenhagen, in 1928, so called "*Artemia gracilis*", collected here by W. Lundbeck in 1890 (described and figured by C. Wesenberg-Lund in Vid. Medd. Naturhist. Foren. Kbhvn. for 1894, pp. 95-104, Pl. I; and by the German Drygalski Expedition in 1893 (described and figured by E. Vanhoeffen in Groenland-Exped. der Gesellsch. fuer Erdkunde zu Berlin 1891-93, Vol. II, pp. 167-68, fig. 10, 1897).

Another species (*A. bungei*, Sars) of this genus occurs in eastern Siberia (Johansen, 1922, p. 31), and has lately been found upon Novaja Zembla, by Jaschnov (Bericht Wissenschaftl. Meeresinst. Vol. 12, Moscow, 1925, pp. 49-76), as mentioned by Oekland (Land und Suesswasserfauna von Novaja Semlja, Oslo 1928, Rep. Scientif. Results Norweg. Exped. to Novaja Semlja 1921, Zoology No. 42, pp. 56-106).

Branchinecta paludosa.—As was to be expected, this circumpolar fairy shrimp was found to be very common in the Hudson Strait area in 1927, though never before recorded from here. The nearest records hitherto were the bottom of Ungava Bay, Hamilton Inlet, Greenland, Fullerton, opposite Southampton Island (see Johansen 1922, pp. 16-17); and as mentioned later in this article, I found it to be very common at Port Churchill, on the west side of Hudson Bay, in 1929. The specimens (both sexes) from Nottingham Island (middle of August 1927) had a length of 1-2 cm.; while the ones (females only) from Lake Harbour, August 23, 1927, were 2 cm. long. The ones (both sexes) from Wakeham Bay and Port Burwell (end of August to middle of October, 1927) had a length of 2-2½ cm., and were found even after 2 inches thick of ice covered the ponds here.

Lepidurus arcticus.—The specimens of this circumpolar tadpole-shrimp collected in certain deeper ponds or lakes on Nottingham Island in the middle of August, 1927, had a length of 1-2 cm., and the larger females had a couple of ripe (red) eggs in the broodpouch (11th pair of legs). The ones (females with eggs) collected in a pond upon the main island at Port Burwell, during the last half of September, 1927, had a length of 2-3 cm. and were found only in the deeper, mud-covered part of the pond, where they "ploughed" through the bottom or "browsed" among its vegetation. These two records from Hudson Strait fill in a large gap in the known distribution of this species, the nearest localities hitherto known being King William Land, Ellesmere Land and Greenland (see Johansen, 1922, pp. 4-5). The Port Burwell record is of particular

interest, as being, besides Pribyloff Islands and the mountains of Scandinavia, the most southerly occurrence of this species (see Oekland, 1928, pp. 71-72, fig. 23).

Eurycerus lamellatus (= *E. glacialis*).—The occurrence of this large Cladocer on Nottingham Island and at Wakeham Bay is also of interest, there being only one other record of it from the eastern part of the Canadian Arctic, namely Labrador (see Report Canad. Arctic Exped. 1913-18, Vol. VII, Part H, Ottawa, 1920, pp. 6-7). As will be mentioned later in this article, I found it in a lake at Port Churchill, on the west side of Hudson Bay in 1929.

Regarding the Copepods, Dr. Marsh tells me in his letter of May 9, 1930, that the species (*Diaptomus Eiseni*) from Port Burwell and Wakeham Bay was hitherto known only from Nebraska, Labrador and Siberia, having been found only once in each place. The species (*D. bacillifer*) from Lake Harbour is a European species; and was in America hitherto only known from Bernard Harbour, N.W.T. (see Rep. Canad. Arct. Exped., 1913-18, Vol. VII, Part J, Ottawa, 1920, p. 7).

Besides Entomostraca, other interesting freshwater invertebrates were secured by me in Hudson Strait in 1927; and as the species are so few, they may be mentioned in this article.

In a deeper pond-lake, situated upon the smaller island forming the north side of Port Burwell, Ungava, I noticed on September 27, 1927, a number of freshwater Amphipods swimming around. I secured 30 of them, and they proved to be the typical Canadian species *Gammarus limnæus* (identified by Dr. C. Shoemaker, Washington, D.C.). I have discussed the distribution of this species in *The Canadian Field-Naturalist*, 34: 129-32, 1920,, so it is sufficient to state that the nearest records hitherto known were the north shore of the Gulf of St. Lawrence; Charlton Island in James Bay; and Bernard Harbour, Dolphin and Union Strait, N.W.T.

In the various lakes and ponds upon Nottingham Island (middle of August, 1927) I found some Oligochaete worms, which according to Prof. Frank Smith of Hillsdale, Mich., probably are *Lumbriculus variegatus* (letter of June 22, 1928, from Dr. P. S. Welch, Mich.), known from the Alaskan and Western Canadian Arctic (see Rep. Canad. Arctic Exped., 1913-18, Ottawa, 1919, Vol. IX, Part A, p. 4).

In the ponds at Port Burwell, examined in September 14th, 1927, I also secured tiny freshwater clams (*Pisidium* sp.); it was the same pond in which *Lepidurus arcticus* occurred (see above). A number of aquatic insects, mites,

Turbellaria, etc., were of course also secured in the various bodies of fresh water examined in Hudson Strait in 1927; freshwater sponges were however, not observed.

To round off the picture of lower macroscopic freshwater life in Hudson Strait as examined in 1927, it should be mentioned that trout (according to Dr. W. C. Kendall of Freeport, Maine, belonging to the arctic *Salvelinus alpinus* group) were said to occur at Cape Wolstenholme; and I secured a number of them both on Nottingham Island, at Wakeham Bay, and at Port Burwell. The 10-spined Stickleback (*Pygosteus pungitius*) I found to be exceedingly common upon Nottingham Island, and also at Wakeham Bay; while the freshwater form of the 3-spined (*Gasterosteus aculeatus*) was found in lakes at Lake Harbour and Wakeham Bay. Remarkable was the complete absence of Sticklebacks in freshwater at Port Burwell (in spite of careful search), though both species (*P. pungitius* and *G. aculeatus*) occur in Baffin Land and on the mainland of Labrador (*G. aculeatus* also in western Greenland). Probably the stickle-backs have not yet spread out to the islands forming Port Burwell Harbour.

1928

The month of April this year was very cold and wintery at Ottawa, delaying the arrival of spring. Temperatures during the month were all below 51°F., except the maxima on April 7 (75°F.) and April 30 (56°F.). The Rideau River began breaking up on April 1st, and rose to a great height during the first week of April; while the Ottawa River began breaking up a week into April, and also rose high.

The first week of May had milder weather (between 40° and 80°F.), except May 6 (36°-50°F.). May 2, 4 and 7 were clear; April 28-May 1 (inclusive), and May 3 had much rain; May 5-6 overcast cloudy weather.

On May 5 I visited the pools upon the fields between Wrightville and Fairy Lake, Hull, Que. They were now all ice-free, but only in one of them (not one in which I had found fairy-shrimps before) did I find *Eubranchipus gelidus*, securing a dozen specimens of both sexes, 1-1½ cm. long. The males had well developed claspers (2nd pair of antennae) and frontal organs; the females with unripe eggs. Air and water in this pool had a temperature of about 60°F. (about 5.30 p.m.).

The next day I was at Billings Bridge, Ont., and looked carefully for *E. gelidus* in the pools here upon the fields near the brick factory; but saw no sign of them nor of *Limnetis gouldii*. The pools were now fairly well separated (the smallest ones had dried up) because the Rideau River had

now subsided considerably. I then went to Hog's Back, and in the low-lying pool on Brule's quarry where I have found them before, I noticed *E. gelidus*, and secured 7 of them, two of which were ½-¾ cm. long and the rest 1-1¼ cm. long. The larger ones comprised one male and four females, less developed sexually than the ones secured yesterday.

These 1-1½ cm. long *E. gelidus* from May 5-6, had probably hatched on April 30 or May 1; the ½-¾ cm. long ones probably a couple of days later. The time of hatching this year was thus about the same as in 1926 (see *Canadian Field-Naturalist*, 41: 132, 1927).

The second week of May, 1928, had temperatures between 32° and 74°F. (maximum every day above 59°F.). Weather clear, cloudy and warm, except rain on May 10-11.

The third week of May (1928) had temperatures between 36° and 74°F. (maximum every day above 60°F.). May 16 and 21 were clear; May 15, 18, 20, 23, overcast, and rain on May 17, 19, 22 and 24.

The last ten days of May (1928) had temperatures between 42° and 68°F. (maximum temperatures every day above 53°F.). Rain every day except May 26-27 (cloudy) and 30 (clear).

On June 1st, I left for Europe and preparations for this trip prevented any observations around Ottawa during the middle and end of May (1928).

1929

In 1929 I first returned to Ottawa on July 7, too late for any observations on Euphyllopoda here this year. In the middle of the month I left for Port Churchill, on the west side of Hudson Bay, reaching the then limit of the Hudson Bay Railway (mile 445; 65 miles from Port Churchill) on July 22. I stayed over a day here, and during an excursion along the creek, I was fortunate enough to secure both *Eubranchipus gelidus* and *Limnetis gouldii* in pools left in the swamps (marshes) surrounding the creek (remains of higher water-level?). I only saw one specimen of each species; the fairy-shrimp (*E. gelidus*) was a one-inch long female with bright orange colours (head-appendages; foliaceous legs; tail, etc.) and a bright rose-coloured, globular egg sack with orange ripe eggs. The Clam-shrimp (*L. gouldii*) was half grown (1½ mm. in diameter), and with a pale yellowish brown colour. The other freshwater animals here (as observed) consisted of two kinds of frogs; minnow (?) fry, and small trout; aquatic insects, etc., and Molluscs (*Physa*, *Lymnaea*, *Sphaerium*). The finding of *E. gelidus* and *L. gouldii* here was most interesting and important, as the locality probably

represents the northern limit (about lat. 58°N.) for both species on the west side of Hudson Bay. *E. gelidus* also occurs in Alaska and Yukon Territory, but in the rest of Canada there were hitherto no records of it further north than Winnipeg, Ottawa and Montreal (see *Canadian Field-Naturalist*, 35: 27-28, 1921. As for *L. gouldii* (= *L. brachyurus*), it also occurs in Alaska and Yukon Territory, but the other northernmost records in Canada hitherto known were Wetaskiwin, Alta., Estevan, Sask., Ottawa and Montreal (see *Canadian Field-Naturalist*, 35: 89-91, 1921. For both species (*E. gelidus* and *L. gouldii*) the northernmost records lie within the limit of trees.

As soon as I reached Port Churchill on July 23, 1929, I observed that the circumpolar fairy-shrimp *Branchinecta paludosa* was extremely common in most of the rock and tundra pools here (no other Euphylllopoidea occurred here). Adults and almost adults (1-1½ cm. long) of both sexes were found from the end of July on; but in the end of August their numbers had been greatly reduced, and they had disappeared entirely from several of the pools, though both sexes were still found (2 cm. long). I also noticed then a difference in size of this species according to the particular pool (pond) in which they occurred; only in one place had they attained the maximum size (2½ cm. long), known for this species. Interesting was the finding of vast numbers of this fairy-shrimp in the pools filling out the holes (cavities) at the northeast and southeast corners (former wells?) of the ruins of Prince of Wales Fort (entrance to Port Churchill), on August 29th. The species occurred (in certain ponds) all during September and the first half of October (last ones collected October 18) on both sides of Churchill River, even after new ice had covered the pools. The last remaining ones were all females.

The other freshwater Entomostraca found here at Port Churchill in 1929 were Cladocera (*Daphnia pulex*; a few *Eurycercus lamellatus*, etc.); Copepods *Diaptomus* sp. ?; and Ostracoda; they were found as late as October 26 under half an inch of new ice in tundra pools. Several even of the larger

ponds here at Port Churchill, dried up completely (before the frost came in the beginning of October), and the life in them was thus finished earlier than in other ponds.

Besides Entomostraca, the lower macroscopic freshwater life at Port Churchill consisted of aquatic insects, and mites, etc.; Turbellaria, Oligochaeta, Snails (*Lymnæa*, *Aplexa* or *Physa*); and (in two lakes) freshwater sponges (*Spongilla* sp. ?). Interesting was also the finding of small earthworms (*Lumbricus* sp. ?) under stones in a tundra swamp, and of naked slugs (*Limax* sp. ?) here.

Contrary to what I found in Hudson Strait in 1927, the lakes, brooks and ponds at Port Churchill contained no sticklebacks or trout; though the former (*Pygosteus pungitius*) were common in beach pools, lagoons and their outlets; and the latter (*S. alpinus*) in the river itself even in brackish water. A number of larger freshwater fish, Whitefishes (*Coregonidæ*), Ling, Pike, Pickerel, Sucker, Grayling, etc.) occur in Churchill River and its tributaries.

In connection with the above observations on Canadian freshwater life, I would call attention to some recent papers by others on the subject.

H. SPANDL has published a monograph on the freshwater Amphipods of the whole world, in his "Studien ueber Suesswasser-Amphipoden I (Sitzber. Akad. Wiss. Wien, Mathem.-Naturwiss. Klasse, Abteil I, Vol. CXXXIII, 1924, pp. 431-525, pl. 1-II and text-figures), in which the Canadian, Alaskan and Arctic forms will be found.

The occurrence of *Pontoporeia* and *Mysis* in Wisconsin lakes is discussed by C. Juday and E. A. Birge in "Ecology", 8: 445-52, 1927.

Isopods (*Mancasellus tenax*), Amphipods (*Gammarus limnæus*, *Hyalella knickerbockeri*) and *Mysis relicta* have been recorded from Lake Simcoe, Ont., by Rawson in Univ. Toronto Studies, Biolog. Series, No. 31, 1928, pp. 90, 97-98.

J. D. Soper records the freshwater fishes *Salvelinus alpinus*, *Gasterosteus aculeatus* and *Pygosteus pungitius* from southern Baffin Land collected by him in 1924-26 (Museum Bulletin No. 53, Ottawa, 1928, pp. 116-7).

THE PILOT BLACK-SNAKE IN ONTARIO

By ROBERT V. LINDSAY



IF THE relative abundance and distribution of any single species of animal is to be determined by the number of published records of its occurrence within a given area, obviously then the Pilot Black-Snake (*Elaphe o. obsoleta*) may be aptly considered

a rare reptile in Ontario. In view of the large size of the serpent and its decided partiality for open fields, meadows and roadways, the marvel is that so few specimens have ever been taken. In fact, a search of the literature will reveal only one reference to its occurrence, at Point Pelee in

Essex County. This record appeared in *The Canadian Field-Naturalist* for May, 1925 (page 93) where Mr. E. B. S. Logier states that the late Mr. C. W. Nash took several specimens there, one of which, taken November 2, 1915, measured six feet three inches in length.

In addition to this single published account, five additional records of this snake have come to light, besides those from Frontenac County, the publication of which is the purpose of this article. The first of these unpublished records appeared under the heading of "The Snakes of Ontario" in the *Toronto Mail and Empire* of October 6, 1894, where the late Dr. J. H. Garnier says "*Coluber obsoletus*, pilot racer, reported south of Windsor, Essex county". At Point Pelee Mr. W. E. Saunders caught one on November 29, 1909, which was identified as a Pilot Snake by the late Professor John Macoun (according to Mr. Saunders' notes). The third record refers to the cast of a specimen now in the Ontario Provincial Museum at Toronto, taken in Essex county in September, 1913, by the late Mr. C. W. Nash. In that institution there is a splendid live specimen of *E. o. obsoleta* living in comfortable quarters under the care of Mr. Robert Virtue. The snake was captured on August 22, 1928, by Mr. W. Robertson at Fonthill, Welland county (in the Niagara peninsula) and sent to the Museum. It appears that Mr. Robertson, a farmer, while busily engaged in a harvest field on the above date observed the reptile as it dropped from a forkful of oats in transit. With commendable nerve Mr. Robertson promptly seized the surprised serpent and its preservation marked a new locality (175 miles east of Essex) for this snake in Ontario. The snake feeds regularly, in captivity, on a diet of house mice, but will not submit to handling, appearing every bit as wild and untamable as it did on the day of its arrival. The fifth unpublished record of its occurrence was made by Mr. Logier of the Royal Ontario Museum of Zoology, who informs me that while engaged in a faunal survey investigation of Prince Edward county with a party of Museum biologists during the summer of 1930, he was told of a large black snake that had been found near Picton during recent years. Mr. Logier is inclined to the belief that it was *E. o. obsoleta*. Picton, it might be mentioned, is about 125 miles east of the Fonthill record.

In Frontenac County I have seen four specimens of the Pilot Snake, two in 1929 (not preserved) and two in 1930, the 1930 specimens being later carefully examined by Mr. W. J. LeRay, of the University of Toronto, Dept. of Biology, who confirmed my tentative identifica-

tion. The first one that I saw, (on August 5, 1929) was a badly damaged specimen on the dirt roadway at Battersea—sixteen miles north of Kingston). The snake had evidently been lying there for several days and a cursory examination of it sufficed, for certain obvious reasons. The smooth lateral scales in contrast to the feebly-keeled dorsal scalation was convincing proof of its being none other than *Elaphe o. obsoleta*. Mr. Ralph Sleeth, a farmer living a quarter of a mile east of Battersea, told me that five days previously he had killed the serpent in his hayfield and that his dog had probably carried the remains to the road. Mr. Sleeth stated that it was positively the first black snake he had ever seen on his property and was sufficiently interested to measure the animal, the total length being four feet eight and a half inches. On the same day another specimen of *E. o. obsoleta* was discovered on the roadway at Godfrey (thirty miles north of Kingston), which is approximately the northern limit of the limestone formation in the county. This one had suffered irreparable damage through coming into too close contact with the ubiquitous and devastating motor car. It was not preserved.

On August 14, 1930, we again paid Battersea a visit and singularly enough found the remains of another Pilot Snake on the roadway less than a hundred feet from the spot where the first specimen was found a year previously. Preserving the specimen, we resumed our journey until within a mile of Inverary (five miles northwest of Battersea) where we noticed another fairly large Pilot Snake lying on the roadside. Being only recently killed and in a much better state of preservation we preserved it too, four feet one inch being its total length.

In a recent communication, Mr. Clyde L. Patch, of the National Museum of Canada, states that this snake has been recorded from Massachusetts and southern New York. The discovery of specimens in Frontenac county would, then, appear to extend the formerly known range considerably farther north.

The other day it was my privilege to peruse the late Mr. C. W. Nash's old journals and I found many interesting notes of which the following extract is of special interest.

"In a letter of July 20, 1906, (filed) Mr. John Ewart of Yarker says, 'On one or two occasions I think I have run across the black snake near Sydenham, S. Frontenac. They were black and shiny on back and not mottled like the water snake, and do not make for the water when disturbed as the water snake does. They sometimes climb trees which is pretty good evidence they are not water snakes. This was some years ago

and they were by no means common, but if I have a chance will secure a specimen.'"

Apparently this gentleman was satisfied that

he had found something pretty good, but for some unknown reason he neglected to carry out his good intentions.

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

"Beiträge zur Kenntnis des nordöstlichsten Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume 8, 1909, pp. 168-229. Volume 9, 1909, pp. 245-320.

(Translated from the original German text in the Library of Congress, Washington, D.C., by M. B. A. Anderson, M.A., Ottawa, 1928.)

Original pagination given in the text.

(Continued from page 55)



THE whole district exhibits rocky, mountainous landscapes for the most part, as Figure 2 [in the original] typically shows. The neighbourhood nearest to Killinek does not rise higher than 100 to 120 meters above the sea, the peaks in the east of the land, especially of Kallaruselik, up to 500 meters. South of MacLelan Strait the mountain masses rise up to a height of perhaps 1,000 meters, in some peaks perhaps even still higher. On the whole the formation of these gneiss mountains is rounded and undulating. In all parts, though, are found fields of boulders, steep rocky declivities and deep cut valleys, so that almost always it is necessary to climb over a confused mass of stones, or climb up and down. The natives, it is true, in their favourite hunting grounds know the most convenient and safest connecting paths between the different places, but if it is wished to cover no set distances, but roam through the district as an explorer, who would like to investigate every possible thing, then in general it is necessary to give up travelling on the level tracts of country. Often long detours are necessitated; indeed many times even with companions who knew the place, I scrambled about so, that we found no way out and had to retrace long distances. If you are on the summit of the high range then you can often travel in a certain direction for kilometers over rock worn quite smooth which has a deserted and rigid appearance, like a lava stream. The wind travels across this with unbridled force, so that no plant life develops here. Only in sheltered clefts, gorges and intervening valleys in the midst of such level surfaces are moss, grasses and flowers. According to all indications these rocky flats worn so peculiarly smooth have been caused by earlier glaciers which at some time may have covered the district to a considerable extent, perhaps in part as an "ice-cap", but now as far

as is known, occur nowhere else in Labrador. A little to the north indeed, in southeastern Baffin island, there are at the present time such glacierized localities. It is assumed, that the movements of the [P. 185] former glaciers radiated from the interior of the land to the coasts (compare A. P. Low, Report on an Exploration of Part of the South Shore of Hudson Strait and of Ungava Bay, Geological Survey of Canada, vol. XI, 1899, p. 45 L), and Robert Bell suspects that the whole northeastern corner of Labrador at that time rose much higher above the level of the Atlantic Ocean than now. The bed of Hudson Strait at that time may have represented a large land valley, which was apparently also covered with glaciers (Report of an Exploration on the Northern Side of Hudson Strait, *l.c.*, 1901, p. 29 M). This theory explains strikingly the present nature of our district: its slight absolute height opposite the mainland of Labrador, the towering up of Button Islands, as the remains of earlier highlands, the rugged, rough surfaces of the more precipitous summits, which tower up from the mass of ice as former "Nunataks" (horns), the polished state of the plateaus, situated between these horns, caused by the grinding action of glaciers. Also the presence of mighty moraines, as well as isolated erratic blocks or even smaller heaps of rocks, which remained behind in the bed of the glacier, after it had melted, bore witness of the earlier conditions.

As already remarked, the chief type of rock in this locality is gneiss in all its possible combinations. It appears not infrequently stratified in ribbon-like layers, a thing which attracts attention particularly in such localities, where steeply raised sites of rock were levelled by the grinding action of glaciers. The different light and dark strata then stand out in marked contrast. Here and there the gneiss is shot through in broad veins by pegmatite of a prevailing flesh colour, as for example just at the entrance of the last indentation of the harbour of Port Burwell, frequently also farther southward in Ungava Bay. This rock reminds one of marble to some extent, especially when it is wet, and is often so-called, therefore, by the white people of the district. I seldom found overlying limestone, in most cases appearing

not even once, but brought thither either in earlier periods of the earth by glaciers or in a later time by the pack-ice. In 1904 Caldwell collected also south of Port Burwell graphite and [P. 186] a little iron-ore (A. P. Low, Cruise of *Neptune*, 1906, p. 192, 245). Weathering of the rocks in those districts proceeds exceptionally slowly, small bits of earth, therefore, occur seldom in the wider strata. The results of closer examination of a number of characteristic rock specimens, which I brought with me, Dr. Johannes Uhlig in Bonn, will have the kindness to publish in the appendix. A. P. Low in 1904 collected in the neighbourhood of Cape Chidley a great number of limestones rich in petrification, which according to his opinion had been brought thither from Akpatok by the pack-ice. This island, as is well known, consists entirely of Silurian rock. A fossil coral found among these was described by L. Lambe as *Labyrinthites* gen. nov. *chidleyensis* sp. nov. (A. P. Low, Cruise of *Neptune*, 1906, Appendix IV, p. 328). H. M. Ami identified without question among the petrifications found of the Silurian age the following species: *Pachydieta* sp. indt., *Sieberella galeata* var. *Chidleyensis* Ami, *Trematospira* sp. indt., *Conchidium decussatum* Whiteaves and *Clorinda lowi* Ami n. sp. [*loc. cit.* p. 355].

Long valleys are situated between the mountain heights, which are arranged rather frequently in masses, in a chain formation. These may represent partly former glacier beds, but are changed from their original state and are covered with rubble, sand and mud by flowing waters, which do not spring from the rock in abundance, but are formed only by the rain and the melting snow. Here and there several broad, low valleys covered with swampy stretches or with moss extend upwards in different directions, which in the summer time afford quite an inviting appearance in the green of their vegetation. The neighbourhood of Killinek does not possess in very great numbers brooks and smaller rivers; they empty mostly in ponds or lakes. Usually the bottom of the valley shows moor-land, which can usually be crossed without danger, grown over with mosses and coarse grasses. I only broke through the humus layer a few times up to my knees in a clayey and very sticky slime, from which I could pull my feet only with effort. The district has an abundance of standing waters. In the vicinity of Killinek [P. 187] almost every depression in the ground shows a rather small or large pond, every enclosed valley a deep, clear lake. At times from a high point you overlook a whole mass of such fresh waters surrounded by mountains, which form a truly characteristic feature

of the landscape. In general these mountain lakes produce a gloomy effect, cold and dead. Since the winter covers them half the year with a layer of ice, the organic life in them cannot develop in abundance. They harbour only a few of the vertebrates, except an exceptionally small number of water birds, perhaps a poor form of trout (*Salvelinus fontinalis*),¹ but form the breeding place for countless mosquitoes. The larger lakes may be very deep, as I was assured by the Eskimos, who occasionally carry their kayaks out to them, in order to hunt the swimming-birds during the moulting season, when they cannot fly. On the other hand you can judge the amount of water even yourself in stormy weather, because very large and high waves are formed. Probably such deep waters do not freeze up entirely in the winter. Often some of them are situated only a little above the level of the sea, so that the tide reaches them, and causes brackish water to occur. On summer excursions the larger lakes form frequently the most unpleasant hindrances to travel. You can often travel so comfortably along the shore, but rocks falling precipitously into the water force the hunter to clamber across the mountains in a wide arch, in order to reach the shore lying on the opposite side of the lake. In the winter the frozen lakes offer the most suitable road for the sleds. The deep ponds and lakes have not many islands. In their landscape appearance they frequently resemble fjords of the sea.

If you ascend the mountain slopes in the sunshine from the clear, gravelly shore or the gloomy banks of the moor, then occasionally animal and plant life is shown in charming development. Little singing birds, especially Pipits, Snow Buntings, and Alpine Larks, call and sing their joyous melodies. Occasionally a Lemming (*Dicrostonyx hudsonius*) [P. 188] or a mouse (*Peromyscus maniculatus*) (A)² scurries across our path, whose holes are frequently to be seen in dry places; for they too, though twilight creatures, love the warm sunshine. Flies and insects hum about. Plainly coloured butterflies, especially frequent the brownish *Brentis polaris* Boisd., more rarely the beautiful greenish yellow *Oeniss semidea* Say, occasionally perhaps owl butterflies too. (I collected *Colias nastes* Boisd., *Arctica queuseli* Payk., *Anarta richardsoni* Thunb. and *Symphista yellerstedti* Stdgr. (B) flutter from flower

¹ According to the kind identification of collected specimens by Conservator E. Leonhardt of the Zoological Museum in Dresden.

² According to the kind identification of the collected specimens by the following gentlemen: (A) Professor R. Matschie, Zoological Museum in Berlin; (B) Dr. Jordan, Zoological Museum, Tring, England; (C) Professor Dr. von Heyden in Bockenheim; Frankfurt on the Main; (D) Professor Dr. Fr. Dahl in Berlin.

to flower or with outspread wings alight on a sunlit place, in order to stretch out comfortably in the warmth. Delicate camboid beetles, especially *Cryobius arcticola* Chaud. and *Amara alpina* Fabr. (C) scurry busily across the ground; I found a small nimble swimming beetle, *Hydroporus lapponum* Gyll. 3 in fresh water ponds. Spiders are to be observed frequently, mainly apparently *Leimonia labradorensis* Thor. (D) which carried about carefully their little heap of eggs, cleverly spun about with a web. All this world of small creatures in sunny weather comes to the light, while in rain and storm it seeks shelter under leaves, stones, and in crevices and small holes. The life-giving sun's rays also bring countless mosquitoes (especially *Culex nigripes* Zett.) to maturity, which then persecute a man day and night and torture him with their sharp stings. The Eskimos suffer just as much almost from these plagues as we do, so that at the present time they like to obtain mosquito netting at the station, to protect their faces in some measure. The neighbourhood of Killinek is said to be somewhat more favourable in this respect, than the Labrador districts situated farther south, probably on account of the harsh climate and slight vegetation. So the warm summer time is really not the most pleasant. You prefer the autumn, when clear sunlit days alternate with cold nights, which quickly kill the delicate insects.

[P. 189] The vegetation on the mountain slopes is quite varied. While moss and grasses prevail in the moist valleys and plains, higher localities are covered more with lichens and plants, in which are found, besides the delicate mountain grasses, charming flowers which you survey with double joy in those regions which are desolate and for the most part so colourless. Fungi are noted frequently; on account of the difficult preparation of these, I refrained from making a collection. Shrub-like plants in this district attain a very insignificant height, seldom high enough to rise more than 15 to 20 centimeters above the ground. There is a complete absence of real bushes or trees of any kind. The old, tough stalks of the willows, which seldom exceed the size of a lead-pencil, creep closely about on the ground, only in an exceptional case do you find a bush which is suitable for firewood. The higher mountain summits and plateaus are mostly entirely without vegetation. Indeed the district on the whole is more desolate and inhospitable looking than different parts of Baffin Island situated farther north, or than the Labrador country which is situated immediately to the south.

During my investigations in the vicinity of Killinek, I made preparations, as I have remarked for the first excursion of any length, which was to take me down the coast to Ungava bay. Such a trip in those districts is unsafe and difficult. Travel on land can scarcely be considered by the collecting naturalist, since carrying provisions and equipment offers considerable difficulty. Whenever Eskimos undertake marches of this kind, they carry only the most necessary objects along with them, but in spite of this often suffer great need. To make use of dogs as pack animals as is the custom in some other districts, in this country is seldom done; such transport is always an uncertain thing because of the restlessness and wild nature of the dogs. As long as the snow covers the ground and the waters are frozen, you naturally use the dog sled as the quickest and safest of all means of travel and transport. Flowing [P. 190] inland waters which would be strong enough to carry canoes and thus make possible summer communication with the interior of the country, are entirely lacking in the district described by me. Since you meet by chance on the whole east coast of Ungava bay, between Killinek and George river, only a few Eskimo families, and toward the Labrador coast as far as Aulatsvik, people dwell even more rarely, there remains in the Summer no other possibility for the collecting naturalist, than to journey along the coast of the sea by boat, having no other resource than himself and a small convoy, to transport tent, sleeping bag and preserved foods with all the necessities in this way, to travel to favourable localities on land and from here to conduct smaller excursions into the interior.

The most convenient method for such coast journeys is the use of as small a boat as possible, which in case of necessity can be handled by one person alone, with which you can sail across stretches of the sea and approach close to the shore; a boat, which is also light enough to be pulled up on the beach by few people. If you join wandering Eskimos of whom usually only the women and children travel in a boat, the men, however, nearby in their kayaks, then you are not free in your movements, and because of the common welfare of the party may seldom pursue special interests.

Hiring people for very large excursions causes difficulties, since the country is so sparsely populated, and then, too, a clever man likes neither the compulsion of any sort of direction, nor does he find pleasure in leaving his family, in order to accompany a stranger, who can only make himself understood with difficulty. If you take several people along, then they feel happier, but at the

time of my stay in Killinek it would have scarcely been possible, to get hold of such people, since all were being used for unloading the mission ship and then later at building the mission house. Moreover you need a larger, less convenient boat to take along several people, and the tent as well as the amount of provisions would have to correspond to the number of people [P. 191]. Because a clever Eskimo by hunting and fishing in favourable circumstances not only can get food and skins in abundance, but also can provide himself with European articles by payment with the superfluous game, you are compelled in engaging such an Eskimo to pay comparatively high prices, perhaps one dollar (4.20 marks) a day, if you wish to secure industrious people. Under existing circumstances, I was happy in securing as a companion an experienced man, the heathen Eskimo [Paksau], about thirty years of age, who proved to be a dependable, happy and clever companion during our whole life together, even if at times a rather stubborn comrade.

On August 11th we two started away from the mission house. Our boat, which I rented from the oldest Eskimo in the neighbourhood, seemed as its owner, to have lived through many a storm, but had been repaired by Paksau in several days' work, pitch used, and it had been provided with new oars as well as a sail. To be sure a little water leaked in constantly, so that we had to bail it out every half hour or so, but otherwise it proved to be serviceable; stood unharmed the many knocks, which it experienced in landing on steep parts of the shore, as well as many a jarring encounter with unseen reefs. When the leaking of the boat became too bad, we turned the boat over, after it was of course completely unloaded on a flat place on the shore, and drew it up on the land, whereupon Paksau stopped the holes with moss, a work of hours, then with the aid of heated stones melted the adhering pitch and smoothed it over, and so gave the outside of the boat new brilliancy even if only a short new durability. He loved to do this work, especially when it was fine weather, and I had preparation work to do in my tent and troubled myself little about him. If I went over to his place of work now and then, in order to show interest in his work with the hot stones, I would occasionally find him lying in the grass by the smoking fire, looking out across the sea and smoking his pipe. Then he would begin to laugh, when I caught him [P. 192] idle, while I myself was working hard and would have liked to have his help in the tent. He spoke with excited words, which I did not understand at all, whereupon I, too, laughing walked up to him,

and tousled his thick black hair, all of which was a great joke to him. Perhaps I gave him a new piece of tobacco too, left him sitting quietly, and walked over to the boat, to investigate how far along the gluing process had progressed. If I looked over in his direction a quarter of an hour later, I could be sure of seeing him again at his tiresome work, tireless and not even glancing up.

The first days passed slowly; in the beginning it was a question of working our way cleverly between ice cakes; then violent southwest winds kept us back. The temperature was raw, wavering between 3° and 5° centigrade [37.4° and 41° F.]. Besides, a fine penetrating mist-like rain trickled down, which shut off the landscape almost entirely from sight. We had not real work, since the excursions on land, already carried out had brought us scarcely any results worth mentioning, and the unfriendly weather soon drove us back to our tents. A survey of the coast could not be thought of in the weather prevailing. Besides the strong current which exists on that coast, permitted us to travel toward the south with the falling water, as long as we were depending upon oars alone and had no strong sailing wind. I had to take hold diligently with the rowing of the boat and the work on land, a circumstance which was the consequence of travelling with only one person, because you lose in this way much time for scientific investigations. At midday on August 14th the weather became clear and sunny at last, so that we could undertake a rather long journey across country. We were situated a little north of 60 degrees latitude. The landscape at this place displays softer outlines than at Killinek; there are more extended plains and broader valleys, the mountains are more rounded. The fresh green grassy slopes glimmered in the golden sunlight, countless flowers grew in sheltered spots, over which the brown butterflies fluttered. Wide-spread, splendid nature [P. 193] lay spread out before us pure and clear, lonely and untouched. Even the wind here spoke in mysterious words; it intoned distinctly audible, bell-like sounds, a thing which filled me with astonishment, because nowhere else had I ever perceived this in the same way. So the great mountainous world around and the blue sky with its scattered white clouds become a cathedral, where attentive creatures may devoutly hear preaching concerning the glory of creation. On August 16th we were able to sail in the most splendid weather quite a distance along the coast. Indeed it was scarcely possible to put down on paper fast enough the confusion of islands, peninsulas and inlets in our hurried progress past them. The landscape continued

to become flatter, often rising not more than 10 to 30 meters above the sea, the land more level and more grassy, even if mighty desolate mountain chains arose in the distant background upon which wide stretches of snow were visible, while such had not entirely vanished near the shore. Our most southern camping place was situated south of the large peninsula, which is said to be called Natsitok. In these districts inside the inlets there is a number of sandy beaches, also marshy soil and earth cover larger stretches than in the north, for which reason the vegetation is much more abundant. The grass grows higher; varieties of flowers other than those which occur in Killinek, especially beautiful bell-flowers, grow in profusion. Shrubs, however, continue to be quite insignificant. Here and there only low willow bushes are seen, especially at some distance from the coast. Some shrubs are recognized, which have been dead for a long time, but in spite of that are still rooted firmly, so that occasionally indeed the growth continues, for which, a considerable period of time may be necessary, as must be concluded from the toughness of the wood and the rings, which can scarcely be discerned, so closely do they lie together. A little south, that is to say at Ablorilik, according to the report of the Eskimos there is more bush country, and in the extreme southeast of Ungava bay, at George river, you find a scanty pine forest. Traces of earlier human inhabitants along the coast districts visited by me are not present in abundance; here and there I found old tent rings, [P. 194] fire-places and heaps of bones, fallen graves and also house ruins and stone men. The families, which formerly lived at Ablorilik have moved to the stations, although the whole coast has an abundance of seals, birds and fish, and apparently also possesses good fishing places.

On the evening of the 18th of August I observed in a pond near our tent very large tadpoles of a species of frog or toad, but I was not fortunate enough to secure a specimen of it. It was heretofore not known that an amphibian occurs so far north in Labrador. During the night I heard several times short squeaking and trilling noises. My intention of searching for the creatures more closely the next morning was frustrated, since at dawn Paksau drove me out of the sleeping bag, because the wind favourable for the return home, which was blowing even the evening before and hindering our progress, was still holding. I had decided to return for the reason that we were very dependent upon the weather with only our two oars, and did not know how many days we would need to go to Killinek.

Besides my ornithological collection was not proving to be more abundant or more varied in species than in the north. Things were just the opposite with me because of the fact that even if the travelling about was varied and interesting, time for hunting and preparation was lost thereby. Because of it the bird skins collected would not dry and in the hurried packing and unpacking took a bad shape. Without taking time for breakfast, in the fresh, clear morning weather we took down the tent, shoved the boat into the water, and travelled in all haste to the northeast. Because favourable sailing wind blew, we held our course directly to Killinek, rather far from the coast. Only in especially clear and favourable weather did the Eskimos dare this with such a small boat as ours. The weather changes often extraordinarily fast, and storm, waves and current have such powerful force far from the land, that you lose all control of your craft, and have to resign yourself helpless to the power of the sea, a circumstance which may result disastrously in this reef-strewn, dangerous water even with a good boat. [P. 195].

We fairly flew forward, so that the water foamed on the bow, and saw the beautifully-shaped splendid island mountain Omanak, later the dangerous Pitsiulatse islands fall behind us. But after we had the peninsula Nuvualuk behind us about noon the wind died down quickly, fog soon set in, and we had to betake ourselves as quickly as possible nearer the coast. Finally we arrived in the loose pack-ice, which toward the west was closely packed in masses farther than we could see. We rowed with all our strength along the edge of the ice, in order to reach Killinek the same day. Since there was an entire absence of wind, and the water lay there calm as a mirror, we made good progress forward, but had to make some detours, in order to go out of the way of large icebergs, which as we saw, had begun to thaw and fall to pieces. Only too often we had seen the bursting of such giants, when the water round about them rose in great foaming waves and the separate mighty ice blocks rocked to and fro from the change in the equilibrium; in the night we had also been frightened repeatedly by reverberations like the sound of shooting, which then occur, so we considered it advisable to stay at some distance from the uncanny fellows, which towered up as majestic and large as churches in the foggy air. It is said indeed, that the bergs which are ready to fall apart, go to pieces through the stroke of the oars; and can destroy boat and man near them. After tireless work, through the ice and the fog, which granted us no kind of

a view, my companion with instinctive certainty found the harbour of Killinek, where towards

evening we alighted on the land, quite satisfied.

(To be continued)

JAMES H. EMERTON

BORN, 1847

DIED, DECEMBER 5, 1930



JAMES H. EMERTON, Arachnologist and Artist, died on December 5, 1930.

Born at Salem, Mass., in 1847, he, in due course, entered the local schools and later assisted in his father's drug store. At the age of fifteen he was visiting the Essex Institute where he came in contact with A. S. Packard and other naturalists. To begin with his natural history studies were somewhat generalized but later he concentrated almost wholly upon spiders on which he became a leading authority.

While yet a young man, Mr. Emerton travelled extensively and spent several months in Europe where he visited various museums and made comparisons of spiders and studied types. In later life he, on several occasions, visited Canada; attended an excursion of the Ottawa Field-Naturalists' Club in 1916, and in company with Mr. J. B. Wallis of Winnipeg, made a trip to the Pas and Kettle Rapids along the Hudson Bay railway in 1917.

His papers are both numerous and varied. From Nathan Banks, in *The Canadian Entomologist*, we learn that his first paper appeared in "Psyche" in 1875 and this was followed by others such as: "Structure and Habits of Spiders"; "The Common Spiders of the United States"; "Life on the Seashore", and many more. A majority of these articles were beautifully illustrated by the author. Altogether he is said by Banks to have described over 350 species of spiders. A list of the spiders of Canada, from his pen, appeared in the *Transactions of the Canadian*

Institute, Vol. 12, 1917. He also contributed a number of articles to *The Canadian Field-Naturalist* of which his "Spiders of Canada" is most noteworthy.

As an artist Mr. Emerton is said to have illustrated at least part of Packard's "Guide to the Study of Insects", Packard's "Monograph of the Geometridæ", Scudder's "Butterflies of New England", Eaton's "Fern Book", and the reports of the United States Entomological Commission and various other works. He married Mary A. Hills in 1884, who predeceased him by approximately 32 years.

Mr. Emerton was an enthusiast and as such he rarely permitted the social affairs of life to interfere with its more scientific aspects. This was interestingly brought to my attention when he visited my home in Manitoba in 1917. Rising with the sun in order to observe the spider webs before the dew evaporated, he also retired with that orb because darkness obscured what he most desired to see.

He was a man of simple habits and one who rarely, if ever, forgot his friends. He was ever ready to encourage and assist the beginner or in any other way to foster the study to which he had devoted so much of his life. Finally, recognizing that his personal usefulness must ultimately cease he turned his thoughts to other means of perpetuating the work he had so much at heart. Among the donations left in his will for scientific purposes was included five hundred dollars towards the maintenance of *The Canadian Field-Naturalist*.—NORMAN CRIDDLE.

NOTES AND OBSERVATIONS

Bufo cognatus cognatus FROM ALBERTA.—On June 8, 1928, Mr. T. B. Kurata and I stopped over between trains at Medicine Hat, Alberta, and spent some hours collecting just outside the city. A toad which Mr. Kurata picked up on that occasion has proved to be *Bufo cognatus cognatus*.

My identification of this specimen has been

confirmed by Professor Tracy I. Storer, to whom it was submitted.—E. B. S. LOGIER.

FRESH-WATER MUSSEL AND COOT KILL EACH OTHER.—While duck-hunting along the shores of the Shuswap lake recently, I came upon a dead coot lying close to the water. There was nothing unusual in this, as these birds are occasionally

found dead along this stretch of beach, but on looking closer I saw that this one seemed to have a fresh-water mussel or clam clutched tightly in its beak. On examination, it was seen that the mussel had the tongue and lower part of the bird's beak tightly clutched in its shell and, furthermore the beak of the waterfowl, in turn, was tightly clutched the mussel's shell, each securely holding the other. The bird, evidently, had been dead some days, as the eyes were completely gone, but, otherwise, it was in good condition. To me it seemed evident that the bird had grasped the clam while feeding, and the shellfish had closed its shell, thus holding the bird securely by the lower part of the beak and tongue. No doubt this killed the bird in a short time, and, when dead, I suppose its beak became so rigidly fixed as to prevent the clam from opening its shell.—A. HIGGS, Revelstoke, B.C.

HAWK FOUND IN SOUTH AMERICA WAS APPARENTLY BANDED IN CANADA.*—A bird, which is said to have been a Swainson's Hawk (*Buteo swainsoni*), wearing a celluloid ring, which is described as being red on the inside and black on the outside, and marked "50 Canada", was killed in the western part of Buenos Aires Province, Argentine, South America, on November 27th, 1930. It would be very interesting to know where this Hawk was banded and any persons who are able to supply information with regard to the banding of the above-mentioned Hawk are requested to communicate with the Commissioner, National Parks of Canada, Department of the Interior, Ottawa.

Swainson's Hawk is one of the abundant hawks of Western Canada. It is one of the kinds commonly called Gopher Hawk, because of its fondness for gophers which it helps to keep in check.

Bird Banding is being conducted by the National Parks Branch and the United States Bureau of Biological Survey, as a means of studying the life histories of wild birds, and with the help of voluntary co-operators throughout Canada and the United States, very valuable scientific information is being obtained concerning our native birds. Any reports received concerning the capture or finding of banded birds will be greatly appreciated.

THE CLAY-COLOURED SPARROW AT HAWKESTONE, SIMCOE COUNTY, ONTARIO.—In a small collection of birds recently acquired by the Royal Ontario Museum of Zoology there is a specimen of this sparrow collected at Hawkestone on Lake Simcoe

*Mr. Jack Miner was also good enough to inform *The Canadian Field-Naturalist* of the recovery of this banded hawk.—D.L.

by Mr. H. B. Haugh, on May 28, 1930. This bird was considerably outside the known range of the species in Ontario and its occurrence there can only be considered as accidental. Clay-coloured Sparrows are rare and apparently irregular summer resident birds of the London region¹, but it is not in this southern section of the province that they are to be expected regularly in numbers. The species more nearly attains this status in the western part of the province, from Port Arthur² to the Manitoba boundary. The only other records which serve to suggest the possible occurrence of the species elsewhere in Ontario are the mention of it as a migrant at Sault Ste. Marie³ (Michigan or Ontario?) and the record of a specimen collected at Port Huron, Michigan⁴, which is adjacent to the Ontario boundary.—L. L. SNYDER, *Royal Ontario Museum of Zoology*.

BOB-WHITE QUAIL LIBERATED IN ALBERTA.—In the autumn of 1928 a shipment of 23 Bob-white Quail was taken in charge by Mr. Dan Paton, Midnapore, Alberta. The birds were kept in confinement during the winter and 19 survivors were liberated in March, 1929. These birds remained in the neighbourhood during the summer and frequently were heard and seen. There is no information regarding their movements during the next winter (1929-30) but in the spring of 1930 several males and at least two females were observed. The latter came regularly to Mr. Paton's feeding station. No broods were encountered and the last definite information is that at least one covey was seen in September, 1930.—J. A. MUNRO.

WHITE-THROATED SPARROW IN WINTER.—In the December 1930 issue, Mr. Clifford E. Hope tells of his observations of the White-throated Sparrow in the Toronto region and suggests that other observations be recorded. I observed two White-throated Sparrows on January 1st, 1929, in the ravine behind the Government House, Toronto. I was accompanied by Mr. Jared McCutcheon. A light rain was falling.—J. MURRAY SPEIRS.

UNUSUAL BEHAVIOUR OF WOODCOCK IN AUTUMN.—On October 17, 1930, several Woodcock were seen at dusk flying out of a cover in the Black River region near Wolfville, N.S. One

¹ E. M. S. Dale, "The Clay-coloured Sparrow at London, Ontario", *Can. Field-Nat.*, 41: 64, 1927.

² Walter Kaelz, "Some bird records for the Lake Superior region of Ontario", *Can. Field-Nat.*, 37: 118, 1923.

³ W. H. A. Preece, "The concentration of migrating birds at Sault Ste. Marie, Ontario, in spring", *Can. Field-Nat.*, 38: 10, 1924.

⁴ W. B. Barrows, "Michigan Bird Life", 1912, p. 510.

bird, a male judging from its small size, was observed to alight in a pasture. The "nasal note" so commonly heard during the nesting season was repeated several times. The bird then sprang into the air and flew about, low and erratically, for some moments. Then it descended in a field and was neither heard nor seen again. The performance was very reminiscent of the "flight song".

I have never heard of similar Woodcock behaviour in the autumn and I am of the opinion that it is decidedly uncommon after the breeding season. It is possible that the bird in question was an immature male and the performance could be classed in the same category as the occasionally heard autumn songs of other species.—VICTOR E. GOULD.

BOOK REVIEWS

REPTILES, AMPHIBIANS AND FISHES. *By C. W. G. Eifrig. 249 pp. Illus. Glossary, Index. Rand McNally and Co., 1930.*

This book has the advantages of being well illustrated and of sticking to a limited group of vertebrates. As interesting supplementary reading for school use, it has much to recommend it, though the field-man going to it in search of a definite fact, is apt to be disappointed. The sections dealing with snakes and fishes are admirable in many ways, as is that on frogs. The salamanders are somewhat inadequately treated, however. Useful hints for aquarium and terrarium lovers are found together with a glossary of technical terms and unusual expressions in the back of the volume. The book is frankly aimed at the public schools of the United States, but Canada is by no means ignored as is so often the case, even in more pretentious works on natural history. The amazing statement (on page 156) that the Saguenay has yielded soundings of five thousand feet sent me scurrying for the encyclopedia, but no confirmation could be found. The greatest depth actually recorded is 1002 feet. Too bad! It would have been wonderful advertising stuff for the tourist agencies!—D.L.

the animal life in the park was not so much considered. Now that the large animals have disappeared from a great part of the country, the value of the great park is becoming apparent as a refuge for vanishing species and a source from which other parks and depleted regions may be restocked. The great and increasing public which is becoming interested in natural history enjoys seeing these large animals which are seldom observed elsewhere as well as the chance of studying the smaller animals and birds which live here undisturbed by fear of firearms, traps, cats and dogs.

Practically all of the animal life of Yellowstone Park is native to the area, and the feeling is against the introduction of exotic species, either of animals or plants, although certain weeds and the English sparrows have crept in uninvited, and certain species of trout have been brought in to stock unoccupied streams and lakes and maintain good fishing.

The author, who is known to most of our readers for his natural history articles and his various Biological Survey monographs of mammals, as well as his excellent work on the Mammals of Glacier National Park, Montana, has made good use of his own notes made during six different seasons of field work in Yellowstone Park, from 1894 to 1926, and has had access to numerous reports in the Biological Survey files.

After a short historical introduction, another short chapter is devoted to the Life Zones of Yellowstone Park, which run through Upper Sonoran, Transition, Canadian and Hudsonian, to the Arctic-Alpine. The most characteristic species of plants, mammals, and birds of each zone are named.

Chapter III, Mammals of Yellowstone, pp. 16-187, takes up the greater part of the book, 65 species and subspecies being definitely recorded, and two more mentioned as of doubtful occurrence. That the notes on these mammals will be of interest to Canadian naturalists may be judged by the fact that 53 out of the 65 forms are found on our own Plains and Rocky Mountains, and

ANIMAL LIFE OF YELLOWSTONE NATIONAL PARK, *by Vernon Bailey, Chief Field Naturalist, United States Biological Survey. Charles C. Thomas, publisher. Springfield, Illinois, and Baltimore, Maryland. 1930. Pages 241, photographs 67, coloured plates 3, and life zone map 1. Cloth bound. \$4.00.*

Several books and many shorter articles have been written about the various phases, including the wild life, of Yellowstone Park, the first and probably the most famous national park in North America. Yellowstone Park has attracted much attention in the past on account of the remarkable geological and scenic features within its borders. During the time when large game animals were a common sight in many other parts of the West,

most of the others are represented in Canada by closely allied subspecies. Only three distinct species, a chipmunk, bear and ground squirrel,¹ mentioned in the list are not found in Canada, and these two are closely akin to Canadian species in appearance and habits. The Yellowstone Park region has been fairly worked over by collectors, and the author's determinations may be depended upon. In a book of this character he has wisely devoted most of his space to very interesting notes on life histories of all the species mentioned, including the historical ups and downs of the larger species of game animals since the present park area was known to white men. Mr. Bailey is one of the keenest living naturalists in the study of mammalian life habits and has a sympathetic insight into their psychology which always makes his observations interesting. The photographic illustrations are very well chosen and are reproduced very well on good paper.

Chapter IV, Birds of Yellowstone Park, pp. 188-228, is more brief, giving a running account of the species, followed by a brief systematic list of the 211 species which are resident, migrant, or breeding. The black rosy finch, gray-crowned rosy finch, and Hepburn's rosy finch (*Leucosticte*), which are all found in the park at some season, have their life histories treated in considerable detail. These three species of rosy finches are well delineated on one coloured plate by O. J. Murie. Mr. Murie's coloured frontispiece of a family of the Big Grizzly Bears of Yellowstone Park is also well done. The third coloured plate is of the Bald eagle by the late Robert Ridgway.

Chapter V devotes two pages to brief mention of the most important species of fish, and refers to another publication, *Fishes of the Yellowstone Park*, by Hugh M. Smith and Wm. C. Kendall, Document No. 904 of the Bureau of Fisheries. Casual mention is made of 3 harmless snakes, 1 lizard, 1 pond turtle, 1 toad, 1 tree frog, 2 green frogs, and 1 salamander, mentioned in Skinner's *Yellowstone Nature Book*, and it is stated that several recent additions have been made, including a rubber snake. Invertebrates are very briefly mentioned in the single page of Chapter VI, which suggests that much remains to be learned in an outdoor laboratory of such magnitude as is offered by the park.

The book is clearly, simply, and readably written, and is well worthy of study by any person interested in the wild life of the Rocky Mountains region, and it should have a place in all scientific libraries.—R. M. ANDERSON, *National Museum of Canada*.

¹ *Eutamias umbrinus* (Allen), Uinta Chipmunk, *Citellus armatus* (Kennicott), Uinta Ground Squirrel, and *Ursus mirus* Merriam Small Yellowstone Park Grizzly.

NATURE NARRATIVES. By Austin H. Clark. Baltimore: Williams and Wilkins Co. 1929. 135 pages.

An interesting little volume, filled with a surprising amount of information about many and various kinds of animals. The Spiny Ant-eater, intoxicated sharks, perfumed butterflies, carnivorous plants, diatoms, all come in for their share of attention. It should make excellent supplementary reading in Nature Study and it is only reasonable to predict that "the author's hope that a perusal of the following pages will stimulate the reader to delve further into the subject of biology" will in many cases be realized.—D.L.

THE CARCASSES OF THE MAMMOTH AND RHINOCEROS FOUND IN THE FROZEN GROUND OF SIBERIA. By I. P. Tolmachoff. Reprinted from *Transactions of the American Philosophical Society. New Series, Volume XXIII, Part I, Article I, pp. 1-74, 1929.*

Probably no other savant is so well prepared as Dr. Tolmachoff to discuss and summarize the voluminous literature relating to these interesting remnants of an extinct fauna. The bibliography which the author has prepared lists 87 titles. His extensive journeys in northern Siberia which have acquainted him with the geology of the deposits holding these frost-conserved fossils peculiarly fit him to evaluate the conditions under which certain mammoth carcasses were frozen and preserved perfectly enough to permit trappers to use the meat for bait and dog feed.

The average reader of this interesting paper will be surprised to learn that hunting mammoth ivory has been an important industry in Siberia for centuries. Peter the Great was interested in the remains of the mammoth and issued a decree to find out to what animal the "mammoth horns" belonged. The views of travellers and scientists concerning the cause of the extinction of the great beasts which produced the ivory of northern Siberia are critically examined and the folk-lore concerning them is not neglected. When a boy in Russia, Dr. Tolmachoff was told that the northern elephants being too large to travel in Noah's ark had to be left behind and so perished from the earth because of their great size. Some Chinese writers held that the mammoth ivory belonged to animals having a habit of life similar to moles which could not live on the surface of the earth and speedily died when they burrowed through to the surface.

The commercial importance of fossil ivory has been and is still far from negligible. Owing to

its ivory the mammoth became known a very long time ago. "The first mention of the mammoth is found in Chinese ceremonial books of the fourth century B.C. It was certainly connected with fossil ivory brought from Siberia to China at that remote time. There are later records of fossil ivory exported from Russia to Southern Europe and Central Asia in the tenth century. The throne of the Great Mogul Khan Kuyuk was made presumably of Siberian ivory, which shows that in the thirteenth century fossil ivory was known in Mongolia in large amounts. There are no exact data as to the export of Siberian ivory to China, but, probably since the old days, this commerce was carried on for centuries in a very regular way. For the last two centuries this trade has been carried on quite regularly, giving the local population a very decent income. Being important economically this industry has contributed very much to the accumulation of information about the mammoth.

The first direct mention of a frozen mammoth carcass, Dr. Tolmachoff credits to Ides who as an envoy of Peter the Great to China travelled through Siberia in 1686 with a man who had found a frozen foot with the girth of a man, and the head of a mammoth. The first carcass of a mammoth to supply remnants to a Museum was found in 1799 in the delta of the Lena river. Parts of this including the short 10-inch tail and ears over ten inches long were described by the zoologist Adams. The most important mammoth discovery was made in 1900 in Northeastern Siberia on the Beresovca river. This find, known as the Beresovca mammoth, disclosed an animal with a tail much shorter than that of the Indian elephant, but much thicker in its basal part. Connected with the tail the mammoth had a peculiar cover of the anus in the form of a fold of the skin. Differing from other elephants the feet of the mammoth had only four toes each. The spiral-like tusks were not turned towards the outside, but had their ends directed inwards and downwards." All the mammoth restorations made previous to this discovery shows the tusks pointing outwards. In 1906 an island north of Siberia furnished a head preserving a trunk about seven feet long.

A perfectly preserved rhinoceros carcass was found in latitude 68°30' showing the skin and hair. Thirty-nine of the recorded discoveries of carcasses Dr. Tolmachoff states refer to the mammoth and five to the rhinoceros. It is suggested that this ratio is due not alone to the greater abundance of the mammoth and its interest to the ivory hunter, but to the different habits of the two, the mammoth like the modern elephant

being gregarious and the rhinoceros preferring solitude.

In western Siberia the mammoth (*Elephas primigenius* Glum.) ranges from 45° to the extreme north shore. In eastern Siberia they occur as far north as 76°47' increasing in abundance toward the north. It may be noted here that they have been found equally far north in the Canadian Arctic Archipelago (Kindle, American Journal Sci., 8: 183-5, 1924, figs. 1-3). Tusks were formerly so abundant in the New Siberian Islands as to make them a veritable mammoth cemetery and ivory mine. Although having an east-west range from the Pyrenees Mountains to the Pacific they are absent or very rare in the Scandinavian peninsula. This distribution is explained as a result of the fact that Northeastern Siberia was never glaciated, while the Scandinavian ice caps excluded the mammoth from that part of Europe.

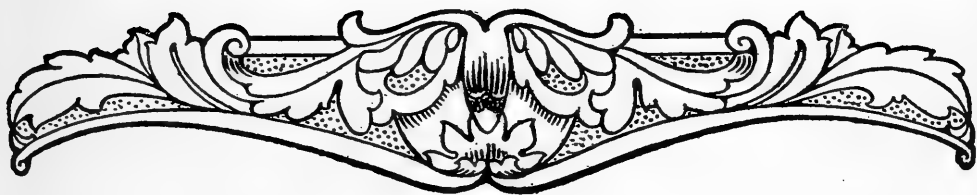
The conclusion of Dr. Tolmachoff that the mammoth lived in a climate not greatly differing from that of the present seems well supported by such significant facts as the perfect preservation of the soft parts and even the blood of certain carcasses which must have been frozen soon after the death of the animals. He suggests that winter food may have been procured in a more southern zone than the northern tundra in a sparsely forested region by migrating a few hundred miles as the reindeer does.

The mammoth carcasses may occur, according to Tolmachoff, in the vicinity of "rock-ice" or ground ice but never in it. The best finds have generally been in the higher parts of the tundra and near its surface, and all of them belong in the opinion of Tolmachoff to the Post-glacial epoch. Toll considers one bed of rock ice in the New Siberian Isles a remnant of a Glacial ice sheet, while Vollosovich claims that mammoth remains occur between this and a later bed of ground ice presumed to be connected with a second Glacial epoch. This opinion Tolmachoff, like other Siberian explorers, does not accept and insists that Toll's view of the glacial nature of "rock ice" must be completely abandoned. Quite correctly Tolmachoff holds that no single theory is adequate to explain all the varieties or types of ground ice. The reviewer would add that no discussion of ground or "rock ice" in situations such as the New Siberian Islands and the Siberian Arctic coast should overlook the observations made, long ago by Dease and Simpson (Geographical Journal, volume 8, pp. 218, 220), that in the shallow sea on the Arctic coast of America the bottom freezes and does not thaw out so soon in spring as the surface of the land. This rela-

tively late thawing of shallow sea ice affords abundant opportunity for its burial by stream dumped sediments in early spring floods and for its occasional preservation as ground ice.

The preservation of the carcasses by freezing Tolmachoff credits chiefly to the agency of mud

flows which in late summer covered bogged animals and which, frozen by the winter cold, prepared the animals for indefinite refrigeration. Photographs taken by the Canadian Arctic Expedition on the Arctic coast show well the considerable volume of sediments which may be moved in summer by these mud flows.—E. M. KINDLE.



Canada North of Fifty-six

By DR. E. M. KINDLE

(This article won the \$1000 prize donated by the late Sir Wm. H. Price)

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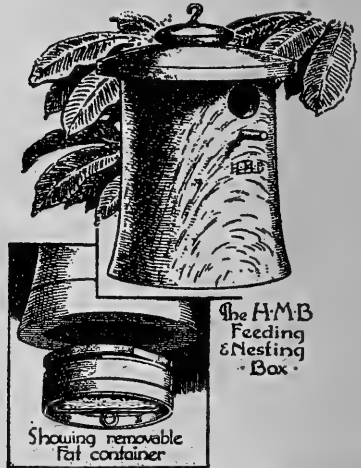
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CONTENTS

	PAGE
Some Plants of the Athabaska and Great Slave Lake Region By Francis Harper.....	97
Mating and Oviposition in <i>Pandalus danaë</i> . By Alfreda Berkeley Needler.....	107
Amphibia, Reptilia and Mammalia of the Temagami District, Ontario. By A. F. Coventry..	109
Notes on Birds of the Labrador Pensinsula in 1930. By Harrison F. Lewis.....	113
Esker at Tweed, Hastings County, Ontario. By M. E. Wilson.....	114
Contributions to the Knowledge of Extreme North-Eastern Labrador. By Bernhard Hantzsch	115
First Canadian Record of Least Brown Bat. By Eli Davis.....	118
Excursions of The Ottawa Field-Naturalists' Club, 1931.....	119
Annual Report, McIlwraith Ornithological Club, London, Ont., for the Year 1930.....	120
Members of the Ottawa Field-Naturalists' Club and Subscribers to <i>The Canadian Field-Naturalist</i> , May, 1931.....	120

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SOME PLANTS OF THE ATHABASKA AND GREAT SLAVE LAKE REGION

By FRANCIS HARPER



THIS paper forms part of my report as zoölogist of an expedition sent by the Geological Survey of Canada in 1914 to Great Slave Lake, with Charles Camsell as leader and geologist. On May 19 our party started downstream from Athabaska Landing, Alberta, reaching the Athabaska Delta on June 2. We remained about the western end of Lake Athabaska till June 24. On June 30 we left this lake at about its northernmost point, traveling in canoes by way of the previously unexplored Tazin and Taltson Rivers to Great Slave Lake, which we reached on August 15. The return journey was made up the Slave and Athabaska Rivers. From September 7 to 12 I made a side trip by horseback into the Wood Buffalo range from Fort Smith, going for a distance of about 35 miles southward from that post. We arrived once more at Athabaska Landing on October 10.

The plants collected during the course of the expedition were identified in part by the late James M. Macoun, but mainly by Dr. M. O. Malte, of the National Herbarium, National Museum of Canada. The help thus given is gratefully acknowledged.¹

In the following list the localities and dates of the specimens collected are mentioned first. Then follow, in some cases, additional notes on such topics as distribution, flowering and fruiting, and economic uses. A few local names are included in quotation marks.

Most of the localities between Lake Athabaska and Great Slave Lake, that are mentioned herein, may be found on one or the other of two maps accompanying papers by Camsell (1916) and myself (1931). The area so frequently referred to as the "Tazin Highlands" is defined in the last-mentioned paper. It is roughly triangular in shape, being bounded approximately on the west by the lower Taltson River valley and the upper Slave River valley, on the south by Lake Atha-

baska, and on the northeast by a line extending from near the east end of this lake through Hill Island Lake to Great Slave Lake at a point a little east of the mouth of the Taltson River.

It is only fitting that reference should be made here to previous botanical work in the Athabaska and Great Slave Lakes region. Our knowledge of its flora is due chiefly to the collecting zeal of such men as Sir John Richardson, John Macoun, James M. Macoun, J. W. Tyrrell, and Edward A. Preble. In his admirable summary of geographical and biological explorations in the Athabaska-Mackenzie region, Preble (1908, pp. 54-85) has supplied information concerning the botanical collections and reports made up to that time. His list (1908, pp. 515-534) of the trees and shrubs of the Athabaska-Mackenzie region includes not only his own records but many of previous workers. Another list of plants, which were collected or noted by Preble on a trip to the region northeast of Great Slave Lake in 1907, appears in Seton's *The Arctic Prairies* (1911, appendix E, pp. 328-338). In 1920, while working under the auspices of the United States Biological Survey, Hamilton M. Laing and I collected about 400 sheets of plants in the Athabaska Basin; these were turned over to the United States National Herbarium. In more recent years Dr. and Mrs. H. M. Raup have undertaken an extensive investigation of the vegetation of the Athabaska and Great Slave Lakes region, and their results have begun to appear (1928, 1930A, 1930B).

LIST OF SPECIES

Cladonia spp. REINDEER "MOSS".—Common on rocks in the Tazin Highlands. In some localities (such as Teseljiri Falls, Tthikethe Gorge, and below Napie Falls) it grows in luxuriant cream-coloured masses nearly a foot in depth.

Gyrophora spp. TRIPE DE ROCHE.—This mainstay of starving explorers grows very abundantly on the extensive rock exposures in the Tazin Highlands.

Usnea spp.—Much *Usnea* was noted along the

¹ In 1920, while in Washington, I borrowed the specimens for re-examination in connection with a forthcoming second trip to the region. I had assumed that the plants were then safely returned to Ottawa, and have only recently learned that they did not reach their destination. Unfortunately all trace of them now seems lost.

lower Slave River, and on spruces and pines in the Wood Buffalo range.

Sphagnum spp. SPHAGNUM MOSS.—Occurs generally throughout the region, and forms a dense, deep mat in all muskegs. In a Dogrib encampment on the lower Taltson River I noticed some sphagnum hanging up to dry in the bushes, and learned that it was used to pack about the babies in the bags that serve for cradles.

Polypodium virginianum L. POLYPODY.—Photographed at Teseljiri Falls, Tazin River. Apparently the same species noted at Tsalwor, Soulier, and Tsu Lakes.

Cryptogramma acrostichoides R. Br.—In muskeg, Hill Island Lake, July 16.

Thelypteris spinulosa (O. F. Müll.) Nieuwl.—Athabaska River at Pelican Portage, October 6.

Woodsia ilvensis (L.) R. Br.—Chipewyan, June 11.

Equisetum arvense L.—Taltson River below Napie Falls, August 2.

Equisetum pratense Ehrh.—Athabaska River at Calling River, May 20.

Equisetum sylvaticum L.—Hill Island Lake, July 15.

Equisetum fluviatile L.—Mouth of Taltson River, August 16.

Lycopodium annotinum L.—Mouth of Charlot River, June 28.

Lycopodium complanatum L.—Athabaska River at Pelican Portage, October 6.

Pinus Banksiana Lamb. JACK PINE.—This pine was found practically throughout the territory covered during the season. It flourishes especially on sandy soil, and yet, of all the trees of the region, it seems best able to maintain a foothold on the barest rocks. Though it lacks the symmetry of the spires of balsam, spruce, and tamarack, its furrowed bark and irregular, cone-laden branches give it an appearance of picturesque ruggedness and strength. Its green masses of needles impart a cheerful tone to the scenery that is scarcely given by the somber-hued spruces.

Along the Athabaska River the jack pine usually appears on top of the ridges that border the steep-sided valley. Throughout the greater part of the Tazin Highlands it seems to be the predominant conifer, since it thrives better than the others on scanty soil. It was noticed that young jack pines were growing up in a number of areas that had been fire-swept. Many saplings have their tops gnawed off by Snowshoe Rabbits, the damage doubtless being done when the snow is deep.

Along the Tazin River are many fine groves, some of the trees attaining a height of 50 feet and a diameter of a foot. On some of the barest of

the rocky hills, however, the trees are considerably stunted. Along the border of the Hudsonian Zone, in the vicinity of Hill Island Lake and Soulier Lake, the maximum height seems to be about 35 or 40 feet, and the maximum diameter 8 or 9 inches. Perhaps the finest specimens seen during the trip were growing on a level area at the junction of the Tazin and Taltson Rivers; some of them reached a height of 60 or 70 feet, and were over a foot in diameter. Along the lower course of the Taltson River, below its junction with the Tethul River, this species is generally seen on the occasional rock outcrops, being less common there than farther upstream, in the Tazin Highlands.

There is comparatively little pine along the Slave River below Fort Smith. In the vicinity of this post, however, it is common, and in the Wood Buffalo country to the southward it occurs in almost pure stands on sandy ridges.

The straight, slender trunks of young trees (especially those from thick groves) make excellent tent-poles, and are commonly used by the natives for the conical framework of their tipis. Of all the trees of the region, doubtless the jack pine makes the best firewood.

Larix laricina (Du Roi) Koch. TAMARACK.—The graceful tamarack, though distributed throughout the wooded region, is much less common than the jack pine and the spruces. It is found not only in muskegs and other swampy places, but to some extent on drier ground as well.

It was noted at several places along the Athabaska, from Pelican Portage to a few miles below McMurray; at Chipewyan; between Lake Athabaska and Thluicho Lake (where it reaches a height of about 70 feet); at Soulier Lake; along Tazin River above Nettell Falls; along the lower Taltson River; at Resolution; in extensive muskegs near Fort Smith; and in the Wood Buffalo range.

Picea canadensis (Mill.) BSP. WHITE SPRUCE. (Figs. 1, 2).—This widely distributed conifer is the largest and doubtless the most important tree of the region. It was noted everywhere along the route we covered. On the steep sides of the Saskatchewan Valley below Edmonton it appears in scattered clumps among the predominant deciduous growth of poplar and birch. In the Athabaska and Slave River valleys it is much more abundant than the jack pine. Along the lower Athabaska some of the white spruces have trunks a yard in diameter and easily overtop the rest of the forest. Along the lower Slave River this species makes up by far the greater part of the practically unbroken forest stretching away on each side. It is much used as firewood

on the river steamers. In time, with the improvement of transportation facilities in the region, it will probably be exploited as a source of supply for the pulp and paper industries, as suggested by Macoun and Malte (1917, p. 4).

In the Tazin Highlands the trees are considerably smaller, comparatively few of them reaching a height of more than 60 feet. During our descent of the Taltson River the white spruces first appeared noticeably larger between Twin Gorges and Tsu Lake, and continued to show some increase in size as we proceeded to the mouth of the river.

Picea mariana (Mill.) BSP. BLACK SPRUCE (Fig. 3).—This species was found in muskegs along the Athabaska River, from Middle Rapid to the vicinity of McKay. Along our route from Lake Athabaska to Tazin Lake, and thence down the Tazin River to its junction with the Taltson, the black spruce was quite common. Though its usual habitat is in muskegs, it was frequently found here on very dry, rocky hills, where lichens thickly covered the ground. On some of the hills along the river below Nolan Falls it was so abundant as practically to replace the jack pine. In

several places along the trail from Fort Smith into the Wood Buffalo range, I noticed this species growing in muskegs.

The black spruce generally has a scraggly, bushy top that serves to distinguish it at a distance from the more symmetrical white spruce.

Abies balsamea (L.) Mill. BALSAM FIR.—This beautiful conifer was found rather commonly along the Athabaska River, from Calling River to within 40 miles of Lake Athabaska.

Juniperus communis L. var. *depressa* Pursh. LOW JUNIPER.—Chipewyan, June 10; Grand Rapids, October 1. Also noted along the lower Athabaska River, at Thluicho Lake, Hill Island Lake, Soulier Lake, Taltson River near junction with Tazin River, and mouth of Taltson River.

Juniperus horizontalis Moench. CREEPING JUNIPER.—Chipewyan, June 10. Also noted along Tazin River at Tthikethe Gorge, at mouth of Taltson River, and along Salt River and one of its brackish tributaries.

Typha latifolia L. CAT-TAIL.—Noted in a muskeg pond near Athabaska River 10 miles below McMurray; at mouth of Taltson River; on Slave



FIGURE 1—Junction of the Tazin and Taltson Rivers, Mackenzie

July 31, 1914.

Photo. by Francis Harper.

River delta; at salt lick in Wood Buffalo range; and in marshes of Athabaska Delta.

Potamogeton Richardsonii (Benn.) Rydb.—Hill Island Lake, July 15. Apparently the same species noted in Tazin River below Nolan Falls; in Taltson River below Tethul River; at mouth of Taltson River; and in Great Slave Lake a few miles farther west.

Najas flexilis (Willd.) Rostk. & Schmidt.—Hill Island Lake, July 15.

Triglochin maritima L.—Taltson River above junction with Tazin River, July 31; near Salt River, south of Fort Smith, September 12.

Sagittaria cuneata Sheld.—Bay east of mouth of Taltson River, August 18.

Phragmites communis Trin. REED.—Abundant in marshes of the Athabaska Delta.

Calla palustris L. WATER ARUM.—Muskeg pond near Athabaska River, 10 miles below McMurray, May 30.

Juncus balticus Willd.—Salt lick in Wood Buffalo range, September 9.

Allium sibiricum L.—Mouth of Charlot River, June 28; Athabaska River above Mountain Rapid, September 24. Noted commonly along the Athabaska from McMurray to the vicinity of House River, and still in bloom as late as October 3.

Smilacina trifolia (L.) Desf.—Common in muskeg south of Thluicho Lake, July 3.

Maianthemum canadense Desf. TWO-LEAVED SOLOMON'S SEAL.—Chipewyan, June 10 and 18; Athabaska River at Pelican Portage, October 5.

Disporum trachycarpum (S. Wats.) B. & H.—North bank of Saskatchewan River, Edmonton, May 17.

Sisyrinchium mucronatum Michx.—Athabaska River at Pelican Portage, October 6.

Cypripedium passerinum Richards.—Low, willow-grown island 3 miles west of mouth of Taltson River, Great Slave Lake, August 19.

Habenaria hyperborea (L.) R. Br.—Slave River, 10 miles below Salt River, September 3.

Calypso bulbosa (L.) Oakes.—Chipewyan, June 10.

Salix interior Rowlee. SAND-BAR WILLOW.²—Athabaska River near Crooked Rapid, September 26.

Populus tremuloides Michx. ASPEN POPLAR; QUAKING ASPEN; "WHITE POPLAR".—This is one of the most abundant and most widely distributed trees of the entire region. It grows generally on hills or on dry soil in valleys, apparently avoiding low, damp ground. By May 18, between Edmonton and Athabaska Landing, this

species was well leaved out, being further advanced than the balsam poplar. On the island at McMurray there was an especially fine grove of aspen poplar, the trees growing to 90 feet or perhaps higher. In the Tazin Highlands the species is abundant and almost universally distributed, but does not attain a large size, the maximum height being 40 or 50 feet. It also grows extensively along the lower Taltson and Slave Rivers. In the Wood Buffalo range I saw specimens of both species of poplar that were about 75 or 80 feet high and nearly two feet in diameter.

By September 8, in the vicinity of Salt River, the leaves had become yellow. At this season, too, some of the foliage had taken on a delicate lilac hue. In late September the colours of the aspen poplar and the white spruce exhibited a striking contrast on the sides of the Athabaska Valley above McMurray, where these two are the predominant trees; the poplars formed a great expanse of bright yellow, in which the somber green spruces appeared as dark patches. By October 9 the poplars had shed their leaves for the most part.

The smoke from the aspen poplar is decidedly irritating to the eyes. Consequently the use of this species for the camp fire is avoided when other wood is available.

Populus balsamifera L. BALSAM POPLAR; "BLACK POPLAR".—This attractive poplar was noted throughout the territory we covered during the season. It is found especially along river banks and lake shores, and its place here might be compared to that of the sycamore along water-courses in the Eastern States. It grows commonly on alluvial soil, such as the deltas of the Athabaska and Slave Rivers, where the other poplar of the region (*P. tremuloides*) is scarcely found. Its trunk is straighter and its branches are much more symmetrical than those of the aspen poplar. Large specimens of the balsam poplar also have rougher bark. Its buds taste gummy, while those of the aspen poplar are bitter. By May 16, at Edmonton, leaves were about half-grown, and by May 24, at Grand Rapids, they were over two inches long. In the wind the leaves of this species turn up, exposing their light-coloured under surfaces, more than do those of the aspen poplar.

In the Tazin Highlands the balsam poplar is much less common than in the valleys of the Athabaska and Slave Rivers. It also becomes somewhat stunted there, no trees more than about 30 feet in height having been noticed. In a number of places small specimens, no more than six or eight feet high, were found growing apart

² Many specimens of other willows were collected at various points along the route of the expedition, but they were not identified before the collection disappeared.



FIGURE 2.—South Shore of Great Slave Lake at Grant Point, Mackenzie, ten miles west of Taltson River

August 20, 1914.

Photo. by Francis Harper.

from other trees well out on the sandy or gravelly beaches of lakes.

In the Wood Buffalo range south of Fort Smith the species is abundant, and attains a height of 75 or 80 feet and a diameter of nearly two feet. Others of about equal size were noted at Pelican Portage on the Athabaska. In the vicinity of Fort Smith the leaves had turned yellow and russet brown by September 7.

The trunks of young trees make excellent ridge-poles for tents.

Myrica Gale L. SWEET GALE.—Mouth of Charlot River, June 28; Hill Island Lake, July 15; Tsu Lake, August 9. This fragrant shrub was also noted at Tsalwor Lake, Tazin Lake, and junction of Tazin and Taltson Rivers. It was generally found by the shores of lakes or streams.

Betula papyrifera Marsh. CANOE BIRCH.—This is a common tree nearly everywhere in the territory covered during the season—along the Saskatchewan at Edmonton, and throughout the valleys of the Athabaska, Tazin, Taltson, and Slave Rivers. It grows in a variety of situations, from rocky hills to low, sandy shores. In the Tazin Highlands it reaches a fair size (40 feet or so) in favourable spots, but remains rather stunted

in exposed, rocky places. By August 6, in the vicinity of Tsu Lake, the leaves on some of the trees were showing a tendency to turn yellow. By October 9, in the vicinity of Calling River, the birches had shed their leaves for the most part.

I noticed birch-bark canoes on Lake Athabaska and on the lower Taltson River. A large proportion of the natives, however, were using factory-made canoes, or even rowboats.

Betula glandulosa Michx. ? DWARF BIRCH.—Thluicho Lake, July 3; Tazin Lake, July 6. Also noted at Hill Island Lake and at Tthikethe Gorge on the Tazin River.

In the muskeg and prairie country immediately south of Fort Smith I found great quantities of dwarf birch. Here, on September 7, the leaves were russet and red. The species was also noted in the Wood Buffalo range.

Alnus crispa (Ait.) Pursh. GREEN ALDER.—Grand Rapids, May 24; mouth of Charlot River, June 28.

Alnus tenuifolia Nutt. RIVER ALDER.—Tazin Lake, July 6; Taltson River below Napie Falls, August 2. (Alders, of undetermined species, were noted at numerous other places.)

Geocaulon lividum (Richards.) Fernald.—Mouth

of Charlot River, June 28; Taltson River below Napie Falls, August 2. This interesting and distinctive little plant was noted at various places between Lake Athabaska and Great Slave Lake, including Tazin Lake, Thainka Lake, Hill Island Lake, junction of Tazin and Taltson Rivers, Tsu Lake, mouth of Taltson River, Mission Island, and Slave River at Grand Detour. The berries had become orange-red by the end of July. The species grows on rather dry ground.

Polygonum aviculare L.—In little pools on top of rocks, mouth of Taltson River, August 16.

Polygonum amphibium L.—Junction of Tazin and Taltson Rivers, July 30. Also noted in latter river between Naili Falls and Twin Gorges, and in Slave River at Grand Detour. In bloom, July 31 and August 3. When growing on the shore, the leaves are green, but those in the water are reddish or purplish.

Polygonum Muhlenbergii (Meisn.) Wats.—Athabaska River near Cascade Rapid, September 25.

Chenopodium capitatum (L.) Asch. STRAWBERRY BLIGHT.—Taltson River above Oracha Falls, August 13. Common along the banks of Slave River below Point Brûlée in August, and along Athabaska River near Pelican Portage in October.

Chenopodium album L.—Mouth of Taltson River, August 16; Slave River near Pointe Ennuyeuse, August 30.

Sagina nodosa (L.) Fenzl.—Mouth of Charlot River, June 28; Taltson River below Napie Falls, August 2.

Arenaria verna L. var. *propinqua* (Richards.) Fernald.—Tazin Lake, July 6.

Stellaria longipes Goldie var.—On rocks, Taltson River above Tsu Lake, August 6. ("This resembles *S. longipes* var. *læta* in colour of the foliage, but differs from it and *S. longipes* itself in having a pale capsule."—M. O. Malte.)

Stellaria longifolia Muhl.—Quatre Fourches marshes, June 17; Slave River at Grand Detour, September 2.

Nymphoanthus advena (Ait.) Fernald. YELLOW POND-LILY.—In muskeg pond near Athabaska River, 10 miles below McMurray, May 30. Also noted in muskeg ponds south of Thluicho Lake (buds opening, July 2) and near the outlet of Tazin Lake; and in Hill Island Lake (in bloom, July 16).

Ranunculus Purshii Richards.—Quatre Fourches marshes, June 17; in muskeg, Taltson River below Napie Falls, August 2.

Ranunculus lapponicus L.—In muskeg near Thluicho Lake, July 2.

Ranunculus reptans L.—Rocky shore, mouth of Charlot River, June 28; marshy shore, Taltson

River above its junction with the Tazin, July 31.

Ranunculus sceleratus L.—Resolution, August 22.

Anemone patens L. var. *Wolfgangiana* (Bess.) Koch.—Athabaska River at Calling River, May 20 (in bloom); Chipewyan, June 14; Fort Smith, September 6 (in bloom). Also noted at Thluicho Lake, Tazin Lake, junction of Tazin and Taltson Rivers, Tsu Lake, and Athabaska River near Middle Rapid. Some plants past bloom as early as June 10.

Anemone multifida Poir.—Chipewyan, June 18.

Anemone canadensis L.—Athabaska River near Crooked Rapid, September 26.

Caltha palustris L. MARSH MARIGOLD.—In bloom beside a muskeg pond near Athabaska River, 10 miles below McMurray, May 30.

Delphinium Brownii Rydb. LARKSPUR.—This beautiful species was common and in bloom in open places in the Wood Buffalo range south of Fort Smith, September 9 and 10, and near Salt River, September 12.

Actæa rubra (Ait.) Willd. RED BANE BERRY.—Mouth of Taltson River, August 16.

Corydalis sempervirens (L.) Pers. PALE CORYDALIS.—Tsalwor Lake, July 5. Apparently the same species noted at Hill Island Lake, below Soulier Lake (in brûlées), at Tsu Lake, and at mouth of Taltson River.

Corydalis aurea Willd. GOLDEN CORYDALIS.—Chipewyan, June 12; mouth of Charlot River, June 28.

Sisymbrium brachycarpon Richards.—Resolution, August 22.

Erysimum cheiranthoides L.—Mouth of Taltson River, August 16.

Barbarea stricta Andrz.—Mouth of Charlot River, June 28.

Arabis brachycarpa (T. & G.) Britton.—Mouth of Taltson River, August 16.

Saxifraga austromontana Wieg.—Chipewyan, June 10.

Saxifraga tricuspidata Rottb.—Mouth of Charlot River, June 28. Apparently the same species was noted at various other points between Lake Athabaska and Great Slave Lake, including Tazin, Hill Island, Soulier, and Tsu Lakes, and the mouth of the Taltson River.

Heuchera Richardsonii R. Br.—On rocks, Chipewyan, June 10 and 18.

Parnassia palustris L.—Taltson River below Twin Gorges, August 4. Also noted at lower points on this river and on an island off its mouth; on Slave River delta; and at Resolution. Everywhere in bloom (August 4 to 25).

Ribes oxycanthoides L. NORTHERN GOOSEBERRY.—Ripe gooseberries were found at Tthi-

kethe Gorge on the Tazin River on July 29, and later at Twin Gorges on the Taltson River and on islands at the mouth of this stream. The species grows abundantly in the clearing at Resolution, and bore ripe fruit in late August. It was also found in the Wood Buffalo range, and along the Athabaska near Middle Rapid and at Grand Rapids.

Ribes hudsonianum Richards. NORTHERN BLACK CURRANT.—Mouth of Taltson River, August 16; Athabaska River at Pelican Portage, October 6. Also noted in the vicinity of Salt River. Some of the ripe fruit, gathered on August 16, made a good sauce.

Ribes prostratum L'Her. SKUNK CURRANT.—Athabaska River, 5 miles below La Biche River, May 20. Also noted at Hill Island Lake and vicinity (with green fruit, July 14 and 16), and along Tazin River below Nolan Falls (with ripe fruit, July 27).

Ribes triste Pall. SWAMP RED CURRANT.—Grand Rapids, May 24.

Amelanchier alnifolia Nutt. NORTHWESTERN SERVICEBERRY; "SASKATOON".—Grand Rapids, May 24; McMurray, May 30. Also noted at Hill Island Lake, Soulier Lake, mouth of Taltson River, Wood Buffalo range, and various other points. On rocky ground at Chipewyan (June 10) and Tazin Lake (July 6), plants only about a foot high were in flower. Ripe fruit was first noted on July 27 (Tazin River at Nettell Falls). In the Tazin Highlands most of the plants seemed to be under two feet, though at Tsu Lake some were four or five feet high. The berries are edible but not delectable.

Fragaria cuneifolia Nutt. ? WILD STRAWBERRY.—Grand Rapids, May 24. Strawberries (of undetermined species) were also noted at the following points: Lake Athabaska near Slate Island; Tthikethe Gorge, Tazin River (ripe fruit, July 29); Tsu Lake; mouth of Taltson River; Mission Island; Grand Detour, Slave River; Wood Buffalo range; and Pelican Portage, Athabaska River.

Dryocallis corymbosa Rydb.—On cliff, Taltson River below Napie Falls, August 3.

Potentilla monspeliensis L.—Mouth of Charlot River, June 28.

Potentilla palustris (L.) Scop.—Muskeg pond near Athabaska River, 10 miles below McMurray, May 30; in marsh, Hill Island Lake, July 14. Also noted in muskeg pond south of Thluicho Lake, and near Salt River.

Potentilla fruticosa L. SHRUBBY CINQUEFOIL.—In muskeg, 5 miles south of Fort Smith, September 7. Also noted commonly along a brackish

tributary of Salt River and in the Wood Buffalo range.

Potentilla tridentata Ait. THREE-TOOTHED CINQUEFOIL.—Thainka Lake, July 11; Hill Island Lake, July 15.

Potentilla Anserina L.—Athabaska River near Mountain Rapid, September 24. Abundant on the river banks between this point and Athabaska Landing.

Potentilla quinquefolia Rydb. ?—Chipewyan, June 10; Tazin River at Tthikethe Gorge, July 29. ("These specimens seem to represent 3-foliolate forms of *P. quinquefolia*."—M. O. Malte.)

Potentilla glabella Rydb.—Taltson River below Tethul River, August 12.

Potentilla multifida L.—Tazin Lake, July 6.

Rubus melanolasius Focke. RED RASPBERRY.—Thluicho Lake, July 2; Tazin Lake, July 6; Athabaska River at Pelican Portage, October 6. The first ripe raspberries of the season were picked on July 27 along the Tazin River below Nolan Falls. The luscious fruit was also found at Tthikethe Gorge, Twin Gorges, Tsu Lake, and mouth of Taltson River. On August 20 some Indian women were gathering the berries near the mouth of Slave River. The species was noted later near Salt River, and along the Athabaska from Middle Rapid to Pelican Portage. A few ripe berries were found still clinging to the vines on October 4, 5, and 6. This raspberry grows on dry ground, and thrives on rocks but thinly covered with soil.

Rubus Chamæmoris L. CLOUDBERRY.—On July 1 and 2 the pretty white flowers of this little plant were conspicuous among the sphagnum in muskegs south of Thluicho Lake. On July 16 it was in fruit at Hill Island Lake. I heard it spoken of by the appropriate name of "muskeg berry".

Rubus pubescens Raf. DWARF RASPBERRY.—Woods on bank of Athabaska River, 10 miles below McMurray, May 30.

Rubus acaulis Michx.—Chipewyan, June 18; mouth of Charlot River, June 28.

Rosa acicularis Lindl. WILD ROSE.—Chipewyan, June 16 (first blossoms noted). One of the commonest and most widely distributed shrubs of the region. Noted at Edmonton; Athabaska River at Pelican Portage, Grand Rapids, and McMurray; Thluicho Lake; Hill Island Lake; Tazin River at Tthikethe Gorge; Tsu Lake; mouth of Taltson River; Slave River at Grand Detour; Smith Portage; Wood Buffalo range (especially abundant); and various other points.

Prunus pennsylvanica L. f. WILD RED CHERRY.—Grand Rapids, May 24; McMurray, May 29; Thluicho Lake, July 2; Athabaska River at Pelican Portage, October 5. Apparently the

same species noted at Tazin Lake (a foot-high plant in flower, July 6) and Tsu Lake.

Astragalus adsurgens Pall.—Wood Buffalo range south of Fort Smith, September 10.

Astragalus tenellus Pursh.—Salt River, September 8.

Oxytropis Lamberti Pursh.—Salt River, September 8.

Hedysarum boreale Nutt.—Wood Buffalo range south of Fort Smith, September 10.

Vicia americana Muhl. VETCH.—Taltson River below Tethul River, August 11.

Vicia americana Muhl. var. *truncata* (Nutt.) Brewer. VETCH.—McMurray, September 23.

Lathyrus ochroleucus Hook.—Chipewyan, June 10 and 18; Wood Buffalo range south of Fort Smith, September 10. Also noted at several places along the Athabaska from McMurray to Pelican Portage, and at Edmonton.

Geranium Bicknellii Britton.—Athabaska River near Pelican River, October 6.

Callitriche palustris L.—Taltson River at mouth of Pierrot Creek, August 15.

Empetrum nigrum L. CROWBERRY.—Mouth of Charlot River, June 28; Tazin Lake, July 8. Also noted at Hill Island Lake, Soulier Lake (with dark berries, July 18), and mouth of Taltson River.

Viola adunca Sm.—Edmonton, May 17.

Elæagnus argentea Pursh. SILVERBERRY.—Grand Rapids, October 1.

Shepherdia canadensis (L.) Nutt. CANADIAN BUFFALO-BERRY.—Edmonton, May 17; Thainka Lake, July 11; Tsu Lake, August 7. Also noted at Grand Rapids; Tazin River at Tthikethe Gorge (ripe berries, July 29); lower Taltson River and at its mouth; Resolution; Slave River at Grand Detour; Salt River; and Smith Portage.

Epilobium angustifolium L. FIREWEED.—Mouth of Charlot River, June 28; Tsalwor Lake, July 5; Athabaska River at Pelican Portage, October 6. Found in practically every locality we passed through, including Tazin Lake, Thainka Lake, Hill Island Lake, Soulier Lake, Tsu Lake, mouth of Taltson River, Resolution, Slave River at Grand Detour, Smith Portage, Wood Buffalo range, Athabaska River at Middle Rapid and Grand Rapids, and Edmonton. Especially noticeable in places that have been swept by fire. In bloom as late as August 31 (Slave River).

Epilobium glandulosum Lehm. var. *adenocaulon* (Haussk.) Fernald.—In marsh on island near mouth of Taltson River, August 19.

Myriophyllum exalbescens Fernald.—Bay near mouth of Taltson River, August 18.

Aralia nudicaulis L. WILD SARSAPARILLA.—

Grand Rapids, May 24; Chipewyan, June 10 and 18.

Cicuta maculata L. SPOTTED COWBANE.—Tazin River above Nettell Falls, July 27; marsh near mouth of Taltson River, August 18.

Sium suave Walt. ? WATER PARSNIP.—Quatre Fourches marshes, June 17. Also noted in Taltson River between Naili Falls and Twin Gorges, August 3 and 4.

Cornus canadensis L. BUNCHBERRY.—Chipewyan, June 10 and 18. One of the most abundant and attractive of the smaller plants of the region. Noted in many places between Athabaska and Great Slave Lakes, including Thluicho Lake, Tazin Lake, Thainka Lake, Hill Island Lake, Soulier Lake, junction of Tazin and Taltson Rivers, Smith Portage, and Wood Buffalo range; also along Athabaska River below McKay, at Middle Rapid, Grand Rapids, and Pelican Portage. In bloom as late as August 17 (mouth of Taltson River), but with red berries as early as August 9 (Tsu Lake).

Cornus stolonifera Michx. var. *riparia* Rydb. RED-OSIER DOGWOOD.—Edmonton, May 17; mouth of Taltson River, August 16; Slave River delta, August 26. Also noted in many places along the Athabaska River (including Pelican Portage, House River, Grand Rapids, Middle Rapid, McMurray, and below McKay); also common along Slave River. Here and there it forms a considerable proportion of the undergrowth along the banks of these rivers, but it is less common on higher land. At Grand Rapids it reaches a height of 8 or 10 feet. In bloom as late as September 3 (Slave River).

Pyrola secunda L.—Tazin River near Nettell Falls, July 27; Grand Rapids, October 1.

Pyrola grandiflora Rad.—In woods, mouth of Charlot River, June 28; Thluicho Lake, July 3.

Ledum grænelandicum Oeder. LABRADOR TEA.—Calling River, May 20; Chipewyan, June 20 (first noted in bloom); mouth of Charlot River, June 28. Also noted along Athabaska River at Middle Rapid and below McKay; in many places along our route northward from Lake Athabaska, including Tazin Lake, Thainka Lake, Hill Island Lake (past bloom, July 17), Soulier Lake, Twin Gorges, and mouth of Taltson River; Resolution; and Wood Buffalo range. In early July great beds of the white flowers make a showy spectacle. Found in practically all muskegs, and sometimes on drier ground.

Ledum palustre L. NARROW-LEAVED LABRADOR TEA.—In muskeg (with *L. grænelandicum*), Hill Island Lake, July 16; Soulier Lake, July 22. Occurs chiefly in the Hudsonian Zone and northward.

Andromeda Polifolia L.—In muskeg, Thainka Lake, July 11.

Arctostaphylos Uva-ursi (L.) Spreng. BEARBERRY.—Calling River, May 20; Chipewyan, June 10. This little evergreen occurs nearly everywhere in the region. Noted commonly along Athabaska River; at many places along our route northward from Lake Athabaska, including Tazin Lake, Thainka Lake, Soulier Lake, junction of Tazin and Taltson Rivers, and mouth of Taltson River; at Resolution and Smith Portage. On May 30 the plants bore lovely little white flowers, with pink tips, and also fruit of the previous year. Green berries were noted from July 17 (Hill Island Lake) to August 9 (Tsu Lake). Red berries were found on September 10 (Wood Buffalo range).

The species flourishes particularly in rather open places on sandy soil. It is nearly always associated with jack pine on sandy ridges, where it forms a dense green carpet of very inviting appearance. The berries seem to be a favourite food of the Black Bear.

Arctostaphylos alpina (L.) Spreng. ALPINE BEARBERRY.—Common in muskegs near Thluicho Lake, July 2. Also noted at Resolution, and from Fort Smith southward into the Wood Buffalo range (leaves turned a very deep red, September 7).

Vaccinium canadense Kalm. CANADA BLUEBERRY.—Tazin Lake, July 6.

Vaccinium uliginosum L. BOG BILBERRY.—Thainka Lake, July 11; mouth of Taltson River, August 16.

Vaccinium Vitis-Idæa L. var. *minus* Lodd. MOUNTAIN CRANBERRY.—Mouth of Charlot River, June 28. Frequently noted in other places between Lake Athabaska and Great Slave Lake, including Tazin Lake, Hill Island Lake, Soulier Lake (both

green and red berries, July 22), junction of Tazin and Taltson Rivers, Taltson River below Tethul River, Resolution, and Wood Buffalo range; also Athabaska River at Middle Rapid. Frequently found in association with *Arctostaphylos Uva-ursi*, but perhaps less abundant.

Primula mistassinica Michx.—Mouth of Charlot River, June.

Androsace septentrionalis L.—Chipewyan, June 18.

Glaux maritima L.—Salt lick, Wood Buffalo range, September 9; along a brackish tributary of Salt River, September 12.

Apocynum androsæmifolium L. SPREADING DOGBANE.—Shore of Hill Island Lake, July 15. Apparently the same species noted at Soulier Lake and at Tthiketke Gorge, Tazin River.

Collomia linearis Nutt.—Lower Taltson River, August 12.

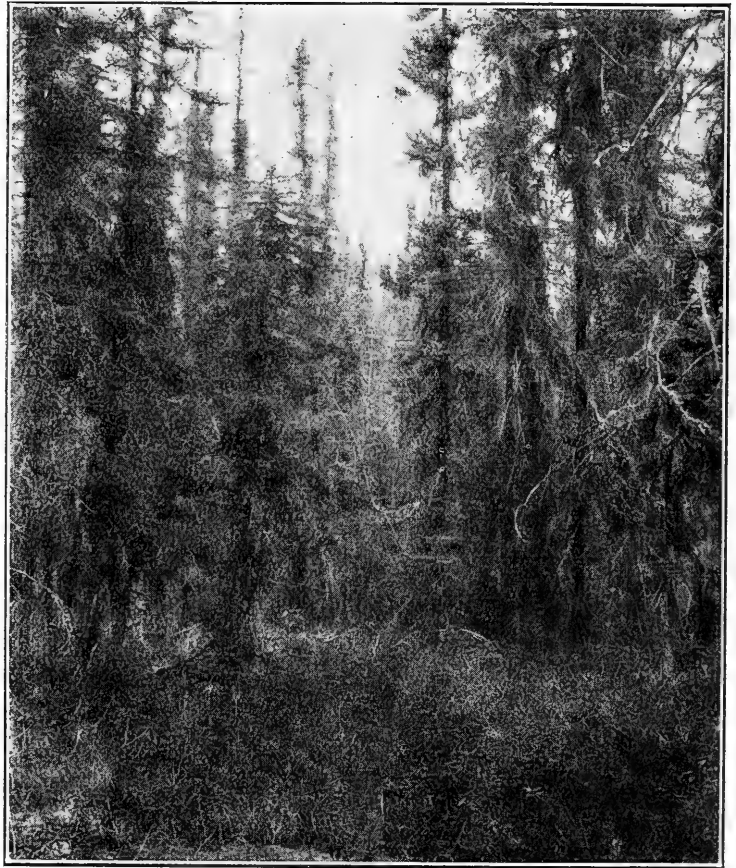


FIGURE 3—A muskeg on the east side of Athabaska River about ten miles below McKay, Alberta. Showing Black Spruce, Labrador Tea, and Sphagnum

May 31, 1914.

Photo. by Francis Harper

Phacelia Franklinii (R. Br.) Gray.—Chipewyan, June 18; Tsu Lake, August 9.

Mertensia paniculata (Ait.) G. Don.—Slave River at Grand Detour, September 2; McMurray, September 20.

Stachys palustris L.—Tsu Lake, August 6.

Mentha glabrior (Hook.) Rydb.—Hill Island Lake, July 16; Tazin River above Soulier Lake, July 18. Apparently the same species noted at Tsu Lake.

Veronica scutellata L. MARSH SPEEDWELL.—Near Salt River, September 8.

Castilleja pallida (L.) Spreng.—Mouth of Charlot River, June 28; Taltson River below Twin Gorges, August 4. Although the plant of this region goes currently under the name given above, Dr. F. W. Pennell, the specialist on Scrophulariaceæ, informs me that it does not represent the true *pallida* of eastern Asia.

Rhinanthus oblongifolius Fernald.—Mouth of Taltson River, August 16.

Utricularia intermedia Hayne.—Muskeg pond near Athabaska River, 10 miles below McMurray, May 30.

Plantago eriopoda Torr.—Salt River, south of Fort Smith, September 8.

Galium boreale L. NORTHERN BEDSTRAW.—Taltson River at Twin Gorges, August 4, and below Tethul River, August 11; Slave River at Grand Detour, September 2; Athabaska River below McKay, September 20, and at Pelican Portage, October 6.

Galium triflorum Michx. SWEET-SCENTED BEDSTRAW.—Athabaska River at Middle Rapid, September 27.

Lonicera glaucescens Rydb.—Calling River, May 20; Chipewyan, June 18; Wood Buffalo range, near Black Duck Lake, September 9.

Symphoricarpos albus (L.) Blake var. *pauciflorus* (Robbins) Blake. SNOWBERRY—McMurray, September 23; Athabaska River at Middle Rapid, September 27.

Symphoricarpos occidentalis Hook. WOLFBERRY.—Salt River, September 8; McMurray, September 23.

Linnæa borealis L. var. *americana* (Forbes) Rehder. TWINFLOWER.—Athabaska River below McKay, September 20; Grand Rapids, October 1. Also noted at Middle Rapid and Pelican Portage, Athabaska River.

Viburnum pauciflorum Raf. FEW-FLOWERED VIBURNUM.—Grand Rapids, May 24; Chipewyan, June 10; Tazin Lake, July 8. Also noted at many other points, including Tazin River above Hill Island Lake (with green berries, July 14), Soulier Lake, Tsu Lake (with red berries, August 9),

mouth of Taltson River, Mission Island, Slave River at Grand Detour, and Smith Portage.

Adoxa Moschatellina L.—Athabaska River, 5 or 6 miles below La Biche River, May 20.

Campanula rotundifolia L. HAREBELL.—Thluicho Lake, July 3 (in bloom). Also noted at various other places, including Hill Island Lake, Soulier Lake, junction of Tazin and Taltson Rivers, Tsu Lake, Mission Island, Wood Buffalo range, Smith Portage, and Athabaska River at Middle Rapid. In bloom at practically every point where observed, up to September 27. One of the loveliest of all the flowers of the region.

Aster Richardsonii Spreng.—Grand Rapids, October 1.

Aster Lindleyanus T. & G.—Taltson River below Tsu Lake, August 10, and below Tethul River, August 11.

Aster salicifolius Ait.—Tributary of Salt River, September 12; Athabaska River near Cascade Rapid, September 25, below Pointe La Biche, September 30, and below Pelican Rapid, October 4.

Erigeron purpureus Ait.—Athabaska River below Pelican Rapid, October 4.

Achillea lanulosa Nutt.—Chipewyan, June 10 and 18; mouth of Charlot River, June 28; Taltson River below Tethul River, August 11.

Achillea multiflora Hook.—Tsu Lake, August 9; Athabaska River near Brûlé Rapid, September 29.

Artemisia canadensis Michx.—Tazin River at Thikethe Gorge, July 29; junction of Tazin and Taltson Rivers, July 30; Taltson River below Napie Falls, August 2; Athabaska River at Middle Rapid, September 27.

Artemisia vulgaris L. var. *Tilesii* Ledeb.—Athabaska River near Cascade Rapid, September 25.

Artemisia frigida Willd.—Edmonton, May 17; Chipewyan, June 10; Salt River, September 8.

Petasites palmatus (Ait.) Gray.—In muskeg, Soulier Lake, July 20. Apparently the same species noted along Taltson River near Twin Gorges; at Fort Smith; in the Wood Buffalo range; and along the Athabaska River at Middle Rapid and Pelican Portage.

Petasites sagittatus (Pursh) Gray.—In muskeg, Taltson River below Napie Falls, August 2.

Taraxacum ceratophorum (Ledeb.) DC. DANDELION.—Chipewyan, June 16; Tazin Lake, July 6 (in seed here, July 8).

Hieracium umbellatum L.—Junction of Tazin and Taltson Rivers, July 31. Also noted at Tsu Lake, mouth of Taltson River, and Athabaska River near Cascade Rapid. In bloom, July 31 to September 25.

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LIST OF ILLUSTRATIONS

Fig. 1.—Junction of the Tazin and Taltson Rivers, Mackenzie, from the north. The rocky, sparsely timbered hills in the distance are very characteristic of the Tazin Highlands. The larger and heavier growth on a level area in the foreground includes jack pine (*Pinus Banksiana*), white spruce (*Picea canadensis*), black spruce (*Picea mariana*), canoe birch (*Betula papyrifera*), and aspen poplar (*Populus tremuloides*). July 31, 1914.

Fig. 2.—South shore of Great Slave Lake at Grant Point, Mackenzie, ten miles west of Taltson River. The trees on this rocky point are white spruce (*Picea canadensis*). August 20, 1914.

Fig. 3.—A muskeg on the east side of Athabasca River about ten miles below McKay, Alberta, with characteristic vegetation of black spruce (*Picea mariana*), Labrador tea (*Ledum granlandicum*), and sphagnum (*Sphagnum* sp.). May 31, 1914.

(Photographs reproduced by courtesy of the Geological Survey of Canada.)

MATING AND OVIPOSITION IN *PANDALUS DANÆ*²

By ALFREDA BERKELEY NEEDLER



IN THE British Columbian coast there are five species of shrimps that commonly occur in the markets. Four of these species belong to the genus *Pandalus* and one to the closely related genus *Pandalopsis*. Of the five, *Pandalus danæ* is the most important species near Vancouver and so was given most attention in the study of the life history of these forms. The following account deals with some observations made during the autumn of 1929 on one phase of the life history of *Pandalus danæ*, namely the mating and oviposition. The investigation was carried out at the Pacific Biological Station, Nanaimo, and thanks are due to the Biological Board of Canada for providing facilities for the work.

The accounts hitherto given of the mating and egg-laying habits of Decapods have been rather scanty. These habits have been described in some detail for various crayfish, for the American lobster, for the crabs *Carcinus moenas* and *Cancer pagurus*, and for the prawn *Atyephira compressa*. For this last species Ishikava (1885)² gives a short but good account of the process of oviposition, which appears to be similar to that of *Pandalus danæ*, but he does not mention the mating habits.

In order to study the mating habits of *Pandalus danæ*, a number of specimens were placed in aquarial tanks early in October. At this time the males have the organs of copulation on the first pleopods and the appendices masculinæ on

the second much enlarged and covered with heavy spines. This has been called the "active" male condition, and is a sign that the vasa deferentia are packed with ripe sperms. In the females the ovaries are filled with blue-green eggs and are very conspicuous through the clear integument.

About fifteen members of each sex were taken and at first the sexes were kept in separate tanks. When desired (usually after a female had moulted) a few males were placed in the tank with the females. In this way it was possible more conveniently to watch the entire process. Later, however, all the shrimps were kept together in one tank and their uncontrolled, presumably natural, actions were observed.

The process of mating and oviposition is always preceded by a moult on the part of the female. At this moult the pleopods develop the long numerous setae characteristic of ovigerous females. Sexually active males display no interest in hard-shelled females and practically none in soft-shelled ones that have not undergone this final moult before oviposition. On one occasion a female moulted in the tank but was not ready for egg deposition. For some hours afterwards the males showed more interest in this female than in her hard-shelled comrades, but made no attempt to mate. Thus it seems probable that some substance is secreted by all females (perhaps all shrimps) that have recently moulted, but that this is much stronger in those that are ready to mate.

If a sexually active male be placed in a tank where there is a female recently moulted ready for the ovigerous condition, his first reactions are similar to those shown in the presence of food. There is, to begin with, only a vague uneasiness,

¹ This work was carried out with the aid of a scholarship from the National Research Council.

² ISHIKAVA, C.—On the development of a freshwater crustacean *Atyephira compressa*, de Haan. *Quart. J. Micr. Sci.* 2, Ser. 25, 1885.

but in a little while the male begins to feel about in the water with the antennæ, the third maxillipeds and the first pereopods. He then advances, obviously feeling rather than seeing his way, towards the female and usually travels the last few inches very quickly. Having reached the female the male attempts to run up on her back. Frequently he is immediately shaken off by the female which is almost always larger than the male, but, if successful, he swings himself under her so that the anterior part of his abdomen is under the posterior part of her thorax. Sometimes the female rolls over and the two shrimps lie side by side. As a rule this mating process takes only from fifteen seconds to one minute, but on one occasion it lasted for fifteen minutes. After mating the female will be found to have a loose mass of sperms tucked in between the bases of the last two pairs of pereopods. A male examined just after mating will be found to have the organs of copulation on the first pair of pleopods hooked together by their cincinnuli, and the appendices masculinæ of the second pleopods lying in between. It is easy to see how these two pairs of appendices with their long spines serve very effectively to guide the sperms from the vasa deferentia to the thorax of the female.

As a rule the female moults at night, and, as far as could be ascertained, the eggs are usually laid about thirty-six hours after this moult. Evidently mating can take place any time within this thirty-six hours. One female moulted at 1.45 p.m. and was continuously watched from 9.00 the next morning until she laid her eggs. According to observations of other females it is believed that her actions were fairly typical, so that they will be described in some detail. The whole of the day after moulting this shrimp was very quiet, ate nothing, and only moved at intervals to clean herself. This cleaning was mainly devoted to the abdomen and pleopods, and was often accompanied by one or two circular movements of the last pair of pereopods similar to those made in oviposition. About 11.00 p.m. she assumed a vertical position clinging to one of the corners of the tank, and cleaned her pleopods more and more frequently. At 1.45 a.m. she suddenly descended to the floor of the tank and began the process of oviposition. The third pereopods were almost straight, so that the shrimp was perched on these pereopods, and the tip of the telson. Meantime the fourth and fifth pereopods were bent with their

tips held under the mid-line of the body. Throughout oviposition the fifth pereopods were in constant motion and the fourth also moved from time to time. This motion was very reminiscent of a man elbowing his way through a crowd and, presumably, is designed to help the eggs in their passage down the oviducts. The pleopods were also seen to move gently but continuously. After leaving the oviducts the eggs passed in a steady stream between the thoracic appendages to the abdomen, and were deposited on the anterior pleopods first. The whole process of oviposition occupied about half an hour, but it was almost another half hour before the female resumed an ordinary position and began to walk about the bottom of the tank.

It is believed that in the main the above would be the procedure followed in a state of nature, but obviously something was not quite right in the artificial environment. This was shown by the fact that none of the females succeeded in fixing the eggs to the pleopods, and they were always shaken off within an hour or two of laying. Ordinarily the eggs after deposition are surrounded by a clear membrane, threads of which attach them to each other and to the pleopods. Now this membrane of egg cement was not present round any of the eggs laid in captivity, and it is probable that some unfavourable condition prevented the action of the glands which usually secrete it. Just where these glands are situated and how they act is still a matter of conjecture.

In going from the oviducts at the base of the third pereopods to the abdomen the eggs would pass over the aforementioned mass of sperms tucked in between the bases of the fourth and fifth pereopods. Now each of these sperms is shaped something like a tin-tack with a three-rayed head, each ray ending in a soft mass of protoplasm, while the rest of the sperm is quite rigid. The sperms with their sharp points are easily collected by the eggs as the latter pass over them and the points tend to penetrate into the eggs. A number of eggs were examined after being laid and in many cases a sperm could be seen stuck into the egg. In most of these the contents of the sperm appeared to have passed into the egg leaving the somewhat collapsed "shell" on the outside. Owing to the large quantity of yolk material and consequent opacity of the egg, it was impossible to see more of the process of fertilization without sectioning the eggs.

AMPHIBIA, REPTILIA AND MAMMALIA OF THE TEMAGAMI DISTRICT, ONTARIO

By A. F. COVENTRY



THE NOTES that follow deal with the Amphibia, Reptilia and Mammalia found in the neighbourhood of Lake Temagami.

They are compiled from the results of several summers' observation and two summers' collecting, and it is probable that they give a fairly complete picture of the forms inhabiting the area under consideration; it is, however, not unlikely that further work will add a number of species to the list.

The area from which the data are drawn is practically continuously covered with untouched forest of the white pine belt, with here and there stretches of white birch and poplar, and in places yellow birch; there are some pure stands of red pine. Their area lies in the southern part of the Canadian Zone, but Alleghanian elements, such as elm and red oak, occur with some frequency. This feature has been noted by Soper.¹

Lakes and ponds of all sizes are numerous, but there are few permanent streams of any considerable size. The shores of the lakes are for the most part stony, and here and there sheer faces of rock rise some two hundred feet from a talus at the water's edge; locally there are sandy beaches, and the more sheltered bays are often muddy and reedy. The smaller ponds merge gradually into the bogs. A very usual type is a shallow sheet of water, held up by a beaver dam or otherwise, the bottom of which is deep, soft mud, and which is more or less completely surrounded by quaking bog. This condition leads naturally to marshes in which there is no permanent open water, or at most a meandering stream, and which are composed of a typical Sphagnum-Kalmia association. There are also numerous alder swamps, sometimes almost free from large timber, elsewhere heavily shaded.

It will be seen then that within the general uniformity of the area there is sufficient variety of detail to provide habitats for a considerable number of species such as may properly be expected in these environments.

AMPHIBIA

CAUDATA

Triturus viridescens viridescens (Rafinesque)
Newt.—One red land form taken in a pit on Island 315 in 1927; cannot be common.

Records marked by an asterisk (*) are supported by specimens in the Royal Ontario Museum of Zoology. All measurements are given in millimetres; L signifies total length, T length of tail vertebrae, H.F. length of hind foot.

**Ambystoma maculatum* (Shaw). SPOTTED SALAMANDER.—I have often found spawn at the heads of swampy bays that seems certainly to belong to this species, but I have not found the metamorphosed animal.

**Ambystoma jeffersonianum* (Green). JEFFERSON'S SALAMANDER.—Abundant on Island 758, which is about thirty acres in extent and sandy rather than rocky. Most specimens from this source are under five inches in length and all are more extensively marked with blue than specimens from southern Ontario.

**Plethodon cinereus* (Green). RED-BACKED SALAMANDER.—Common and variable in colour.

SALIENTIA

**Bufo americanus* Holbrook. COMMON TOAD.—Very abundant. The markings are generally more brilliant than those of southern Ontario specimens, often with well-developed red colouration. The head frequently has a shape that strongly suggests *Bufo fowleri* Garman. The adults leave the water after spawning about the middle of June, and may occasionally be heard singing as late as the end of August.

Hyla crucifer Wied. SPRING PEEPER.—Is heard singing during June in most quiet bays after sundown, and again sporadically in September.

**Rana septentrionalis* Baird. MINK FROG.—Apparently not common; identified specimens have been found in only two sites. One specimen was caught in a mousetrap about eight feet from the water's edge.

**Rana catesbiana* Shaw. BULLFROG.—Local in ponds with swampy margins.

**Rana clamitans* Latreille. GREEN FROG.—One of the commonest frogs about ponds, marshes and streams; in colour olive or brown rather than bright green.

**Rana pipiens* Schreber. LEOPARD FROG.—Abundant in marshes; always small and generally of a bright, almost metallic, green with bright yellow lateral ridges.

**Rana cantabrigensis* Baird. NORTHERN WOOD FROG.—Not uncommon in the bush during the summer. The adults have left the water after spawning by the first week in June.

REPTILIA

SERPENTES

Diadophis punctatus (Linnaeus). RING-NECKED SNAKE.—One specimen seen so far, in 1928.

Liopeltis vernalis (Harlan). GREEN SNAKE.—One specimen seen so far, in 1929.

**Thamnophis sirtalis sirtalis* (Linnaeus). GARTER SNAKE.—Not at all uncommon; of the usual type, sometimes with red markings. It appears to vary widely in abundance from year to year.

**Storeria occipito-maculata* (Storer). RED-BELLIED SNAKE.—One specimen, caught in 1930.

TESTUDINATA

**Chrysemys marginata marginata* (Agassiz). PAINTED TURTLE.—Occurs here and there in suitable localities.

Chelydra serpentina (Linnaeus). SNAPPING TURTLE.—Reported from various points in the area.

MAMMALIA

INSECTIVORA

**Condylura cristata* (Linnaeus). STAR-NOSED MOLE.—Only one specimen, found dead in a creek leaving a typical Kalmia-swamp to flow into the main lake. A specimen of this species is in the Royal Ontario Museum of Zoology from Kirkland Lake, some ninety miles further north.

**Sorex cinereus cinereus* Kerr. CINEREOUS SHREW.—Abundant. Average measurements of sixteen specimens collected in 1929 are: L., 91.5; T., 38.8; H.F., 11.4, figures notably smaller than those given by Anthony². Averages for seventeen specimens taken in 1930 are: L., 100.5; T., 41.5; H.F., 12.3; these correspond very closely with Anthony's² figures. The figures for the two seasons combined are: L., 96; T., 40.1; H.F., 11.8. The largest specimen taken in 1929 had a total length of 99.5; in 1930, 112. These shrews were much more abundant in 1929 and formed a constant element in catches, both in damp and dry localities; in 1930 they were less abundant and were almost limited to the damper places. It is possible that the marked differences in size are connected with this.

**Sorex palustris albibarbis* (Cope). WATER SHREW.—Taken at only one site, by the torrent draining Gull Lake near where it flows into Lake Temagami. Apparently not common or else hard to trap, since only two specimens were obtained by intensive trapping along the rocky, overgrown slope that constitutes the side of the valley close above the stream's edge. L., 148; T., 70; H.F., 19.

**Blarina brevicauda brevicauda* (Say). LARGE SHORT-TAILED SHREW.—Generally distributed. The average measurements of ten specimens are: L., 115.4; T., 22; H.F., 14.9; smaller in all respects than typical figures.

CHEIROPTERA

Myotis keenii septentrionalis (Trouessart). LITTLE BROWN BAT.—Taken once and identified by Dymond³.

CARNIVORA

Ursus americanus americanus (Pallas). BLACK BEAR.—Rarely seen in summer, but not uncommon. *Martes americana americana* (Turton). MARTEN.—Not common, and, according to trappers, of poor, pale colour.

Martes pennanti pennanti (Erxleben). FISHER.—Not common.

Mustela cicognani cicognani Bonaparte. BONA-PARTE WEASEL.—Seen occasionally.

Mustela vison vison Schreber. MINK.—Not rare. Sometimes, especially over food, this species will allow a very close approach. I have seen one dragging a lake trout of about three and a half pounds (taken from the fish-box at the water's edge) towards its den below a cedar root refuse to abandon its booty in spite of the approach of three men, one of whom tried to retain the fish by holding it against the ground with a canoe paddle.

Lutra canadensis canadensis (Schreber). OTTER.—Rare. I have seen slides on the Sturgeon River. *Mephitis mephitis mephitis* (Schreber). SKUNK.—Widely distributed but not common.

Vulpes fulva (Desmarest). RED FOX.—Not common.

Canis lycaon Schreber. TIMBER WOLF.—Not rare, especially farther away from Lake Temagami.

Lynx canadensis canadensis Kerr. LYNX.—Rare, but seen occasionally, even close to Lake Temagami.

RODENTIA

Marmota monax canadensis (Erxleben). WOOD-CHUCK.—Reported from New Liskeard and may occur near Temagami.

**Tamias striatus lysteri* (Richardson). EASTERN CHIPMUNK.—Not general; occurs in widely separated colonies throughout the area. Average measurements of three specimens: L., 239; T., 95; H.F., 33. The only other record of this form so far north appears to be that of Soper¹, who reports it from Hound Chutes on the Montreal River below Latchford; this is some ten miles farther north than Sandy Inlet, Lake Temagami, whence my specimens come.

Eutamias minimus borealis (Allen). WESTERN CHIPMUNK.—Seen on the road between North Bay and Temagami, and on the shore of the North Arm of the lake, but unfortunately not collected. Soper¹ reports it very scarce in the Reserve, and my observations confirm this.

**Sciurus hudsonicus gymnicus* Bangs. RED SQUIRREL.—Very common throughout the area. For the greater part of the summer each animal appears to dominate a definite region of bush to the exclusion of other individuals. Average measurements of eight specimens: L., 293; T., 113; H.F., 44.7.

**Glaucomys sabrinus sabrinus* (Shaw). NORTHERN FLYING SQUIRREL.—Apparently not uncommon; it has been observed a number of times on Islands 315 and 578, where it has been known to enter cabins in search of food. Settlers report seeing this form often in winter when felling trees for firewood. The average measurements of two specimens are: L., 272; T., 117; H.F., 34.

Castor canadensis canadensis Kuhl. BEAVER.—Nearly extinct in this area, in spite of attempts to re-establish itself. It is trapped out as soon as it reappears.

**Peromyscus maniculatus gracilis* ((LeConte). LECONTE WHITE-FOOTED MOUSE.—The commonest mouse, caught everywhere in both the brown and grey phases. The material collected is very considerably smaller than the typical measurements given by Osgood⁴, and shows leanings towards *P. m. maniculatus* (Wagner). It may be noted that for five grey-phase females the average measurements are: L., 165; T., 83; i.e. the tail slightly exceeds the body in length. The average measurements for twenty specimens are: L., 171; T., 83.7; H.F., 19.7. It is of interest that four grey-phase females were pregnant, though this colour is the "immature" of Anthony², the "adolescent" of Osgood. It is perhaps worth remarking that the average measurements over the two summers for eighteen males and twenty-two females show the males to be smaller than the females; females: L., 172.4; T., 84.2; H.F., 19.6; males: L., 164.1; T., 80.3; H.F., 19.8.

**Clethrionomys gapperi gapperi* (Vigors). RED-BACKED VOLE.—Seems to be generally distributed, but is more abundant in some spots than in others, notably on Island 578, some thirty acres in extent sandy and partly cleared, where it is the dominant mouse. The average of twenty-one specimens is: L., 133.1; T., 35.9; H.F., 18.4, i.e. small compared with Bailey's⁵ figures. My figures show a considerable difference in size between the sexes; the average of eight males is: L., 127.6; T., 34.9; H.F., 18.4; of thirteen females: L., 138.5; T., 37; H.F., 18.4. This form breeds at least well on into September.

**Microtus pennsylvanicus fontigenus* (Bangs). FOREST MEADOW MOUSE.—This species was collected by Soper¹ at one point, and he reports signs of it elsewhere. It is represented in my

collection by one immature specimen taken in 1929.

Microtus chrotorrhinus chrotorrhinus (Miller). YELLOW-CHEEKED VOLE.—Not abundant but apparently well distributed. The first specimens were taken at the same site as the Water Shrew, others later at points up to eight or ten miles away and across the main lake. In all seven were collected, four immature. The colouring of the Temagami specimens is typical; their measurements, compared with those given by Bailey⁶, are small: L., 147.7; T., 42.7; H.F., 19.7. The skull characters, especially those of *m2*, are decisive, making this the third record for Ontario. Saunders⁷ and Snyder⁸ have reported the two earlier finds.

**Zapus hudsonius hudsonius* (Zimmerman). MEADOW JUMPING MOUSE.—Not common, but taken in two widely separated spots. The average measurements of the two animals caught (both females) are: L., 205.5; T., 124.7; H.F., 31, i.e. considerably less than Preble's⁹ measurements. Soper¹ reports *Z. hudsonius* from a point a few miles north and west of Lake Temagami.

**Napæozapus insignis insignis* (Miller). WOODLAND JUMPING MOUSE.—Not common, but taken in three localities about the south end of the lake. The average of the measurements of five specimens is: L., 233; T., 146.3; H.F., 32.7, i.e. small compared with Preble's⁹ figures for this sub-species, except for the hind-foot. The skull characters indicate perhaps a slight leaning towards *N. i. abietorum*; the colours of the Temagami specimens are, however, much duller than those of *N. i. abietorum* from the Lake Nipigon region, now in the Royal Ontario Museum of Zoology. Soper¹ reports *N. insignis* from two points north and west of Lake Temagami, with measurements smaller than mine; it is presumably this form.

**Ondatra zibethica zibethica* (Linnaeus). MUSKRAT.—Common; more often burrows than builds houses. Measurements: L., 618; T., 270; H.F., 79.

Erithizon dorsatum dorsatum (Linnaeus). PORCUPINE.—Not common; it is unusual to see more than one or two specimens in a summer.

Lepus americanus americanus Erxleben. VARYING HARE.—Not uncommon in some years; appeared to be on the increase in 1930.

ARTIODACTYLA

Odocoileus virginianus borealis (Miller). WHITE-TAILED DEER.—Quite common and often seen.

Alces americana americana (Clinton). MOOSE.—Common, though rarely seen near the main lake by summer visitors except in the fly season.

Rangifer caribou caribou (Gmelin). CARIBOU. —Does not now occur in this area. In 1901 Parsons¹⁰ reported "the forests abound in game of all kinds, chief among them being the moose, bear, red deer, and caribou", and again "The country lying south and east of Smoothwater L. and northwest of Wakima L. and river seemed to be the best suited to these cautious animals, as it is rough and hilly country". Comparison of this report with those of natives of the Temagami district makes it probable that the Caribou was beginning to desert this region at the time the report was written.

DISCUSSION

A consideration of the data will suggest that while the area is in general well-stocked with forms of the Canadian Zone, the Alleghanian element noticeable in the vegetation is to be found also in the fauna. In this connection it is to be noted that the area is rather less than one hundred miles south of the watershed where this crosses the same meridian of longitude.

The Urodela found in Temagami are absent from Abitibi¹¹; they seem unable to pass the height of land. *Triturus* and perhaps also *Ambystoma maculatum* seem to be near the limits of their range in Temagami. Of the Anura only *Bufo americanus* and *Rana pipiens* are reported from Abitibi¹¹, a notable falling off. The absence of *Pseudacris triseriatus* is noteworthy since it is reported as ranging north to Hudson's Bay (Dickerson)¹²; it may have been overlooked.

Of the Reptilia collected in the Temagami region only *Thamnophis sirtalis* is known to occur at Abitibi¹¹, and the other species of snakes from Temagami are so scarce as to suggest that they are near the limit of their range. This is probably also true of *Chrysemys marginata*, since its distribution is very scattered.

The small mammals are with few exceptions smaller than the average typical dimensions, and since all measurements were made in the flesh this difference may have some significance, though possibly not the same for all forms.

The records of Bats are undoubtedly incomplete owing to the difficulties of collecting.

Among the Rodents *Microtus chr. chrotorrhinus* is at the altitude of Temagami a northern form. *Glaucomyss s. sabrinus* is also northern. It is possible that the Temagami material shows a tendency towards *Glaucomyss s. macrotis* (Mearns), but since none of the specimens are fully grown this cannot be certainly decided without further collecting. *Napæozapus i. insignis* is a form of the Canadian Zone, but here appears to be somewhat under the Hudsonian influence, if the slight

similarities to *Napæozapus i. atietorum* are significant.

Tamias striatus lysteri is with reference to the Temagami region a southern form which must here be near the northern limit of its range. *Peromyscus m. gracilis* is southern, but shows the northern influence in its approach to *Peromyscus m. maniculatus*.

If we may strike a tentative balance of the data presented above, we may say that a southerly aspect is given by the following items: the relative abundance of Amphibians and Reptiles, *Tamias s. lysteri*, *Myotis k. septentrionalis*, *Peromyscus m. gracilis*; a northerly by *Rana septentrionalis*, *Microtus p. fontigenus* and *M. chr. chrotorrhinus*, *Sorex p. albicinctus*, as well as the red colouring of snakes and toads^{11 13}, and the sombre colour of *Rana clamitans*¹³.

The conclusion seems justified that we are dealing with a forested area, about one thousand feet above sea-level and some two hundred miles north of the northern limit of the Alleghanian Zone, in which, however, the Alleghanian strongly invades the Canadian; the area is in fact an excellent example of the overlapping that must always occur near the necessarily vaguely defined boundary between two life-zones.

It is perhaps worth recalling Parson's¹⁰ remark that "the fur-bearing animals of this territory are without a doubt but a remnant of the number which at one time inhabited these districts. . . . The most numerous of the fur-bearing animals are: the bear, marten, mink, fox and muskrat. The beaver, otter, fisher and wolf are very scarce". This condition has, if anything, been emphasized during the thirty years since he wrote.

In conclusion I wish to express my thanks to Dr. R. M. Anderson, of the National Museum of Canada, to whose kindness I owe definitive identifications of *Tamias*, *Sciurus*, *Glaucomyss* and *Peromyscus*, and to the Staff of the Royal Ontario Museum of Zoology, both for personal help and for permission to use the Museum's collections for comparative work.

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NOTES ON BIRDS OF THE LABRADOR PENINSULA IN 1930

By HARRISON F. LEWIS



HE following notes have to do with observations made on the southern shore of the Labrador Peninsula, or north shore of the Gulf of St. Lawrence, in Saguenay County, Quebec, between May 29 and August 8, 1930.

Gavia stellata. RED-THROATED LOON.—On August 3, 1930, I found, in a pond on the upper part of the northwest portion of St. Charles Island (long. 63° 17' W.), one of the Mingan Islands, an adult Red-throated Loon and a young one that was nearly as large as its parent. This is much farther west than any other point on this coast at which I have a record of the nesting of this species.

Uria troille troille. COMMON MURRE.—The first young of this species that I saw in the water with its parent in 1930 was observed near Kegashka Bay on July 27. Several others were seen between Natashquan and Little Watshishu on August 1. It seems very likely that these young were hatched in the colonies of this species near the eastern end of Anticosti, where, on account of the more southern position and warmer climate, they might be expected to hatch and develop a few days earlier than young Murres native to the north shore of the Gulf of St. Lawrence.

Phalacrocorax carbo. COMMON CORMORANT.—Under the protection provided by the Province of Quebec Society for the Protection of Birds, the colony of this species on the cliffs of Lake Island, near Cape Whittle, continues to increase. On June 15, 1900, I counted 63 occupied nests of Common Cormorants in this colony. This is the largest size to which the colony has attained in recent years and indicates an increase of 14 pairs since 1929, when 49 occupied nests were recorded here. (*Can. Field-Nat.*, 44: 109). Young were found in not more than about 6 nests on June 15, 1930, and the largest of these young were then no larger than Robins. Development of young in this colony has in most years advanced much farther than this by June 15.

Somateria mollissima dresseri. AMERICAN EIDER.—This species produced a splendid hatch of young in 1930, but unfortunately, owing chiefly to failure of the usual supply of small "bait"

fish in many localities, a great many of these little ducks were destroyed by Great Black-backed Gulls (*Larus marinus*).

The first broods of young Eiders that I observed in 1930 were seen on June 25, in Mecattina Bird Sanctuary, between Whale Head and Mutton Bay, but doubtless some young hatched earlier than that date at points farther west along the coast.

On July 21, having special occasion to make a long search for Eiders' nests with eggs on islands in Aylmer Sound, where the species nests commonly, I found only four such nests, and in one of those the eggs were hatching at the time. Evidently incubation by Eiders in that region was very nearly at an end for the year by that date.

Corvus corax principalis. RAVEN.—Two young Ravens that were almost ready to fly were captured by my companion, Mr. R. A. Johnson, when they were frightened from their home nest on a cliff at Harrington Harbour on June 24th. They were kept tethered and unsheltered on the after deck of our boat. On June 28, when we were anchored in the outer harbor of St. Augustine, about 70 miles north-east of Harrington Harbour, the young Ravens began to repeat their cry of hunger, a very primitive, penetrating, and annoying shout, like *Baw!* or *Waw!*, about half past three in the morning, as their custom was. After they had kept this up for half an hour or so without our leaving the cabin, two adult Ravens, attracted by their cries, came near the boat and answered them frequently. Eventually both of the old birds alighted on the deck of the boat, but one of them flew away again almost immediately and did not venture to return, while the other made several protracted visits to the two young Ravens. A dead sculpin was lying on the deck near the young, but, while they would take small portions of its flesh readily, they made no attempt to tear it to pieces themselves. The old Raven, however, pinned the dead fish to the deck with one strong foot, while with its beak it tore off strips of flesh and passed them to the two young until their hunger was satisfied and their cries ceased. It also swallowed some of the sculpin's

flesh itself. Later it brought and fed to the young small portions of some unidentified food, evidently obtained from a muddy place, for fresh mud was

smearred on its beak. After we began to stir about the boat, it feared to return to it, but called often to the young from a neighboring cliff.

ESKER AT TWEED, HASTINGS COUNTY, ONTARIO*

By M. E. WILSON

ON THE western outskirts of the town of Tweed, Hastings County, Ontario, there is a symmetrical ridge of gravel about 50 feet high that continues with a sinuous course south and southwesterly for over twelve miles. It follows the highway from Tweed to Belleville closely, (Figure 1) lying on the west side from Tweed to Chapman and on the east from Chapman to Thomasburg. From Thomasburg it continues almost to Phillipston.

In many places gravel pits have been opened in this ridge or esker, as such ridges of gravel are called, and in these its interior may be studied. It is seen that the gravel and boulders of which

it is composed are roughly stratified parallel to its outer slope and that, in most places, the gravel is finer in its interior than near its surface, for there boulders up to two feet in diameter may be present.

The manner in which eskers are formed is not definitely known. They are, of course, related to the melting of the last great continental ice-sheet that covered nearly the whole of the north-eastern part of North America in the Ice Age. It is supposed that they are deposited by streams flowing in a restricted channel in or beneath the ice sheet.

This gravel ridge is one of the best examples of

*Published with the permission of the Director of the Geological Survey of Canada.

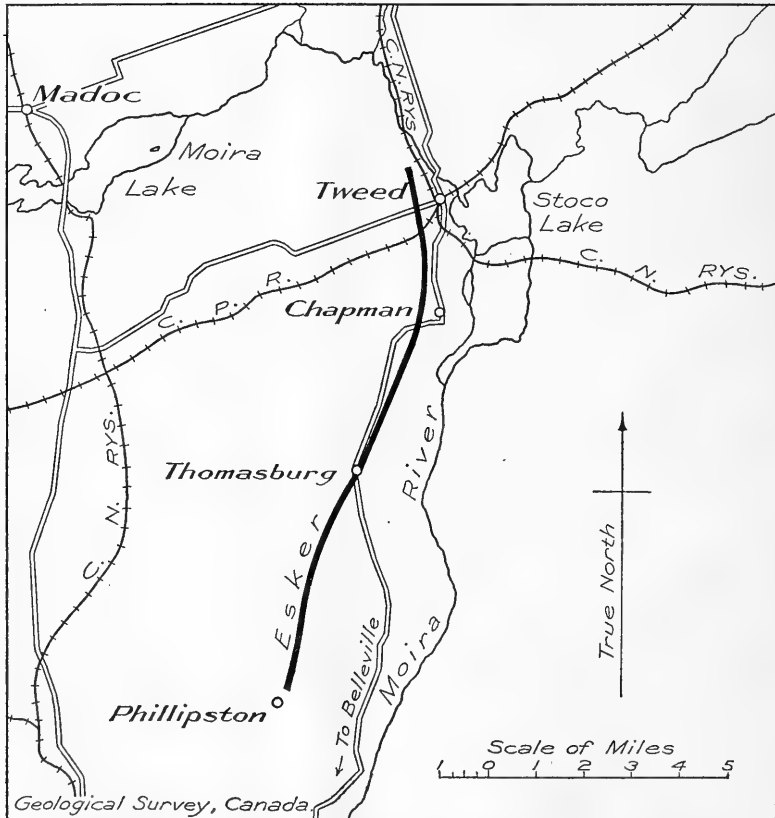


FIGURE 1,—Diagram showing the location of the "Tweed" Esker



FIGURE 2,—“Tweed” Esker as seen looking north from Chapman

an esker in old Ontario. It not only lies close to the country road from Tweed to Belleville but will be on, or near, the proposed Ottawa-Sarnia highway.

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

“Beiträge zur Kenntnis des nordöstlichsten Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume 8, 1909, pp. 158-229. Volume 9, 1909, pp. 245-320.

(Translated from the original German text in the Library of Congress, Washington, D.C., by M. B. A. Anderson, M.A., Ottawa, 1928.)

Original pagination given in the text.

(Continued from page 90)

SO THE first excursion of any length ended, and we had felt very well on this trip. Daily or at least every other day we travelled a little farther down the coast. Then we succeeded in finding a sheltered inlet, where we found also a grassy camping place, above all drinking water and drift wood. Usually Paksau's skilled gaze had soon discovered a quiet and snug nook. We now unloaded the boat, drew it upon the land whenever possible or, with several ropes, [P. 196] made it fast to projecting rocks. Then the little tent was erected, and a fireplace of stones, closed on three sides, was built. Paksau prepared chips, cutting with his knife along the stick as thin shavings as possible, being careful not to break the shaving

until he had a curl of wood. These finely split curls of wood were laid in the fireplace, where they usually soon started to burn even in wet weather. When conditions were worst, I had to pour a little of my preparation alcohol on crumpled paper and push this under the shavings. Soon the damp wood was crackling and smoking, in a short time the water in the tea-kettle was bubbling, and we were cooking tea, soup, fish or birds. Now came the pleasant meal in the tent or in calm weather outside the tent, and then we turned to new activities. We travelled across mountain and valley together, in order to shoot birds, and prepare them afterwards in the tent, or we did other work. There was always something to do. When we brought home only little birds, which Paksau could not handle well, because he had lost several fingers through an accident, he made himself useful in other ways. Full of good spirits he played the part of a true goblin, when I sent him out with an insect-killing phial to collect beetles, spiders and the like. That he, who as one of the bravest hunters in his district had killed polar bears, walrus, etc., should now be hunting such

small creatures, caused him immense merriment. His round, good-natured face beamed, he bubbled over with laughter and jokes, when he knelt down on the ground, in order to raise up the stones, and to place the insects found underneath carefully in the bottle with tweezers. He was a good fellow, with whom I got along most of the time in the best manner possible, besides a pleasant companion, who with the exception of spitting, which came from smoking too much, had no bad habits which annoyed me. Aside from his Eskimo virtues, he showed much innate tactful reserve, was clean also, did not snore in his sleep, and in all respects was very sensible. He had, according to the nature of all children of nature, [P. 197] moods, and then it was difficult many times to get along with him. In the evening when it began to grow dark, we looked once more at the boat, covered our boxes, chests and other things in front of the tent with water-proof tarpaulin, crept into our small sleeping quarters. Paksau closed the entrance with the boat sail, and, after removing our outer clothing, we crawled into our sleeping bags under cover. Paksau now usually smoked a pipe, we talked a little while, for the most part in his own tongue, and tried to go to sleep finally, not always succeeding, especially when the rain fell on the tent, the storm moved its walls to and fro, or the mosquitoes paid us a visit. As a rule though, nothing finer can be imagined than such a tent life; you are at home everywhere, where you please to go. You lie on the soft mossy ground on the breast of Mother Nature, to whom you gladly devote your services as a naturalist and to whom you belong indeed as a human being.

Within the succeeding fourteen days, only two attempts at important excursions were undertaken, to reach on foot and by boat the highest mountain of the northern group of islands, Kallaruselik, the broad summit of which is visible from a long distance and from which you are said to have an excellent view round about the whole neighbourhood, also a view of the Button islands which have never been mapped correctly and probably have never been visited by a white man. Heavy wind, the other time fog, drove us back before we reached our goal, and so Kallaruselik is still waiting the first white man to ascend it. It is easiest to reach the foot of the mountain, if you travel up the Kangerdluajuk, with the rise of the tide and down with the ebb of the tide. This is a long and in places a narrow inlet, which cuts deep into the land from the water side. It is hardly possible to make progress here against the tides in a small row boat—we were three in number. The inlet is said to be the only real

fjord of the whole district, and displays great scenic beauty. Above all when the sun lies low in the sky and throws shadows across the profound abyss, 100 meters deep, often wonderfully delicate rose and yellow colours kindle the desolate heights of the rim of the fjord; then the bright sunlight plays on the gulls flying high above, while all life is sleeping in the cold depths of the valley. The fjord makes little turns here and there, which might make one believe, he was at the end of it, but it continues to open up and then splendid views are granted of the gradually nearing Kallaruselik, and its neighbouring peaks. In some places the fjord widens into deep basins from which steep valleys usually lead upward. In most of the other places, on the other hand, an ascent of the rocks is exceptionally difficult or quite impossible. The mountain peaks in the background during August are generally partly free of snow, in September though they are usually covered by new fallen snow. Low bushes grow on the slopes of Kallaruselik, which serve as breeding places for ptarmigan. Also some rocky caves are said to be there, which furnish the polar bears with favourite summer homes, especially as the neighbourhood otherwise has few such caves, and the animals search in vain for such in places which are situated far from the coast. North of the long Kangerdluajuk there are two similar inlets, but shorter ones, which broaden at the inner end. They are likewise of great scenic beauty, even if less splendid. I learned to know them as breeding places of Barrow's Golden-Eye and the Harlequin Duck.

On the fourth of September with Paksau I was again out on a long excursion. The purpose this time was to journey through MacLelan strait, commonly called by the Eskimo name of Ikkerasak (Passageway), in order to investigate the islands in front of it, of which I had heard, because I hoped to find a lucrative field for observation at the time of the migration of the birds. The Ikkerasak, as I also shall call it now, is the strait which, since ancient times, has been used by the Eskimos as the shortest route between Ungava Bay and the Atlantic. Kohlmeister and Kmoch in 1811 were the first white people to navigate it. This has happened frequently since that time, so that it is really a matter of surprise to find on no map an approximately correct drawing of the strait. [P. 199] Different maps give, even if with dotted lines, a double communication between the Atlantic and Ungava Bay. This in no way corresponds to the real facts of the case. Perhaps this idea has come about because of the narrow fjord Kangerdluajuk, mentioned above, which cuts deep into the interior but comes to an end

at the foot of Kallaruselik. Also the Tunnusatsuk goes deep into the land from the south of the west opening of the Ikkerasak from the farthest corner of which an old foot path leads across the mountains to the Tunnusuksoak, which has an abundance of seals. But there is only one real strait. The Ikkerasak might offer a considerable shortening in the sea route for communication with Ungava bay, especially Port Burwell. Yet it appears always precarious for large ships to navigate it in unfavourable weather. The passage through is very well protected from wind, also possesses sufficient width everywhere, 200 to 600 meters, only once in the western part is it contracted to perhaps 150 meters; on the whole the bottom may possess also considerable depths, but in front of the mouth of the western opening there are situated numerous sunken rocks and islands, in the neighbourhood of which the strongest current hurries along. Many Eskimos maintain also, that there is a sunken reef in the broad eastern outlet under the water, which is dangerous for navigation. The passage remains hazardous, until careful soundings have found the location of this dangerous point, or have determined definitely that such does not exist at all. Also the navigation of the strait with boats or kayaks is an undertaking, which in case of wind, fog, driving snow or ice demands the whole attention and cleverness of the indigenous Eskimo, who has such knowledge of the navigable waters, and often enough even for him it is quite impossible.

In cloudy, rather quiet weather at midday of the 4th of September, we travelled into the Ikkerasak. We held our course to the north coast, passed in deep water different islands on winding arms of the sea, which were covered with an abundance of different sea-weeds of soft olive green to a dark brown up as far as the high water mark. Perhaps they have developed in such abundance, because the Ikkerasak in these parts is said never to be quite frozen over even in the hardest winters. Then we came into pond-like coves, not very far from the narrowest place in the strait. Here the current, rushing along like a great river caught us, turned us in a great curve round circular surfaces of water, smooth as a mirror, and irresistibly carried us back to the same place in spite of our most vigorous rowing. In this circling motion there was apparently not much danger, because calm weather prevailed and we had only to look out to see that we were not shoved on the rocks on the shore. It may be more critical for the long kayaks less strong than our boat. Paksau knew of the proceeding very well, of course, and since he acted

as if he were scolding soundly, though occasionally laughing good naturedly, I was quite willing to travel round once more in the merry-go-round. When some ice-cakes came into the whirlpool from the outer current, even though they were small ones, and began to circle faster than we did, Paksau stopped laughing, issued his commands with loud cries, as only a temperamental Eskimo can give a command: *aksut, aksut* (that is to say, forward) and the like, and rowed with his second oar with such strength and haste, that I likewise exerted myself to the utmost of my ability. We then came out of the uncanny current with a strong shove, as one has to in order to escape the still more dangerous main vein of the Ikkerasak, and at once arrived in almost motionless water. When a week later we journeyed the same way, we found a much weaker whirlpool, so that it is to be assumed that these currents, interesting as well as dangerous, change according to the tides in strength and swiftness of motion. Some whirlpools farther on which we passed were easily overcome.

In order to rest and take a look about the country, we took refuge in a wonderfully quiet rocky inlet, where countless Eider Ducks were moving about, some of which we killed. In addition the depths of the water swarmed with cod, down upon which we could look in the clear water for many meters as upon fishes in an aquarium. Paksau let one of the large fish hooks down to them, in order to fetch up our supper. [P. 201] Full of curiosity they at once swam around the gleaming instrument, raised high by the line, and then loosened again; stared at it, vied with each other in playing with it, when I could observe the wonderful flexibility of such a fish; bit at it, got loose again, were caught and wounded by the sharp hook elsewhere than in the mouth, until at last a hook drove into the body of one so that it was impossible for it to escape and Paksau pulled it up. When he had caught two specimens; three-quarters of a meter in length, we left the others undisturbed. I saw with sadness though, how countless fish may be grievously wounded by this method, with which many millions are caught every year on the coast of Labrador. And Paksau was a skilled fisherman and could watch the motions of the hook, because we saw the fish. But when later I saw old women or little children stupidly or slackly handling the line, then I always imagined I perceived the unheard complaint of the many tortured creatures, which even in the still depths of the sea are not safe from human wits and cunning. We were so pleased with the cove, that in spite of difficulty in finding shelter for the boat, we decided to pitch

our tent here, chiefly because we caught sight of some larger ice cakes in the main current of the Ikkerasak, which without exaggeration, were travelling past as fast as railway cars. I shrank from the thought of being overtaken and run down by such a hard fellow. After we had drawn up our boat in a small rocky channel with great exertion and had secured it with ropes, Paksau, with housewifely industry, set about the erection of our camp, which was situated in picturesque surroundings perhaps 10 meters higher up than the gorge. He had taken great pains in gathering some small driftwood sticks and making a fire with these to cook our meal. He was so in his element with all these activities, that it was quite all right with him, when I left him for an hour to walk up the mountain a short distance. The terrain arose like terraces and rather steeply, as far as I could judge in the damp cloudy air, as far as 300 meters in height at least. Everywhere there were rocky gulches, in which it was not very difficult to climb up to the different plateaus. In all places sheltered in the least measure the rocks were covered with thick cushions of different and abundant lichens to a degree I had never observed anywhere before. The varied forms of these delicate plants, which here by far predominated

over mosses, grasses and the higher plants, would have charmed anyone. Below in the valley the mighty Ikkerasak flowed past; on the other side lay that flat, gently undulating peninsula, which represented the old favourite dwelling place of the Killinek Eskimos. A road-like valley leads there from Ikkerasak up to the hills which, covered with fresh green grasses growth, stand in marked contrast to the gray of the other lichen covering, some half fallen earth houses on the slopes seemed to motion to us in a friendly way and awakened the wish in me to search for the place, in which centuries of the vanished history of this vicinity may have played to the end. A crossing of the Ikkerasak at this place was impossible. Then in former times they had to travel by land from Tunnusuatsuk, which extended proud and quiet beyond the peninsula. This evening we did not know how to protect ourselves from the dampness. All the things in our limited equipment were wet through by the fine mist which lasted for hours, which even penetrated into the tent, so that we ceased fighting against it. We were especially sorry concerning our goods and guns, which were in a pitiable condition.

(To be continued)

FIRST CANADIAN RECORD OF LEAST BROWN BAT

By ELI DAVIS

Myotis subulatus leibii (Audubon and Bachman)

LEIB BROWN BAT, LEAST BROWN BAT,
La Chauve-souris de Leib.

1842. *Vespertilio leibii* Audubon and Bachman, Journ. Acad. Nat. Sci. Philadelphia, ser. 1, vol. 8, p. 284.

1913. *Myotis winnemana* Nelson, Proc. Biol. Soc. Washington, vol. 26, p. 183 (Plummer Island, Md.).—Miller, List North Amer. Recent Mamm., 1923, Bull. U.S. Nat. Mus. No. 128, p. 71.

1928. *Myotis subulatus leibii* Miller and Allen, U.S. Nat. Mus. Bull. 144, p. 171-174.

Type Locality.—Erie County, Ohio.

“*Distribution.*—From Vermont (Brandon, Proctor), New York (Sing Sing), and Ohio south to West Virginia and Kentucky; exact limits of range not ascertained. . . .

“*Diagnosis.*—General colour much darker than in the typical sub-species and closely resembling that of *Myotis lucifugus lucifugus* in the olive phase, but slightly more golden above and lacking the dark spot at the shoulder. . . .

“*Remarks.*—This smallest of the bats known to occur in the eastern United States seems to be much less common than *Myotis lucifugus lucifugus*, and the few specimens that have been taken have usually been confused with the better known animal. Its black ears and facial mask, rather golden tint, keeled calcar and shorter forearm (31 to 34 mm. instead of 36 to 40 mm.) will at once distinguish it, however. Though described by Audubon and Bachman eighty years ago, it was not recognized again until Nelson redescribed it in 1913 as *Myotis winnemana*.

“*Specimens examined.*—Total number 8, from the following localities: Kentucky (Hickman's Cave, 1); Maryland (Plummer Island, 2); New York (Sing Sing, 2); West Virginia, (White Sulphur Springs, 1); Vermont, (Brandon, 1, Proctor 1).” —(Miller and Allen, 1928, p. 172.).

On May 19th, 1929, while trapping moles (*Parascalops breweri*) at Mt. Brydges, about fifteen miles west of London, Ontario, the owner of the farm gave me a little brown bat that he had knocked down with his hat in an open shed. This was taken to be *Myotis lucifugus lucifugus* and was put away and forgotten.

During the autumn of 1930 I became suspicious that this specimen was *Myotis keenii septentrionalis* and sent it to Dr. R. M. Anderson, National Museum of Canada, Ottawa, who "discovered" it to be *Myotis subulatus leibii*, a new mammal for Canada. Dr. Glover M. Allen, Curator of Mammals, Museum of Comparative Zoology, Harvard University, Cambridge, Mass., verified Dr. Anderson's determination and states that this is the first time that this species has been reported outside the United States.

Canadian mammalogists have been on the lookout for this little animal for some time. Cross and Dymond, Royal Ontario Museum, Handbook No. 1 (1929, p. 28), give a list of the bats found in Ontario and point out that two other forms, *M. subulatus leibii* and *M. sodalis* occur in the United States along the St. Lawrence and Lakes Erie and Ontario and may extend into adjoining parts of Ontario. A man knocked one of these down with his hat and gave it to me—perhaps some other collector will have as good luck with the other one.

EXCURSIONS OF

The Ottawa Field-Naturalists' Club, 1931

Kindly do not pick wild flowers except for scientific purposes.

1. GEOLOGY:—

Ottawa River, Hintonburgh, Saturday, May 2nd, commencing at 3 p.m. Take Somerset Street O.E.R. car going West as far as Parkdale Avenue, thence walk North to termination of said avenue at Ottawa River.

LEADERS—Dr. F. J. Alcock and others.

2. AMPHIBIANS AND OTHER NATURAL HISTORY:—

Rockcliffe vicinity, Saturday, May 9th, commencing at Rockcliffe Ferry at 2.30 p.m. Take Rockcliffe O.E.R. car.

LEADERS—Dr. R. M. Anderson, Mr. G. A. Miller, Mr. Herbert Groh and [Mr. Robert Lockwood.

3. BIRDS AND OTHER NATURAL HISTORY:—

Fairy Lake vicinity, Saturday, May 16th. Take Hull Electric Railway car at Chateau Laurier for Wrightville at 2.30 p.m.

LEADERS—Mr. Hoyes Lloyd, Dr. Ralph De Lury, Mr. G. A. Miller, Dr. R. M. Anderson, Mr. Herbert Groh, Mr. C. E. Johnson and Mr. A. G. Kingston.

4. BOTANY AND OTHER NATURAL HISTORY:—

Britannia-on-the-Bay, Saturday, May 30th. Meet at the O.E.R. terminus at Britannia at 3 p.m.

LEADERS—Mr. Herbert Groh, Mr. G. A. Miller, Dr. R. M. Anderson, Miss M. E. Cowan, Mr. Robert Lockwood and Mr. A. G. Kingston.

ALL ARE WELCOME TO ATTEND THESE EXCURSIONS

BERTRAM A. FAUVEL, Convenor :: Phones—Residence, C. 4102; Office, Q 6300—342
WILLIAM H. LANCELEY, Assistant Convenor :: :: Phone—Residence, Rideau 1196-J

ANNUAL REPORT, McILWRAITH ORNITHOLOGICAL CLUB, LONDON, ONT., FOR THE YEAR 1930

DURING the year the McIlwraith Ornithological Club held eight regular meetings with an average attendance of thirty-eight. The speakers at these meetings were Mr. Newton Tripp, of Forest, and Messrs. W. E. Saunders, J. F. Calvert and E. M. S. Dale from our own Club. At two of the meetings the members themselves furnished the programme consisting of "Items of Interest". On March 12th a special lecture on "Bird Calls" was given in the Normal School auditorium by Mr. Edward Avis, which was much enjoyed by approximately 400 persons.

During the spring four organized bird walks were conducted by our field men, the average attendance being twenty-five, while on May 12th the Normal School students were taken on an early morning hike to the "Ponds" where birds and other phases of nature study were observed.

The picnic on June 7th and corn roast on Sep-

tember 20th were each attended by about thirty and were enjoyable affairs.

The Christmas census was taken on December 20th, and the list of birds seen, thirty-three, has already appeared in the columns of *The Field-Naturalist*.

A total of 203 species were observed in Middlesex County during the year, including many of unusual interest, among them being: Common Tern, Gadwall, Whistling Swan, American Egret, Black-crowned Night Heron, Little Blue Heron, Northern Phalarope, Stilt Sandpiper, Sanderling, Goshawk, Duck Hawk, Bald Eagle, Snowy Owl, Dickcissel, Acadian Flycatcher, Evening Grosbeak, American Crossbill, Henslow's Sparrow and Yellow-breasted Chat. Three of these were new records for the county, while the total for the year was the largest yet recorded by the club.

Number of paid-up members, 48.

E. M. S. DALE, *Secretary*.

MEMBERS OF THE OTTAWA FIELD-NATURALISTS' CLUB AND SUBSCRIBERS TO THE CANADIAN FIELD-NATURALIST, MAY, 1931.

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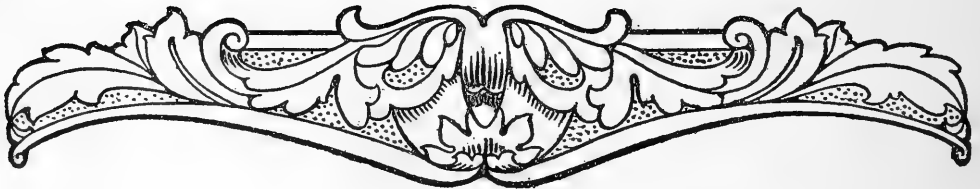
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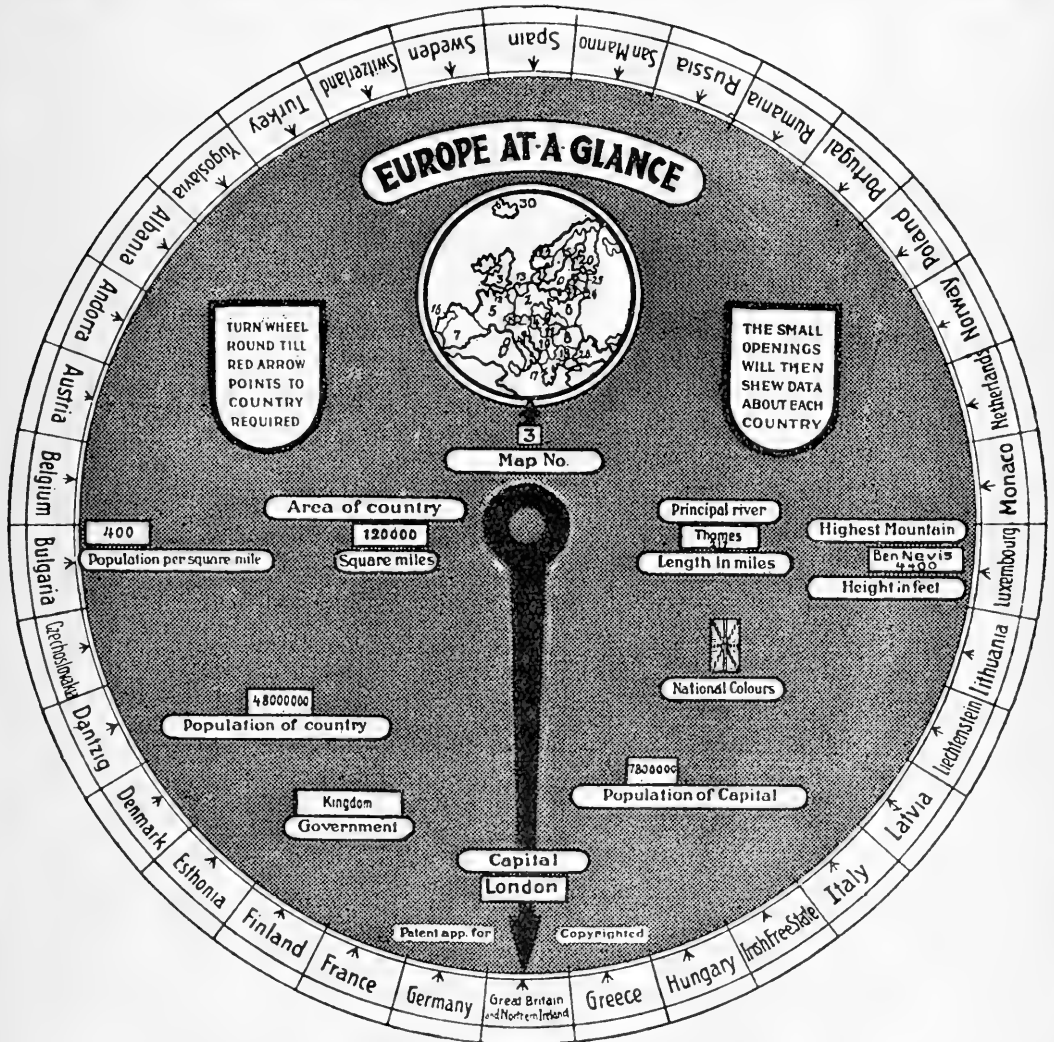
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CONTENTS

	PAGE
An Annotated List of Vascular Plants Collected on the North Shore of the Gulf of St. Lawrence, 1927-1930. By Harrison F. Lewis.....	129
Fresh-Water Plesiosaurs. By Lorin S. Russell.....	135
Nesting of Bonaparte's Gull (<i>Larus philadelphia</i>) in Central Alberta. By Frank L. Farley.....	138
New Records of Mushrooms and Other Fleshy Fungi of the Ottawa District. By W. S. Odell.....	139
Is Gambel's Sparrow an Ontario Bird? By L. L. Snyder.....	141
Occurrence of the Pomarine Jaeger in the Montreal District. By L. McL. Terrill.....	142
Contributions to the Knowledge of Extreme North-Eastern Labrador. By Bernhard Hantzsch.....	143
Obituary—Maunsell Schieffelin Crosby.....	146
Notes and Observations:—	
Hoary Bat at Toronto in Summer. By Clifford E. Hope.....	147
The Vanishing Musk-Ox. From <i>Nature Magazine</i>	147
Snow Bunting in Nova Scotia. By C. W. G. Paulson.....	148
American Egret at Guelph, Ontario. By Henry Howitt.....	148
Grasshopper Control in Eastern Canada. By A. G.....	149
Hoary Cress, (<i>Lepidium Draba</i> L.) at Ottawa. By H. Groh.....	149
Book Review—The Fresh-water Mollusca of Wisconsin. By F.R.L.....	149
Official Canadian Record of Bird-Banding Returns.....	150

The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July and August. Its scope is the publication of the results of original research in all departments of Natural History.

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AN ANNOTATED LIST OF VASCULAR PLANTS COLLECTED ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE, 1927-1930

By HARRISON F. LEWIS



COLLECTION of vascular plants on the north shore of the Gulf of St. Lawrence was carried on by the writer in the summers of 1927 and 1928 in connection with botanical studies in the Graduate School of Cornell University. The collections made in those years, together with a few supplementary ones made in the summer of 1929 and 1930, are reported on in this paper.

I am much indebted to Mr. Howard H. Cleaves, who was my companion in the summer of 1927, and to Mr. E. C. Abbe, who was my companion in the summer of 1929, for aid in the field. Certain collections made by Mr. Abbe alone while a member of my party are included herewith by his kind permission and are duly credited to him. I am also under obligation to Dr. Arthur A. Allen and to Mr. C. G. Watson for aid in the field for shorter periods, in 1928.

The identifications of the plants collected were made in the Botanical Department of Cornell University and in the National Herbarium of Canada. I was thus very fortunate in having, in this work, the advice and assistance of Dr. K. M. Wiegand, of Cornell, and of Dr. M. O. Malbe, of the National Herbarium, and I take pleasure in acknowledging my deep obligation to these gentlemen. To complete my good fortune, Prof. M. L. Fernald, of the Gray Herbarium, kindly examined with me all my collections for 1927 and 1928 except those of *Botrychium virginianum*, var. *europaeum*, which were not available at the time. I gratefully acknowledge valuable aid received from him. I am also glad to express my appreciation of assistance given by Dr. F. K. Butters, who identified my collection of *Botrychium virginianum*, var. *europaeum*, and by Messrs. Stewart Burnham and C. A. Weatherby.

During the periods in which these collections were made I was engaged in work for the Department of the Interior which required me to spend the summer in travelling along the north shore of the Gulf of St. Lawrence, between Seven Islands and Blanc Sablon, in a small motor-cruiser, and to make a great many landings on that intricate

coast and on the islands fringing it, especially from Natashquan eastward. This enabled me to make incidental collections of plants in many and varied localities. My summers, from 1921 on, have been spent in travel of this kind in this region, which gave me a fairly detailed knowledge of its general features before I began to collect plants there.

I was further favoured in my work by having with me a copy of Dr. Harold St. John's valuable memoir, "A Botanical Exploration of the North Shore of the Gulf of St. Lawrence, including an Annotated List of the Species of Vascular Plants" (St. John, 1922). This excellent and detailed list furnished a most important foundation for the collecting that I was doing, and a useful standard of comparison. Comparisons with its records of various plants are repeatedly made in the list presented below. Species, varieties, or forms not contained in St. John's list, which is the most recent general list of plants for the region in question, are starred thus (*) where they occur in the list of my collections. This mark (*) appears 116 times in my list. Special remark is made concerning any species, variety, or form in my list that was not listed by St. John but that has been subsequently attributed to this region by any other author.

Concerning many of the species, varieties and forms listed by St. John and also included in the following list, remark is made as to an extension of the known range on this coast as shown by my records in comparison with St. John's. For the sake of brevity, the expression "range extension" is used to mean "extension of known range on this coast", and the capital letters "E" and "W" are used to represent "eastward" and "westward" respectively. In using the expressions "eastward" and "westward" the coast is considered as though it extended practically east and west, which, indeed, is the case with the greater part of it. As the relation of the localities named may not always be quickly comprehended by one not personally familiar with the region, a statement of the approximate distance involved in the

extension of known range is also furnished. Thus, "range extension, 50 miles E", means "extension of known range on this coast, as compared with the range shown by St. John's list, is 50 miles in a generally eastward direction, or a direction toward the Strait of Belle Isle".

The question of the geographical nomenclature that it is most desirable to use when referring to places of collection on this coast, where post offices are comparatively few and far between, has been carefully considered. St. John used consistently the names on the provincial maps by Gustave Rinfret (1913), including township names where these were available. The fact that he did so is a strong reason for my doing so too, but, on the other hand, many of these names differ from those authorized by the Geographical Board of Canada, many are quite different from the names actually in general use, and all are in French, whereas I am writing in English and English forms for many of these names are authorized and in common use. Therefore it has been decided to use for each place mentioned in the body of the list what is considered the most suitable name available, using as authorities the published decisions of the Geographical Board of Canada, the Canada Official Postal Guide, the publications of the British Admiralty, the Rinfret maps, and local usage. In order to correlate these with the names used by St. John and others, a list of all place-names used is given in Appendix A, where each such name is accompanied by the corresponding name (if any) used by St. John, and by other published synonyms, by the name of the township, seignior, or archipelago in which it is situated, and by a statement of its latitude and longitude. The last mentioned data will enable each place-name herein referred to be located with exactness and certainty at any time.

St. John states that the north shore of the Gulf of St. Lawrence, as understood by him, "lies between Pentecote river on the west and Blanc-Sablon river on the east, and forms part of the south shore of Saguenay county, province of Quebec". The collections made by the writer all came from the area thus delimited, except that a number of collections were made east of the Blanc Sablon River, but within a mile of it. This change is due to the fact that, in 1915, when St. John made his collections, the Blanc Sablon River was believed to constitute the eastern boundary of Canada for some distance up (northward) from its mouth, which is at the head of Blanc Sablon Bay, but that, by a decision of the judicial committee of the Privy Council in 1927, the boundary of Canada was declared to

extend northward from the easternmost point of Blanc Sablon Bay, or along a line roughly parallel to the course of the Blanc Sablon River, but about two miles farther east. The land between this line and the river is therefore included within the County of Saguenay, Province of Quebec, Canada. The writer made no collections west of Manowin Island, Seven Islands.

The first set of specimens will be deposited in the herbarium of the Department of Botany of Cornell University, the second set in the National Herbarium of Canada.

It is well known that most of this coast has risen from a submerged position since its last glaciation, and that consequently most of the glacial drift deposited on it has been removed by action of waves and ice at successive sea-levels as the process of emergence went on. Erratic boulders are not found where deposited by the glacier on the lower areas that have been submerged since the glacier last receded from them, but are common at higher elevations, which have experienced no submergence since their last glaciation. The line at which these poised erratics are first found, as one ascends an elevation sufficiently great, is in this region usually remarkably definite. I have visited and observed it on Little Mecatina Island, on the hills beside Mutton Bay, and on the hills north of Bradore Bay, and at all of these positions estimate its present elevation above sea-level to be roughly 450 feet, indicating a rise of that extent since the departure of the last glacier. Hind (1864) has stated the height above sea-level of the lowest erratics in the Moisie region, near Seven Islands, as about 1000 feet.

St. John (1922) has already called attention to the fact that, as a result of removal of glacial drift from the post-glacially submerged areas near the coast, the scanty soil now found on these areas has been recently formed in situ, and, generally speaking, resembles the country rock in its chemical constituents. He states, "This affords clear and neatly delimited conditions for the study of the correlations between the nature of the soil and the distribution of the plants", and goes on to show that, along this coast, calcicolous plants are generally found chiefly or exclusively on the limestone areas of the Mingan Islands and parts of the adjacent mainland and on the calcareous sandstone areas east of Bradore Bay, while typical oxylophytes are generally found elsewhere or where special conditions reduce the lime content in the soil. In his annotated list there appear, however, some exceptions, particularly in the case of the calcicoles. The number of apparent exceptions has been so

increased by my collections that it has been thought advisable to list them specially here, as well as to show them in the annotated list, and to show the special conditions on which they are dependent, so that it may clearly appear that what seem exceptional records of occurrence for calcicolous plants are actually entirely in harmony with their known need of available calcium.

Plants that appear to be calcicoles and indifferent calcicoles, at least in this region, are recorded, then, by St. John (1922) and in this present paper from the following stations that are neither in the limestone area of the Mingan region nor in the calcareous sandstone area east of Bradore Bay. The records from St. John's list are marked with a dagger (†). Following the list of apparent calcicoles from each of these stations, explanation of their occurrence there is briefly discussed.

MANOWIN ISLAND, SEVEN ISLANDS.

Thalictrum confine, *Gentiana Amarella*, *Campanula rotundifolia*.

Manowin Island is composed of Archaean rocks, but these calcicoles were found on it growing on a raised boulder beach. It is well known that sea beaches often contain much available lime, due to the presence, in the material composing them, of more or less of the broken and comminuted shells of marine molluscs. When such beaches are elevated above sea-level by the rise of the land mass on which they are situated, as they have been and are being elevated along the north shore of the Gulf St. Lawrence, they must still be able to support calcicolous plants for a longer or shorter period of time, until they become too poor in available lime through leaching or other processes. Apparently this raised boulder beach on Manowin Island was still sufficiently rich in lime for the three calcicoles named.

SEVEN ISLANDS

Thelypteris fragrans†, *Spiranthes Romanzoffiana*†, *Caltha palustris*, *Fragaria virginiana*, var. *terrae-novae*†, *Pyrola secunda*, var. *obtusata*†, *Arcostaphylos Uva-ursi*, var. *coactilis*, *Arcostaphylos Uva-ursi*, var. *adenotricha*†, *Campanula rotundifolia*.

The village of Seven Islands is situated on the western edge of what the "St. Lawrence Pilot" (1916) refers to as "an extensive tract of low sandy country, thickly wooded, between the hills and the sea, which seems to have been formed, in the course of time, by the action of the rivers [Moisie and Matamek] and the sea". Presumably this large area of littoral sand deposits, now elevated a few feet above sea level, still contains, in places, at least, a great deal of lime, originally mingled with the sand chiefly in the form of

broken sea shells. It is true that *Pinus Banksiana*, a typical oxylophyte, grows on large areas of this sand plain, but this indicates only that lime is not everywhere available in the soil of the plain, but influences the flora only in certain portions of it, as might be expected from a naturally uneven concentration of the original deposits of shell, and differences in drainage subsequent to elevation above sea level. Where lime occurs, even though actually a small proportion of the soil content, it would naturally be more readily available to plants in a light, sandy soil, with its free percolation of water, than in a heavier soil. Hilgard (1911) remarks: ". . . . some (sandy) soils containing only a little over one-tenth of one per cent of lime show all the characters and advantages of calcareous soils: while in the case of heavy clay soils, as has been shown, the lime percentage must rise to over one-half per cent to produce native lime growth". It is believed that these conditions explain the presence of numerous plants considered as calcicoles about Seven Islands.

MOUTH OF MATAMEK RIVER

Gentiana Amarella, *Campanula rotundifolia*.

The explanation of the occurrence of calcicoles in this case is uncertain. It may easily be due to elevation of beach material, or to sea-bird droppings, or perhaps to a fairly high percentage of calcium in the country rock.

THUNDER RIVER

Luzula parviflora, var. *melanocarpa*†, *Glyceria striata*, var. *stricta*, *Pyrola minor*, *Gentiana Amarella*.

The occurrence of these calcicoles at Thunder River is probably due to the occurrence of a sufficient percentage of calcium in the country rock, made available to the plants as the rock weathers. This is not yet proven.

BAIE JOHAN BEETZ

Spiranthes Romanzoffiana, *Salix candida*.

Both of these calcicoles at Baie Johan Beetz grew close to shore. They probably occurred there because of the presence in the soil of comminuted mollusc-shells.

WATSHISHU

Spiranthes Romanzoffiana.

This plant at Watshishu grew on elevated parts of small islands. Its presence there is believed to be due to the occurrence of masses of broken sea-shells, elevated bodily in depressions in the granite as the islands rose from sea-level.

MASCANIN

Spiranthes Romanzoffiana, *Thalictrum confine*. *Spiranthes* occurs at Mascanin in the same way

as at Watshishu, and the explanation is doubtless the same. *Thalictrum confine* occurs along the border of a marshy shore, where it is probably able to obtain lime from shells of comparatively recent deposition.

NATASHQUAN

Scirpus hudsonianus, *Carex diandra*, *Carex Oederi*, var. *pumila*, *Habenaria dilatata*†, *Spiranthes Romanzoffiana*†, *Fragaria virginiana*, var. *terrae-novae*†, *Pyrola secunda*.

These presumed calcicoles grow on the extensive sandy tracts at and near Natashquan. Their occurrence there is probably to be explained in much the same way as is the occurrence of numerous calcicoles on the similar sandy area at Seven Islands.

KEGASKA ISLAND

Habenaria dilatata, *Thalictrum confine*, *Actaea rubra*, f. *neglecta*, *Parnassia parviflora*, *Ribes lacustre*, *Gentiana nesophila*, *Gentiana Amarella*.

These plants, which I class as calcicoles, grow on the outer side of Kegaska Island, near a cove on the beach of which occur heavy deposits of mussel-shell. These deposits and the gradual elevation of the land doubtless explain why they can grow there.

GREEN ISLAND, KEGASKA

Carex diandra, *Habenaria dilatata*, *Parnassia parviflora*, *Ribes hirtellum*, var. *calcicola*, *Geum macrophyllum*, *Geum rivale*, *Viola nephrophylla*, *Gentiana Amarella*

The soil on Green Island, owing to its especially favourable form and situation, is composed to a very large extent of broken mussel-shell. The relation of this to the presence of a number of marked calciphiles seems fairly obvious.

ROMAINE

Carex capillaris†.

I have not visited the point, on an outer island near Romaine, where St. John collected this species, and do not know the reason for its occurrence there.

FOG ISLAND

Spiranthes Romanzoffiana, *Parnassia parviflora*.

This island resembles Green Island, at Kegaska, in many ways, and has similar extensive deposits of broken mussel-shell, which are doubtless responsible for the fact that these two calcicoles are able to flourish there.

WOLF BAY

Glyceria striata, var. *stricta*.

I have no information as to the local conditions providing calcium for this plant at Wolf Bay.

LAKE ISLAND

Pinguicula vulgaris.

The precise reasons for the occurrence of this indifferent calcicole on Lake Island are not known.

MATCHIATIK ISLAND (WAPITAGUN)

Pinguicula vulgaris†.

This is a collection by St. John, this species not having been seen by me on Matchiatik Island. There are several possible explanations of such isolated occurrences of solitary calcicoles, but the particular one operative in this case is not known.

ETAMAMU

Potamogeton filiformis, var. *borealis*†.

The cause of occurrence is unknown in this instance.

POINTE AU MAURIER

Botrychium Lunaria†, *Pinguicula vulgaris*†.

St. John (1922) attributes the occurrence of *Botrychium Lunaria* at Pointe au Maurier to lime (probably from comminuted sea-shells) in the sea-beach, at the top of which the plant grew. The circumstance favouring the occurrence of *Pinguicula vulgaris* is not known.

ST. MARY ISLANDS

Pinguicula vulgaris.

While the cause of occurrence is not certainly known in this case, the local situation was such that it is highly probably that lime was present in the soil because of the elevation of a basin in the rock which, when at a lower elevation, was abundantly supplied with lime by sea-birds, in a manner which will presently be considered in more detail.

HARRINGTON HARBOUR (MAINLAND)

Habenaria dilatata.

This plant at this section grew on the face of a sandy bluff above the beach. Such bluffs are commonly well supplied with lime in the form of broken sea-shells that they have carried up with them from sea-level or below as the coast has been elevated.

MUTTON BAY

Streptopus oreopolus, *Saxifraga Aizoon*†.

St. John (1922) states that the perthitic syenite on which he found *Saxifraga Aizoon* growing at Mutton Bay contains 8 per cent of lime. Basalt from the basaltic dyke in the ravine where *Streptopus oreopolus* was found growing was submitted to the Division of Chemistry of the Mines Branch of the Canadian Department of Mines for analysis and was reported to contain 1.29 per cent of calcium. Calcium from the rock on which the plants were growing is the only

important source of the element known for the plants in these cases.

LA TABATIERE

Barbarea orthoceras, *Ribes lacustre*, *Geum rivale*, *Campanula rotundifolia*.

Three samples of rock from La Tabatiere were partially analyzed for me by the Division of Chemistry of the Mines Branch of the Canadian Department of Mines. One specimen of disintegrating country rock was found to contain 1.28 per cent of calcium, while another specimen contained 4.28 per cent of that element. A specimen broken from material, believed to be intrusive, that filled a narrow fissure, was found to contain 9.29 per cent of calcium. Probably calcium in the disintegrating surface rock is responsible for the continuing occurrence of these apparent calciphiles at La Tabatière.

Mutton Bay and La Tabatière are only about six miles apart, and are situated on a definitely bounded block of igneous rock formation which extends from Cape Mecatina to Lake Salé, and which, although not uniform throughout, differs conspicuously from the country rock beyond its borders in that it is higher and rougher, is composed of larger crystals, is more readily disintegrated by exposure to weather, and is marked by numerous dykes, which often, by weathering even more rapidly than the country rock, have formed narrow, shallow ravines. This block of rock is bounded by the sea on the south and east and, although it reaches a height of eight hundred feet, is cut off from the mainland north and west of it by a fresh water system consisting of a lake said to have an elevation of only twelve feet above sea level, with an outlet to the sea at either end. When the elevation of this part of the coast was only twelve feet less than it is now, which was well within historic times, the Mutton Bay—La Tabatière—Lake Salé block of land was an island in the gulf. The evidence points to a higher percentage of calcium in the rocks of this formation generally than in the country rock east, west or north of it.

KECARPOUI ISLAND

Pinguicula vulgaris†.

This is one of St. John's records, and the exact local conditions can only be surmised.

ST. AUGUSTIN

Botrychium Lunaria.

Here, as in many other places, the presence of this plant may be explained by the fact that it was growing on the upper part of a sea-beach, where lime from broken sea-shells was presumably available for it.

LITTLE COXIPI RIVER

Pyrola minor†.

This is another of St. John's records, the exact local conditions relating to which are unknown to me.

BONNE ESPERANCE

Botrychium Lunaria†, *Microstylis monophyllos*†.

St. John quotes both of these records from Stearns (1883). I am without information as to the source of lime for these plants.

BRADORE BAY (AREAS OF GNEISS AND GRANITE)

Salix candida, *Taraxacum lapponicum*.

In this case *Salix candida* was growing among boulders at the head of a cove, where it could probably obtain lime from broken sea-shells. *Taraxacum lapponicum* was growing on sand, where lime may be available as in the sandy tracts at Seven Islands, and elsewhere, previously discussed, and it may also have received lime through drainage from calcareous sandstone at higher levels.

It appears from the above survey that in all cases in this region where plants that behave as calcicoles are found in numbers in areas of Archaean rocks they are well supplied with lime through the nature of local soils which, in spite of glaciation and of washing by the sea, occur as a result of the action of one or more of several agencies. Probably the scattered occurrences for which the exact reasons are not at present known would be susceptible of similar explanations if the pertinent facts relating to them were available.

If it be objected that some of the plants that I have named, such as *Habenaria dilatata*, *Spiranthes Romanzoffiana*, *Calltha palustris*, *Barbarea orthoceras*, and *Campanula rotundifolia*, are not true calcicoles, I can only say that they clearly behave as such in this region.

Along many coasts lime salts supplied by the sea, directly or indirectly, are available only to plants in immediate proximity to the shore. Owing to several factors, of which the continuing and fairly rapid elevation of the land mass is chief, there are many exceptions to this condition along the north shore of the Gulf of St. Lawrence, where lime supplied by the sea in the form of broken and comminuted sea-shells is often available in quantity at a considerable distance from the shore and at a considerable elevation above it, especially on certain islands.

It is obvious that, if sea-shells are cast ashore by the waves and the land is subsequently elevated, these shells, rich in calcium, will occur above sea-level, and may thus be available for the support of calcicoles there. It might, however, be supposed that calcium of this origin,

occurring in strictly limited quantities, even in the largest deposits, might soon leach away, at least from the upper layers of the soil, and so become unavailable to plant life. Apparently this has actually occurred quite generally, for otherwise calcicoles should be much more widely distributed on this coast than they are. Nevertheless certain islands form exceptions. Green Island, at Kegaska, shows a strongly calciphilous flora, and that on Kegaska Island itself is only slightly less so. Fog Island and the small islands at Watshishu and Mascanin show tendencies in the same direction, although all of these islands are formed of resistant pre-Cambrian granitic rocks. Examination of these instances points to the following facts as the explanation.

1.—The soil on these islands, at least where the calcicoles grow, contains a high proportion of broken and powdered sea-shells, principally those of the common mussel (*Mytilus edulis*), which are doubtless the source of the lime that the plants in question require.

2.—The sea about these islands, especially on the seaward side, contains extensive rocky reefs and shallows, on which unusually large beds of these mussels can grow, but where they are so near the surface that agitation of the water in storms can tear great numbers of them from their places and hurl them or their empty shells on the shores of the islands.

3.—The shores of these islands are low and gently shelving, so that great quantities of shells can be securely lodged on them. Neighbouring islands that face the sea with abrupt cliffs obviously cannot receive many shells from the waves.

4.—The surface of such islands is fairly flat, but is very often characterized by shallow, smooth-sided, impervious basins in the solid granite, wherein the shells and also lime that may be removed from them by surface water are retained for centuries.

Islands of this type form suitable places for development of such calcicoles as may chance to reach them.

Another agency that helps to make lime from sea-shells available to plants on this coast, even at some elevation above sea-level, is found in the large population of sea-birds, particularly Eider Ducks (*Somateria mollissima dresseri*). These ducks feed to a very large extent upon small common mussels. These are obtained by diving, are eaten whole, and are finely ground in the powerful gizzards of the birds. Consequently the ordinary excrements of Eiders consist largely of mussel-shells broken into small pieces. A great many of these excrements are discharged

either directly into the sea or on rocky shores, where they do not influence land vegetation, and many others are dropped here and there on land, where the birds go for nesting and for sunning themselves on the turf, but are so scattered as to have no observable influence. However, during the period when the young Eiders are small, that is, for about a month in the life of each brood, their mothers customarily take them ashore on some small island at evening and brood them there during the night. For such brooding they greatly prefer an area of level and rather damp turf, and on the islands which they frequent areas of this kind are commonly to be found where vegetation-supporting soil and water are caught in some shallow, impervious basin, a few yards square, in the uneven surface of the granitic country rock.

Several Eider mothers may spend night after night together, with their young, on one such small area, elevated several feet or even yards above the present reach of the waves. Toward the end of August the vegetation on such an area will be much trampled by the birds in their continued visits, and will be heavily littered with their excrements. Thus, year after year, these ducks add fresh lime to a limited patch of soil in an impervious basin, and so they may greatly aid the establishment and continuance of isolated colonies of calcicoles on the islands along the coast. Even when the general coastal elevation has carried such pockets of lime to a height where they are no longer acceptable to the female Eiders for brooding their young, the fact that they are held in impervious catch-basins of granite may enable them to support calcicoles for a long time. I suspect that some of the unexplained occurrences of *Pinguicula vulgaris* and of other calciphiles on outer islands along this coast are really due to this elevation and concentration of lime from sea-shells by Eider Ducks.

Three Eider excrements, composed almost wholly of finely broken shells of *Mytilus edulis*, which I gathered carefully from bare rock in Cape Whittle Bird Sanctuary on August 6, 1928, and which were weighed with metric balances when well dried, showed weights of 28.5 grams, 31.5 grams, and 14 grams, respectively. The average of these three weights is 24.7 grams.

If we allow 20 grams as a conservative estimate of the weight of sea-shell present in one normal Eider excrement, a female Eider brooding her young nightly for 30 nights on an area of turf containing three square meters and depositing there two excrements per night will, at the end of that time, have deposited on the area 1.2 kilograms of shell, or 400 grams per square meter.

Estimating that there are at least 10,000 such female Eiders on this coast each year, we find that they place in this way 12,000 kilograms of ground sea-shells annually, most of it concentrated on small, selected areas of a certain type. This takes no account of the fertilization of such areas by the excrements of the growing young. Male Eiders do not attend their young, and so play no direct part in this process.

Great black-backed Gulls (*Larus marinus*) and Herring Gulls (*Larus argentatus*), both of which nest commonly on islands along this coast, have the habit of opening various molluscs and echino-

derms, on which they feed, by carrying them to a height in the air and allowing them to drop on a bare rock surface so that the shell is broken. The bird then alights beside its prey, eats the organism, and leaves the shell. Certain suitable rock areas in convenient situations are used repeatedly by numbers of birds for this purpose, and in consequence a litter of broken shells becomes concentrated at such places. This, too, may affect appreciably the local lime content of the thin soil, and so may permit certain calcicoles to become established.

(To be continued)

FRESH-WATER PLESIOSAURS*

By LORIS S. RUSSELL



THE Mesozoic era or Age of Reptiles was characterized not only by the presence of the dinosaurs, which dominated the land, but also by the development of several independent lines of aquatic reptiles, particularly the ichthyosaurs ("fish-lizards"), mosasaurs ("lizards of the Meuse") and plesiosaurs ("near-lizards"). All of these reptiles had the limbs more or less altered into swimming paddles, but the body form in each group was peculiar. Among the plesiosaurs the trunk was low and broad, and in the typical genera there was a long neck and a somewhat shorter tail (fig. 1). This characteristic form was rather aptly described by Dean Buckland, that early synthesist of theology and geology, as a snake threaded through the shell of a turtle.

Plesiosaurs are considered to be characteristically marine reptiles, and this is certainly true for almost all of them. From time to time, however, remains of these reptiles have been found under conditions that strongly suggest a fresh-water habitat. In most cases the ecological significance of such occurrences has been disregarded. This paper describes the vertebra of a plesiosaur from beds that are definitely of fresh-water deposition, and considers some other cases of what appear to be fresh-water plesiosaurs.

The fossil to be discussed particularly came from an outcrop of the Edmonton formation on North Saskatchewan river, about six miles above the city of Edmonton. Dinosaur bones are not uncommon at this locality, and in making a collection of these, Dr. D. G. Revell, Professor of Anatomy at the University of Alberta, found

a vertebral centrum of peculiar character. This centrum was first recognized as plesiosaurian by Mr. C. W. Gilmore, of the United States National Museum. Dr. Revell kindly presented the vertebra to the writer, by whom it has been deposited in the palaeontological collection of the Department of Geology, University of Alberta. The writer is indebted to Professor John A. Allan for the opportunity to complete his studies of this specimen.

The centrum (figs. 2-5) is about 47 mm. long and 65 mm. wide. It is inoderately amphicoelous, somewhat constricted at mid-length, and has, in end view, the depressed-hexagonal outline that is common in plesiosaurian centra. The bases of the neuropophyses are ovoid, and there appear to be two pairs of poorly defined facets for the chevrons. On one articular face there is a rounded protuberance above the centre. There are no traces of transverse processes.

This vertebra is referred to the caudal series because of the apparent presence of facets for the chevron bones, and the absence of transverse processes. There appear to be close resemblances to vertebrae of *Leurospondylus ultimus* Brown, which is discussed below. The present specimen is referred provisionally to *Leurospondylus*, and therefore to the Elasmosauridae, but a form considerably larger than Mr. Brown's specimen is indicated.

Let us consider next the geological occurrence of the specimen. The Edmonton formation, which is the uppermost division of the Cretaceous System in central Alberta, represents a period of deposition following the last retreat of the Pierre sea. We are able to trace fairly accurately the maximum extent of this sea in its last advance in Alberta. This is the Bearpaw stage, and

* These notes were prepared prior to the writer's association with the Geological Survey of Canada, and were presented at the Washington meeting of the Paleontological Society, December, 1929.

during it the sea did not reach within twenty-five or thirty miles of the point where the plesiosaur vertebra was found. If the Pierre sea was this far away in Bearpaw time, it must have lain much farther to the east and south after two hundred feet or more of Edmonton beds had been deposited. Thus the non-marine nature of this plesiosaur's environment can be demonstrated by palaeogeography.

Most of the fossils associated with this vertebra are dinosaur bones. Hadrosaurs and carnivorous forms of the deinodont type are known to be represented. Such reptiles are not considered to have been of marine habitat, but their bones do occur in marine deposits, presumably carried seaward in estuaries. The only invertebrate fossil known from this locality is an incomplete shell of a large species of *Viviparus*, possibly *V. raynoldsanus* Meek and Hayden. This, of course, is a fresh-water shell. Twigs, cones and wood, probably of *Sequoia*, are rather common here. The palaeontological evidence is not definite, but the absence of marine forms may be taken to corroborate the interpretation of the beds as of fresh-water deposition.

We must conceive, therefore, that the plesiosaur represented by the vertebra described above lived in a body of fresh water. The channel-like structure of the beds at the locality suggests a fluvial environment.

Plesiosaurian remains have been obtained from other localities in Alberta, but none of these has been taken definitely as representing a fresh-water form. The type of *Leurospondylus ultimus* Brown¹ was found at about the middle of the dinosaur-bearing Edmonton formation on Red Deer river. This is about the horizon of a rich bed of brackish-water molluscs that occurs at certain places along the Red Deer, although not where the plesiosaur was found. Apart from this shell bed, and some transitional strata in the basal portion, the Edmonton formation appears to be of fresh-water deposition. Hence *Leurospondylus ultimus* inhabited a brackish-water, or possibly a fresh-water, environment.

The marine shales of the Bearpaw formation underlie the Edmonton beds. Below these shales, in turn, we have the Belly River series, the uppermost strata of which are distinguished as the Pale beds. These rocks, exposed in "bad-

lands" along Red Deer river, have yielded a very rich dinosaurian fauna. In 1902 the late Mr. Lawrence M. Lambe² referred a number of vertebrae from these beds to *Cimoliosaurus magnus* Leidy, a plesiosaur from the New Jersey Upper Cretaceous. While the writer would be inclined to question the accuracy of such a definite determination based upon vertebral centra, there is no doubt that Lambe was dealing with the remains of a plesiosaur. The Pale beds have also yielded vertebrae that are referable apparently to *Ischyrotherium* Leidy. It is almost certain that this genus is plesiosaurian.

With the exception of some strata at the top, the Pale beds are definitely of fresh-water deposition. Beside the numerous remains of terrestrial vertebrates, rich Unio beds occur in the Red Deer badlands. Well preserved leaves and twigs are also fairly abundant. It seems fairly safe to regard any plesiosaurian remains from this portion of the Belly River series as representing animals of fresh-water habitat.

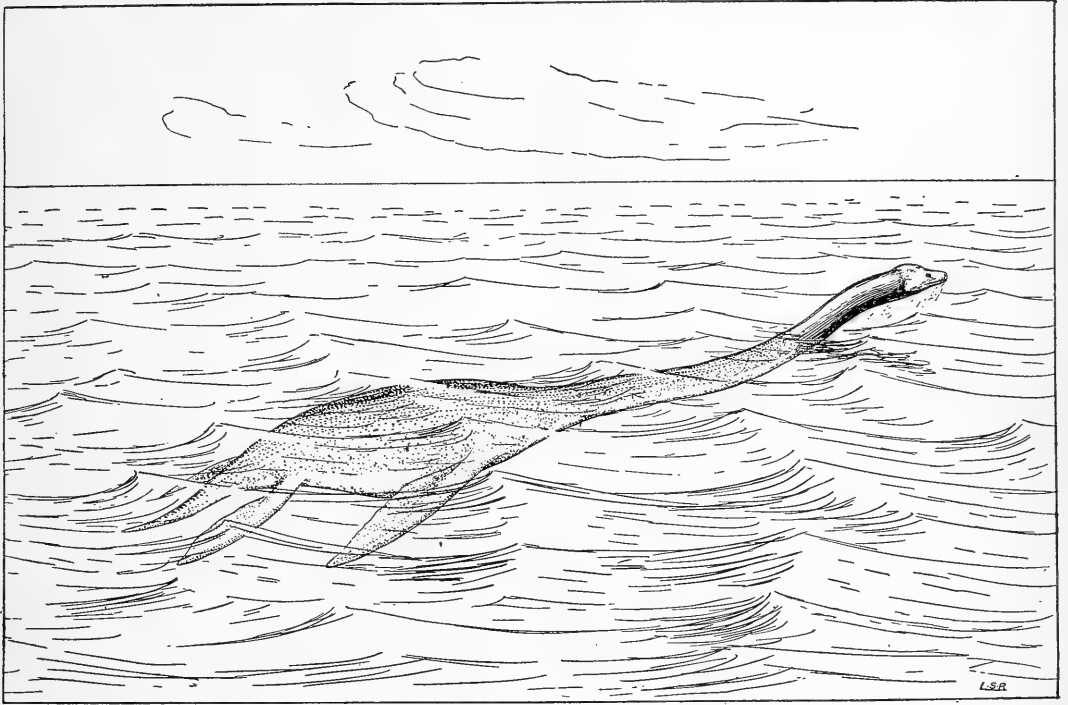
One other occurrence may be considered in this connection. In 1922 the late Dr. C. W. Andrews³ described a new plesiosaur, *Leptocleidus superstes*, from the Weald clay of Sussex. This formation, as is well known, is of fresh-water deposition, and Lower Cretaceous in age. The plesiosaur is a rather primitive member of the Plesiosauridae, and was thought by Andrews to have owed its survival to its invasion of the fresh-water environment, where competition was less keen than in the sea.

It may be concluded, therefore, that some plesiosaurs lived in bodies of fresh water. From a palæobiological standpoint this has some bearing on the adaptation of these reptiles. To be stratigrapher it means that plesiosaurian remains are not absolute evidence of marine deposition. It is most reasonable to consider these fresh-water plesiosaurs as the inhabitants of rivers. The gradual transition from marine, through estuarine, to fluvial environment makes possible the secondary adaptation of sea animals to rivers. Modern examples of this are the cetaceans in the Ganges and the Amazon, as well as some rays, which have been observed in the larger rivers.

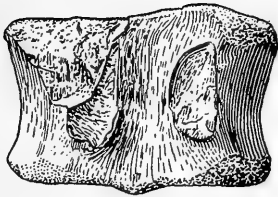
² Geol. Surv. Canada, Contrib. Can. Pal., vol. 3, pt. 2, p. 32, 1902.

³ Quart. Jour. Geol. Soc. London, vol. 78, pp. 285-298, pls. 14, 15, 1922.

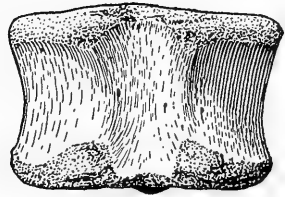
¹ Amer. Mus. Nat. Hist., Bull., vol. 32, pp. 605-615, 7 figs., 1913.



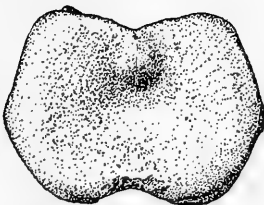
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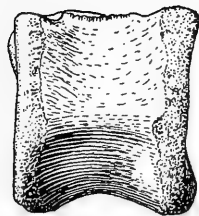
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Fig. 1. Restoration of the plesiosaur *Elasmosaurus*, a relative of *Leurospondylus*.

Figs. 2-5. Vertebral centrum of *Leurospondylus*?, $\times \frac{1}{2}$: fig. 2 dorsal view; fig. 3, ventral view; fig. 4, view of articular face; fig. 5, lateral view.

NESTING OF BONAPARTES' GULL (*Larus philadelphia*) IN CENTRAL ALBERTA

By FRANK L. FARLEY



THE occasional appearance of Bonaparte's Gull during the breeding season, on various lakes and sloughs in the vicinity of Camrose, led the writer, years ago, to suspect that the species might nest sparingly in certain localities midway between Camrose and Edmonton. The discovery of several nests of this interesting gull in 1915, by Mr. A. D. Henderson, about 70 miles north-west of Edmonton, aroused further interest in the matter, and seemed to warrant careful investigation of the region above referred to. Although several trips were made into the territory in an effort to locate the birds on their breeding grounds, it was not until 1928 that success was achieved.

According to pre-arrangement, on May 27th, 1928, I met Mr. Arthur Twomey, an undergraduate of the University of Alberta, at a certain place in the Beaver Hills. While on his way to the place of meeting, Mr. Twomey observed, circling over a small lake, several gulls one of which was seen to settle in the branches of a live spruce and disappear from view. He immediately walked over to the lake and in a short time found four nests belonging to Bonaparte Gulls, each containing three eggs. Eight gulls were in the vicinity, and as search for the nests was being carried on, the birds watched proceedings from the tops of the trees, or circled overhead, at the same time uttering their notes of disapproval, "te-ar", somewhat similar to those of the Common Tern. Later in the day I visited the colony and found it to be in a well-settled district, two hundred yards from a graded road, and less than that distance from an occupied farm house. The lake, which has an area of about three acres, is surrounded on all sides by marsh and muskeg. Until recent years the muskeg had supported a heavy growth of spruce and tamarack, but most of the trees have been cut and used for building on the homestead. It was in the few remaining trees that the nests were built, at distances of from ten to fifty feet from the water's edge. The nests were loosely constructed of dead twigs of spruce and tamarack, and lined with dried grasses and reeds, and mosses gathered from the trunks and branches of the trees. They were built on the branches eight to fifteen feet from the ground, and one to two feet from the trunk of the tree. So well were they concealed that it was nearly impossible to detect them from below. Their

outside diameter was about ten inches, and the inside depth about one inch.

On the 1st of June, 1929, we again visited the lake and found three pairs of gulls nesting. One nest contained two eggs and the others, three eggs each. Incubation at that date had commenced. All nests were newly constructed, and were similar in every way to those found the previous season. Although a pair of crows nested close by there was no evidence that they had molested the gulls in their nesting operations. At the time of this visit the owner of the farm was working with a team in the field about one hundred yards from the nesting trees, and a number of children were noted passing along the road on their way to school, which was located about a mile distant, yet none of these people were aware of these nests.

While motoring to Edmonton on the 23rd of May, 1930, I spent a few minutes looking over the muskeg and found six gulls resting on the lake or sitting on the tree-tops. Three nests were easily located, all freshly built and in the same trees that held the nests the previous season. Each nest contained three eggs and at this date incubation had not commenced. The average measurement of a number of eggs is as follows: length 1.9 inches, and width 1.35 inches. There is considerable variation in the shape and colouration of the eggs. The ground colour is green of varying shades, spotted and blotched with brown and umber.

The area embraced in this isolated bit of Canadian Life-zone did not exceed fifteen acres, yet, in addition to being the summer home of Bonaparte's Gulls, it was also the summer home of a number of varieties of birds, characteristic of the extensive muskeg regions north of the Saskatchewan river. To all of them it must have been as an oasis in the desert. The following birds were noted in this restricted area, where they were probably breeding; Greater Yellowlegs, Lesser Yellowlegs, Solitary Sandpiper, White-throated and Lincoln's Sparrows, Juncos, Northern Yellowthroat, Tennessee Warbler, Ruby-crowned Kinglet and Olive-backed Thrush. Less than half a mile from the muskeg, a pair each, of Baltimore Orioles and Catbirds were nesting, while Kingbirds were noted in noisy combats with Crows and Blackbirds in the surrounding woods.

This is probably the first recorded nesting of

Bonaparte's Gull south of the North Saskatchewan River, and it may constitute a southern

record for its breeding in Western Canada.

NEW RECORDS OF MUSHROOMS AND OTHER FLESHY FUNGI OF THE OTTAWA DISTRICT

By W. S. ODELL

THE records presented in the following are supplementary to those given by the writer in "List of Mushrooms and other Fleshly Fungi of the Ottawa district" (Victoria Memorial Museum, Bulletin No. 43, Biological Series No. 11, Ottawa, 1926). The number after each record, e.g. 534 after that of *Amanita verna*, is a field number which corresponds with a number of negatives filed with the Photographic Division of the Geological Survey, Department of Mines, Ottawa, where all the specimens recorded were photographed. All determinations have been made or checked by Dr. John Dearness, London, Ont., to whom the writer also wishes to express his appreciation for kind assistance in the preparation of the MS.

WHITE SPORED BASIDIOMYCETES

AGARICALES Agaricaceae

Amanita verna (Bull.) Fr. Berrigan's bush, Ont. Sept. 534.

Amanita porphyria Fr. Henry's bush, Ont. Sept. 536.

Armillaria granulosa (Fr.) Kauffm. (*Lepiota granulosa* Fr.) Beneath pines; Henry's bush, Ont. Oct. 586.

Armillaria mellea Fr. Pine woods; Berrigan's bush, Ont. Oct. 629.

Armillaria robusta Fr. Mixed woods; Bernard lake, Que. Oct. 580.

Clitocybe sp. On lawn; Fairmont Ave., Ottawa, Ont. 568.

Clitocybe inversa Fr. Beneath pines; Val Tetreau, Que. Sept. 540.

Clitocybe robusta Pk. Beneath pines; Val Tetreau, Que. Sept. 548.

Clitocybe sinopicoides Pk. Beneath spruce; Merrifield's corners, Que. Sept. 611.

Collybia strictipes Pk. Beneath pine bush; near Cantley cemetery, Que. Oct. 626.

Cantharellus lutescens Fr. Wet ground beneath hemlocks; Kingsmere, Que. Oct. 589.

Cantharellus infundibuliformis (Scop.) Fr. Glen Major, Ont. Sept. 561

Hygrophorus probably *camarophyllus* (Alb. & Schw.) Fr. Moist coniferous woods; Merrifield's corners, Que. Sept. 612.

Hygrophorus coccineus (Wulf.) Fr. Beneath hemlocks; Val Tetreau, Que. Oct. 546.

Hygrophorus fuliginosus Frost. Beneath conifers; Gilmour's grove, Que. Oct. 632.

Hygrophorus (nr.) *hypothejus* Fr. In leaves, open hardwood, Kingsmere, Que. Oct. 574.

Hygrophorus pallidus Pk. Mixed conifers, Merrifield's corners, Que. Sept. 616.

Hygrophorus purpurascens Schw. Moist mixed woods, Meach lake road, Que. Oct. 577.

Hygrophorus Russula Fr. Moist mixed woods, Merrifield's corners, Que. Sept. 610.

Hygrophorus speciosus Pk. Beneath spruce; Child's bush, Ont. Oct. 584; also swampy ground Merrifield's corners, Que. 622.

Lactarius chelidonium Pk. Beneath spruce; Green's creek, Ont. Oct. 556.

Lactarius colorascens Pk. Beneath pines; Henry's bush, Ont. Oct. 566.

Lactarius controversus Fr. Common; Green's Creek, Ont. July, 602

Lactarius helvus var. *aquifluus* Pk. Beneath pines; Huston's bush, Ont. Sept. 606.

Lactarius helvus var. *aquifluus* Pk. Beneath pines; Huston's bush, Ont. Sept. 614.

Lactarius indigo Schw. Beneath pines; Green's Creek, Ont. Oct. 553.

Lactarius lignyotus Fr. Beneath hemlocks; Huston's bush, Ont. Sept. 613.

Lactarius subdulcis Fr. Beneath pines; Henry's bush, Ont. Oct. 567.

Lactarius theiogalus Fr. Beneath pines; Green's creek, Ont. Oct. 550.

Lactarius trivialis var. *gracilis* Pk. Henry's bush, Ont. Sept. 535.

Lepiota acutaesquamosa Fr. City Park; Ottawa, Ont. Sept. 538.

Lepiota clypeolaria Fr. Beneath pines; Meach lake road, Que. Oct. 578.

Lepiota Fischeri Kauff. Maple woods; Val Tetreau, Que. Oct. 547.

Lepiota Friesii (Lasch.) Fr. In rose garden, Experimental Farm, Ottawa, Ont. Oct. 585.

Lepiota granulosa (Batsch) Fr. = *Armillaris granulosa* (Fr.) Kauff. Beneath pines, Henry's bush, Ont. Oct. 586.

Marasmius rotula Fr. On dead beech log; Gilmour's grove, Que. July 601.

Mycena pura Fr. Among pine needles; Wychwood, Ont. Oct. 583.

Pleurotus albolanatus Pk. Mossy pine log; Merrifield's corners, Que. Sept. 608.

Pleurotus sapidus Kalchb. Growing on log in cellar; Experimental Farm, Ottawa, Ont. Oct. 559.

Pleurotus subpalmatus Fr. On living ash; Arboretum, Experimental Farm, Ottawa, Ont. June, 599.

Russula crustosa Pk. Beneath pines; Green's creek, Ont. Oct. 552.

Russula (near) *delica* Fr. In moist ravine; Green's creek, Ont. Oct. 570.

Russula fallax Cke. Beneath pines, Wychwood, also at Green's creek, Ont. Oct. 571.

Russula flaviceps Pk. Beneath pines in bush; near Cantley cemetery, Que. Oct. 625.

Tricholoma lascivum (?) Fr. On pine cone; Val Tetreau, Que. Oct. 572.

Tricholoma personatum Fr. Beneath hemlocks; Berrigan's bush, Ont. Oct. 555.

Tricholoma subacutum Pk. Beneath hemlocks; Cascades, Que. Oct. 579.

Tricholoma terriferum Pk. Open field near cedars; Merrifield's corners, Que. Oct. 623.

PINK SPORED

Clitopilus abortivus B. & C. On dead birch stump; Henry's bush, Ont. Oct. 581.

Clitopilus caespitosus Pk. Beneath hemlocks; Val Tetreau, Que. Sept. 542.

Entoloma (near) *clypeatum* (L.) Fr. Coniferous swamp; Merrifield's corners, Que. Oct. 624.

Entoloma griseum Pk. Moist low ground; Huston's bush, Ont. Oct. 619.

Pluteus cervinus Fr. On lawn; Experimental Farm, Ottawa, Ont. Oct. 549.

Pluteus umbrosus Fr. On sawdust; Lady Grey Hospital, Ottawa, Ont. Oct. 573.

BROWN SPORED

Cortinarius (near) *caerulescens* Fr. Beneath hemlocks; Val Tetreau, Que. Sept. 543.

Cortinarius (near) *coloratus* Pk. Berrigan's bush; Merivale, Ont. Sept. 539; also beneath spruce; Green's creek, Ont. Oct. 557.

Cortinarius flavifolius Pk. Margin of moist wood; Manotick, Ont. Sept. 565.

Cortinarius (near) *infractus* (Pers.) Bres. Beneath hemlocks; Val Tetreau, Que. Sept. 545.

Cortinarius multififormis Fr. Green's creek, Ont. Sept. 541.

Cortinarius pholideus Fr. Child's bush; Russell Road, Ont. Oct. 554.

Cortinarius uraceus Fr. Beneath spruce; Green's creek, Ont. Oct. 558.

Crepidotus dorsalis Pk. On decayed poplar; Mansfield's bush, Ont. June 598.

Crepidotus mollis Fr. Between railway ties, Gilmour's grove, Que. Oct. 630.

Flammula spumosa Fr. Base pine stump, Green's creek, Ont. Sept. 604.

Pholiota flammans (Batsch) Fr. At base of elm, Experimental Farm, arboretum, Ottawa, Ont. Sept. 594.

PURPLE SPORED

Hypholoma sublateralium Fr. At base of pine stump, Huston's bush, Ont. Oct. 618.

Psalliota abruptibulbus Pk. In pine woods; Berrigan's bush, Ont. Oct. 627.

BLACK SPORED

Gomphidius viscidus var. *columbiana* Kauff. Beneath pines; Cascades, Que. Oct. 635.

Boletaceae

Boletinus cavipes (Opat.) Kalchb. Mixed coniferous woods; Merrifield's corners, Que. Sept. 617.

Boletus subaureus Pk. Beneath pines; Green's creek, Ont. Oct. 551.

Clavariaceae

Clavaria coralloides (?) L. Berrigan's bush; Merivale, Ont. Sept. 533.

Clavaria fusiformis Sow. Berrigan's bush; Merivale, Ont. Sept. 532.

Clavaria cristata (Holmsk) Pers. Kingsmere, Que. Aug. 603.

Clavaria ligula Schaeff. Sent from Toronto Exhibition, Sept. 544.

Clavaria pistillaris L. Beneath spruce and pines; Merrifield's corners, Que. Sept. 609.

Hydnaceae

Hydnellum humidum (?) Banker. Beneath pines; Huston's bush, Ont. Sept. 607.

Polyporaceae

Daedalea quercina Pers. On oak stump; Henry's bush, Ont. Oct. 588.

Irpex tulipifera Schw. On fallen beech; Gilmour's grove, Que. Nov. 597.

Merulius tremellosus Schrad. On dead beech; Gilmour's grove, Que. Oct. 596.

TREMELLALES

Tremella reticulata (Berk.) Farl. Between railway ties; Gilmour's grove, Que. July 600.

DACRYOMYCETALES

Dacryomyces aurantius (Schw.) Farl. On spruce; Green's creek, Ont. Sept. 605.

LYCOPERDALES

Bovista plumbea Pers. In grain field; Henry's bush, Ont. Oct. 582.

Calvatia cyathiformis (Bosc) Morg. Open field; Berrigan's bush, Ont. Oct. 634.

Calvatia elata (Masse) Morg. Low ground; Merrifield's corners, Que. Oct. 633.

Lycoperdon gemmatum Batsch. Common; Henry's bush, Ont. Oct. 587.

SCLERODERMATALES

Scleroderma bovista Fr. Sent from Toronto, Ont. Sept. 531.

ASCOMYCETES

HELVELLALES

Gyromitra gigas (Krombh.) Cke. At base of pine; Henry's bush; Ont. May, 592.

Helvella Infula Schaeff. On poplar log; moist ravine; Kingsmere, Que. Sept. 575.

Morchella angusticeps Pk. Among ferns; Henry's bush, Ont. May 591.

Morchella angusticeps. Cluster; open space in woods; Henry's bush, Ont. May 590.

Morchella crassipes Pers. Among ferns; Henry's bush, Ont. May 593.

PEZIZALES

Aleuria aurantia (Pers.) Fekl. In damp ravine; Gilmour's grove, Que. Sept. 564.

Chlorosplenium aeruginascens (Nyl.) Karst. South March, Ont. Sept. 537.

Geopyxis cupularis (L.) Sacc. Beneath spruce; Experimental Farm, arboretum Ottawa, Ont. July 562.

Haematomyces faginea Pk. (*Ascotremella faginea* (Pk.) Seaver). On decayed beech log; Gilmour's grove, Que. Oct. 569.

Peziza proteana (Boud.) Seaver. Beside beech log; Meach lake, Que. Oct. 621.

HYPOCREALES

Cordyceps capitata (Holmsk.) Link. On ground, moist ravine; Kingsmere, Que. Sept. 576.

SPHAERIALES

Xylaria castorea Berk. Decayed beech log; Meach lake, Que. Oct. 620.

Xylaria corniformis Fr. Decayed beech log; Gilmour's grove, Que. Oct. 631.

Xylaria digitata (L.) Grev. Decayed beech log; Gilmour's grove, Que. Sept. 615.

IS GAMBEL'S SPARROW AN ONTARIO BIRD?

By L. L. SNYDER



ALTHOUGH it is probably generally known among ornithologists of Eastern Canada that Gambel's Sparrow has recently been discovered as a migrant in the State of Michigan¹, it seems worth while repeating the circumstances of the discovery so that field observers in Ontario will not overlook the possibility of its occurrence in that Province. Mr. M. J. Magee, the well known bird-bander of Sault Ste. Marie, Michigan, noticed a peculiarly marked White-crowned Sparrow at his feeding station on May 21, 1925. Later the same day he was fortunate enough to capture the bird in a banding trap and a sketch showing its peculiarities was made before it was banded and released. Information relative to the discovery was forwarded to the University of Michigan, Museum of Zoology, and to the Biological Survey at Washington, both of these institutions verifying Mr. Magee's determination of the bird as Gambel's Sparrow. A careful search of the series of White-crowned Sparrow skins in the Museum of the University of Michigan was made by Mr. J. Van-Tyne and he discovered two previously unrecognized specimens of this sparrow. Additional

records were brought together from bird-banders in the state, the total being eleven, all since 1918.

Gambel's Sparrow, *Zonotrichia leucophrys gambeli*, usually considered a subspecies of the White-crowned Sparrow species, resembles very closely our familiar White-crowned Sparrow, *Zonotrichia leucophrys leucophrys*. The major difference between them is that in the *gambeli* form the light stripes over the eyes are continuous forward, to the base of the bill, not being interrupted by black areas in front of the eyes (the lores). Although it may appear that this character would be very inconspicuous in life, Mr. Magee has told the writer that he was immediately struck by the peculiar appearance of the supposed White-crowned Sparrow at his feeding station. From the front the bird had a bald-faced appearance which gave it quite a different expression from the ordinary White-crowned Sparrow. Apparently this character is one of those which is more conspicuous in life than in preserved specimens but easily overlooked if one is not acquainted with what to look for. It may be added that immatures of the two forms are extremely difficult to distinguish even with specimens in hand.

So far as the writer is aware specimens which show intergrading or intermediate characters between the two forms have not been found.

¹"Status of Gambel's Sparrow in Michigan" by Josselyn Van Tyne, *The Wilson Bulletin*, 42: 95-97, 1930.

This sharp separation of characters in conjunction with a more or less overlapping summer distribution suggests a specific difference between them, in fact some ornithologists are strongly inclined toward this belief.

The breeding range of Gambel's Sparrow extends through the boreal parts of the prairie provinces, southward in the mountainous country to Idaho, and Montana. The winter range is largely in the southwestern States. During migrations, individuals disperse eastward so that casual records have been made in Texas, Kansas, Iowa, Minnesota and Michigan. Casual occurrence in Michigan and Minnesota and regular occurrence in Manitoba suggests very strongly that this sparrow invades the Province of Ontario as a migrant.

By way of checking up on the possible past occurrence of this form in Ontario, the writer has examined the series of White-crowned Sparrows from Ontario in the R.O.M.Z. collection. Nothing definite was discovered but at least one specimen

was found which lends some weight to the supposition that Gambel's Sparrow is an Ontario bird. The specimen, an adult male *gambeli* was taken on May 16, 1890 by Mr. J. A. Varley. The locality datum "Toronto" appears on the Museum's label with remarks on the reverse side which state that the place of capture was stated verbally by Mr. Varley when he presented his small collection of Eastern North American birds to the Museum in November 1925. No place of capture is indicated on the original label. Memory is too uncertain in any case such as this to place any positive assurance in the record. The circumstances are such, however, as to justify including Gambel's Sparrow in the list of hypothetical records of Ontario birds.

A careful scrutiny of White-crowned Sparrows in museums and private collections may reveal specimens of this bird that have been taken in Ontario or close inspection of White-crowns in the field may disclose a "new" bird in Ontario's avifauna.

OCCURRENCE OF THE POMARINE JAEGER IN THE MONTREAL DISTRICT

By L. McI. TERRILL



WHILE looking for late shore birds along the south shore of the St. Lawrence River near St. Lambert, on October 26th, 1930, I found a dead jaeger lying on the beach just above high water mark. Apparently it had been shot several weeks previously as little more than the skeleton remained. The plumage, however, was in good condition and as definite jaeger records of any species are unusual in the vicinity of Montreal, I brought away portions of the bird, including the head, a wing and a foot, and some of the tail feathers. Later, I came to the conclusion that it was a juvenile Pomarine Jaeger (*Stercorarius pomarinus*), principally on account of the size and character of the bill. As this was my first record for the species I sent the remains to Mr. Taverner of the National Museum of Canada, who confirmed the identification and furnished me with the following measurements in millimeters:—wing 330, middle tail feathers about 137, tarsus 60, culmen 37. Mr. Taverner added that the bill and tarsus agree in size with

many fully adult specimens of *pomarinus* and that they were much larger than any *parasiticus* in the National collection. These features in conjunction with juvenility he believes are determinative. Although the wing is distinctly small, I understand that variability in the length of the primaries is a characteristic of juvenility in this family.

Mr. Taverner states that he has no records of *pomarinus* for localities so far up the St. Lawrence as Montreal and that this is the first specimen in juvenile plumage that has come to his attention. He mentions that the underwing surface in this specimen is spotted instead of having the solid colouring of the adult and that the tarsus is pale blue.

When I first saw the bird I was impressed with the barred, hawk-like appearance of the under plumage and noted that the middle tail feathers projected about half an inch beyond the others.

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By **BERNHARD HANTZSCH**

"Beiträge zur Kenntnis des nordöstlichsten Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume, 8, 1909, pp. 158-229. Volume 9, 1909, pp. 245-320.

(Translated from the original German text in the Library of Congress, Washington, D.C., by M. B. A. Anderson, M.A., Ottawa, 1928.)

Original pagination given in the text.

(Continued from page 118)

The next morning we decided to continue our journey. Not even a slight breeze was blowing, and the damp fog had changed into a fine autumn mist, which calmed the waters of Ikkerasak. Since it seemed to be free of ice, we started off about nine o'clock with favourable conditions. We held our course at first farther over towards the north shore, and found countless whirlpools and bubbling places, in which the water flowed as if boiling, but we were never carried along with dangerous speed. We soon had these dreaded currents behind us, and were rowing in a calm, smooth waterway. [P. 203]. The landscape on both sides of Ikkerasak forms a splendid picture. As a rule the mountain heights rise abruptly from the water and at times display strong bold outlines, reaching a height occasionally of 200 to 300 meters. The hinterland rises still higher, especially towards the south, so that from Hudson Strait you see these mountain spurs towering above the Killinek Islands. The slopes create a desolate cold impression almost everywhere. They are covered here and there with fallen rubble, which has made a narrow foreshore in places, and a landing may be made in case of necessity. We approached the entrance to the strait after a three hour journey. Since the tide was beginning to change, we rowed through a very narrow entrance, quite smooth at low tide, into a beautiful inlet of some length, in order to continue our journey the following day. This locality is situated on the south side of Ikkerasak, and is called Tessiujaksuk or Tessiujak for short by the Eskimos. It is a welcome, sheltered harbour for boats, though the narrow entrance prevents larger ships from entering. It might form a safe shelter from the dangers of the Ikkerasak in bad weather, because it is surrounded by high mountains. It is a favourite camping spot of the Eskimos, possessing fresh water and an abundance of drift-wood near the entrance on the west shore. Because of its importance to the neighbourhood, I gave it a special name:

I called it Snow Bay,¹ because more old snow remains in the deep gullies of the slopes than in other places here, and because on September 6th we found our tent and the whole neighbourhood covered with snow at 0° temperature [32° F.] though it soon melted away.

We left Snow Bay later on the morning of September 6th travelling along farther in changeable weather, driving snow, sunshine and thick fog. The Ikkerasak is very broad at this place. Low-lying islands are situated in a long chain in front of the tip of land in the north (Nuvutsit). The coast farther northward is said to fall abruptly into the sea, so that in bad weather a landing place can hardly be found. Paksau had explained it would be dangerous to travel alone with me in this neighbourhood, so we now turned southward, passing a narrow arm of the sea between the northeastern mainland island Operngevik and an island situated close by and we saw south of the Labrador coast the mighty Kakkiviak rise up before us in the hazy autumn mist and vaporous sunshine. Far out there in the southeast, however, lay different islands, the largest of which we had set as our goal. We had scarcely rowed half an hour's distance from the shore, when a low, but very thick, fog enveloped us. We could still see the bright spot that was the sun, but nothing more of the land. Trusting to the direction we rowed forward in fairly quiet water, and about two o'clock at last reached the main island. Later, for personal reasons, and since it is called only "Big Island" by the Eskimos, I gave to this island the name "New Plauen" in honour of my present home (Dresden-Plauen) where I have spent fifteen years of my life. [P. 205].

The island of New Plauen has, it is estimated, a length of eight kilometers, and perhaps the same

¹ However necessary it may be for travellers to know the native names of geographical localities, I consider it expedient to give special names in a civilized language, to such localities as have importance to the white people of the vicinity. It is quite unnecessary for one who is not a traveller to fix in mind the difficult Eskimo words, which are often very long; for example, the mountain Allakattariavialuk not far from Snow Bay. Many Eskimo place names are contradictory, not corresponding in the least to the significance of the place. As an example Tessiujak means a bay like a pond, Kikkertaujak means a peninsula, Kikkertasoak means a large island, Nuvualuk a mighty or dangerous point of land, etc. Other names [P. 204] have characteristic value; for example Operngevik—spring hunting place, Napartolik—forest of all kinds of trees, Ukkusiksalik—a land where there is soft stone. Not many Eskimo names may be called true names; for example, Komaktorvik—a place (bay) where there are many lice, Kallaruselik—a place, where a nail-shaped small mountain peak stands near a larger one. I myself proposed new names for only two localities in our district; Snow Bay and the island, New Plauen.

breadth. A mountain range extends in the interior about 60 to 80 meters high, mostly rising in a gentle slope, which terminates in the north of the island with a conical summit of 115 meters height. From this peak a rather steep rubble slope descends to the sea, upon which, both near and far, a great number of small islands rise high. You have a splendid view of the mainland across the desolate rocky island, lying nearest to you. You see the entrance of the Ikkesarak and the projecting parts of the coast northward as far as the vicinity of Cape Chidley. This mountain peak is separated from the remaining part of the high range by an inlet toward the south. When you have crossed this, however, you can travel along very comfortably on the crest until, in the southern part of the island you reach a summit, which falls abruptly. From here the Labrador coast lying to the southwest is very imposing. Dark and mighty the coffin-shaped Kakkiviak and the more rounded Ullevaluit rise up from the sea, farther southward also the beautifully shaped Mt. Bache on the northern tip of the large island at Aulatsivik. These splendid mountains may perhaps reach the height of 700-800 meters. There are a number of islands between these and New Plauen, which are flat for the most part. Some of these lodge large breeding colonies of Eider Ducks—the only ones in the district described by me. There is a long island quite near the main island (New Plauen), to which one may cross with dry feet at low tide. The lower slopes of New Plauen have an abundance of grasses, plants, mosses and somewhat larger willow shrubs than at Killinek. The strips of coast are covered alternately with the freshest green or are desolate and gravelly. The island has on the whole more vegetation than the opposite mainland. This is due to the numerous small brooks, which everywhere run down to the sea, and give a very special stamp to the landscape. There is an almost entire lack, however, of standing waters, which are so frequent on the mainland. Except some salt-water lagoons, there are only swampy pools near the shore, with an abundance of vegetation, and surrounded in places by ferruginous red and yellow mud flats. Near the sea there are large piles of driftwood, sticks of such size as I had rarely before seen. Paksau was astonished at the abundance of wood, and spent more time and strength than I liked in dragging large heaps together in different places on the shore, with a high stick towering up in the centre of each pile. This serves, he explained, as a sign that someone has taken possession of the wood, and this right is usually respected by the Eskimos. It often

happens that during the summer families carry such heaps of wood to favourable places on the coast, in order to fetch them during the winter. All the people in Killinek would have found here more than enough wood for the winter's supply, but the island is situated so far out of the way, that transport might cause great difficulty. New Plauen has also an abundance of animal life. We observed flocks of Eider Ducks on rocky sandy places, which probably come out here from their breeding places. Seals, too, were lying on the narrow ledges; on the afternoon of September 6th we saw 30 or 40 at the same time in the east of the island, where they stretched themselves out comfortably. Paksau was at once seized by the desire to hunt, but the flat shore offered only slight cover and he killed only one medium sized Ringed Seal. He dragged the animal, as he told me, above the tide mark, in order to fetch it the next day with the boat. But when he returned, two white foxes had eaten much of it, and had also devoured a large piece of the pelt. Because Paksau approached carelessly they sprang away at once, and vanished among the rocks. Probably they come across the ice in winter to the mainland, even if this remains in constant motion. We did not find any signs of earlier human habitation on the beautiful island, neither tent rings, fire places, house ruins nor even graves. Only on the highest mountain height a long fallen round heap of stones gave witness of the presence of earlier visitors, probably only Eskimos. I arranged the stones a little and then looked across the island world lying before me in the wonderful autumn gold, while Paksau without success stalked a large Bearded Seal, which was sunning itself in lonely fashion outside on a rock in the sea, probably filled with the same feeling of well-being as I.

After almost two days' stay we left the island in a light snow fall and $+ 2^{\circ}$ Centigrade [35.6°F.] temperature. Although the current carried us along, we had to fight with a contrary wind, so that the waves tossed us about hither and thither and we were wet through. After four hours' rowing we reached the mainland, fortunately, and pitched our tent on the peninsular Operngevik. Sunday, September 9th was a beautiful autumn day. The air remained cool—toward midday at 3°C [37.4°F.] but there was such bright sunshine, that our spirits rose, when we wandered out into the morning. Kakkiviak showed its imposing length in the south, and near us extended the gentle slopes which surround the broad Tunnusuksoak, which cuts so deep into the land. The neighbourhood is desolate and deserted looking. The grinding of old glaciers has made flat

plateaus, which show countless white quartz lines pushed upright in the gneiss. Operngevik is a favourite place for the Eskimos of Killinek to visit, for the vicinity has an abundance of seals. The high southeastern corner of the mainland peninsula is preferred as a camping spot, from which you can look far across the sea. A very sad impression is created by such a deserted Eskimio dwelling place. The grass grows greener and more abundantly than elsewhere, unchoked and untrampled. Stones arranged in rings are found in some spots, which have been used for countless years to hold down the edge of the tent. Countless bones lie scattered about near the fire-places. Paksau could name at once all that I pointed out to him, even the human bones. Seal bones predominated naturally, more rarely smaller cetaceous animals [P. 207] and birds. But we also found bones and claws of a polar bear, as well as several small caribou antlers. There were a few house remains which may have fallen into ruin long ago. Show houses and tents are preferred to stone or earth houses as temporary residences.

I pictured to myself what a different life prevailed in the Spring of the year than at present, when only croaking ravens bade us welcome in the eternal loneliness. At that time the place was not deserted nor sad; Eskimo families were there to make it appear inhabited, then the beach resounded with joyous laughter and the chatter of women and children. Standing in front of the tents they awaited the arrival of the men, whose shots break the silence of nature now and then. And what a busy life began when the kayak travellers approached land, one or more seals in tow. Talking loudly they alighted on the shore, while the women at once began removing the spotted skins. The children stood, attentive, in a circle; the dogs lurked whining in the background. Soon the cooking fire was smoking and at last the whole merry company sat together chatting and eating. Such picturesque folk-scenes, as I like to see them, entangling my own self among the happy people, came into my mind when I walked upon the tent places here on Operngevik, until several rather long, artistically made stone graves over the dead, reminded me of more serious times in the life of these carelessly happy people. Almost all the graves were fallen into ruin, very old and scattered. By kind words and a couple of dollars I had induced Paksau not to oppose my taking away some of the bones. I am convinced that he kept me away from the graves whenever possible. After taking a photograph of the best preserved grave here at Operngevik, I busied myself in raising the heavy stone

plates carefully, in order to get at the skeleton. Paksau did not consider it suitable for him to assist me with such work, although he saw how heavy and difficult it was for one person [p. 209] to throw to one side such large stones, so that no others would slip down into the interior. I did not wish to hurt the feeling of piety in him, and left him undisturbed. During the hour's work while taking out the partly mouldy bones, drying these in the sun, as well as careful packing in a box brought in a boat, he continued to sit almost motionless on a stone at some distance, smoked his pipe, and looked on as a watchman of good morals with a solemn face, as I likewise in a serious and quiet manner, emptied the grave upon a flat rock. As I heard later, Paksau knew who the old woman had been, whose bones these were. In the following days I had many difficulties with his superstitious fears, before the dread box was at last hidden in Killinek. My good comrade clung still more stubbornly to his heathen beliefs than many a "candidate for baptism" considered wise, and I understood him and respected his adherence to the old customs and beliefs. The converts are often questionable fellows! There were found also some stone monuments all erected by Eskimos perhaps, on points situated higher on the Operngevik peninsula. A close investigation of the district would perhaps bring to light old weapons and tools, of which I found only a kayak paddle, a harpoon point, and some carved bones which had been worked upon [artifacts]. I did not have time to search more carefully, since my chief object concerned the avifauna, and this gave me enough work to do the whole day, especially since Paksau, while on journeys, did not like to help me at all in the preparation of specimens.

After we had stayed at Operngevik until September 10th on account of the unfavourable weather, at last on the morning of the 11th we left our camp there. At first we had an annoying adverse wind, so that we thought of waiting in Snow Bay until more favourable weather. Because we were longing for home and the barometer was falling slowly but steadily, we rowed on. The following days, there was very bad weather that certainly would have hindered us on our homeward journey. Our patience was soon rewarded; a dead calm set in, and [P. 210] the Ikkerasak lay, as often, so quietly before us, that the dark mountains were mirrored in it with the greatest clearness. We did not stop to rest. In spite of the fact that we had begun the journey at 6 o'clock without breakfast, in order to be betimes in the Ikkerasak with the falling tide, we now ate some ship's biscuit, while we kept

on rowing with one hand. Paksau was working with all his strength, for it was near time to conquer the powerful currents formed at the western outlet as the water flowed out. Otherwise we should have been forced back to land, perhaps even to Snow Bay. We reached the dangerous places however at the right time, passed them with good luck, especially as we had the help of the sail in a narrow rushing adverse current

close to the rock, then after eight hours of rowing put our oars aside, in order to let ourselves be driven comfortably to Killinek by a brisk wind which was blowing outside the strait. About five o'clock we reached Killinek, happy to see people again, after an absence of eight days, and now prepared for a more settled routine.

(To be continued)

MAUNSELL SCHIEFFELIN CROSBY

BORN FEBRUARY 14, 1887.

DIED FEBRUARY 12, 1931.

MAUNSELL SCHIEFFELIN CROSBY, a member of the Ottawa Field-Naturalists' Club since 1925, died suddenly at Rhinebeck, Dutchess Co., New York, on February 12, 1931, of pneumonia, following an operation for appendicitis. He was born February 14, 1887, in New York City, the son of the late Judge Ernest H. and Fanny (Schieffelin) Crosby. His parents acquired the beautiful estate of Grosmere at Rhinebeck when he was still a very small boy and it was here that the greater part of his life was spent. He was fitted for college at a school in Morristown, New Jersey, and by private tutors and graduated from Harvard in 1908.

From birth Crosby was interested in nature, the country, and outdoors. This was in part, at least, by inheritance from his father, with whom he used to go on long walking trips in his boyhood. His special interest in birds was, however, greatly stimulated and directed by his life-long friend, Clinton G. Abbott, who acted as his tutor for some time in his youth.

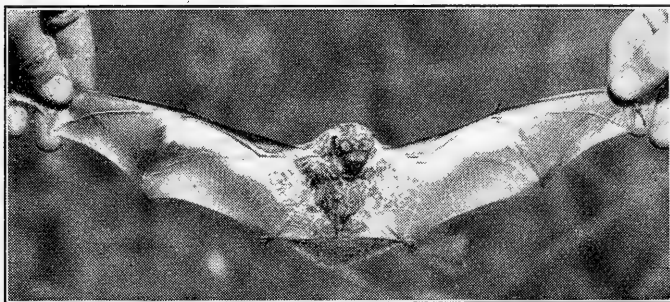
It was not until after the Great War, in which he made an honourable military record, that Crosby had a little more leisure for bird study. He immediately acquired a wide circle of acquaintances and friends, and, profiting by his associations with skilled ornithologists, made rapid progress in his knowledge of birds. He made a number of carefully planned field trips to various parts of North and Central America, but always returned with undiminished enthusiasm to the

study of the birds of his "local region". It was his good fortune and that of his friends that the Hudson River was full of ducks in spring and fall, and the Valley swarmed with great waves of Warblers and other transients in May and September. Many notable ornithological gatherings enjoyed his hospitality and hunted for unusual birds under his expert leadership, infected with his own enthusiasm. He was himself a most gifted field-naturalist, with remarkable keenness of vision and most unusual acuteness of hearing.

Although Crosby wrote with difficulty and diffidence, his list of publications is fairly extensive. He was interested in the work of the Ottawa Field-Naturalists' Club, and had acquired one of the few complete sets of the Club's publications.

Those who were privileged to know him will remember him, however, not only as an ardent ornithologist, but as a thorough gentleman in the best sense of the word. His easy, charming manners, his unflinching courtesy, his conviviality, his ready wit and humor, his capacity for making friends and his unswerving loyalty to them, his wonderful courage in the face of severe trials, caused him to be liked by all who came within reach of his influence and won a great respect from those who knew him best.—LUDLOW GRISCOM, in *The Auk*, 48: 320, 1931 (Abridged and amended, by permission).

NOTES AND OBSERVATIONS

*Nycteris cinerea*.—Hoary Bat

HOARY BAT AT TORONTO IN SUMMER.—On the evening of July 29, 1930, while observing bats in Cedarvale ravine, Toronto, my attention was drawn to a large bat flying about the trees with a number of smaller individuals. The specimen was secured and proved to be a female of this species. The measurements of this specimen, as taken from the flesh, are—length, 129 mm.; wing expanse, 387 mm.; hind foot, 12 mm.; tail 57 mm.; and forearm, 54.5 mm. Another bat as large as the one collected was noted at the same time and may also have been of this species.

The date of capture of this specimen suggests that the Hoary Bat is established as a rare summer resident of the Toronto region although the only summer record of which I am aware is that of a specimen in the Royal Ontario Museum of Zoology taken by Mr. W. J. LeRay in August, 1919. In June, 1910, Mr. A. Cosins collected some specimens here which are now in the Ontario Provincial Museum.

All other local records of this bat concern the species as a migrant, and are as follows:—one seen at Toronto marsh in early September, 1885, by Ernest Thompson Seton¹, a specimen secured by Mr. A. E. Parlow on October 25, 1909 (now in the R.O.M.Z.), one secured by R. V. Lindsay on October 1, 1927 at Erindale², one secured by the writer at Cedarvale ravine on October 2, 1927² and the specimen shown in the accompanying photograph, taken at Ashbridges Bay by me on October 23, 1927².

Cross and Dymond³ consider this bat as everywhere rare in Ontario and its status at Toronto is the same according to Fleming⁴.—CLIFFORD E. HOPE.

THE VANISHING MUSK-OX*.—We thought that

¹ Life-histories of Northern Animals, Vol. 2, 1909, page 1197.

² Can. Field-Naturalist, 41: 155, 1927.

³ The Mammals of Ontario, 1929, page 26.

⁴ The Natural History of the Toronto Region, 1913, page 210.

the present precarious status of the musk-ox had been sufficiently impressed on the sport-loving public to insure some compassion for the species, and that these relict animals were no longer shot down wantonly by those who consider themselves sportsmen. We were, therefore, distressed and a bit discouraged to read in a recent issue of one of our most prominent sportsmen's magazines the story of a hunt made in the Arctic last summer by a party of eleven Americans. Seemingly the musk-ox was one of the special objects of pursuit for we are told of the killing of several, though in a way that leaves the impression that the deed is not considered one to be proud of. The boast is made, however, that each of the party added this rare animal to his score. Necessarily, only the heads were taken.

From the circumstantial accounts of hunts of other days all readers of Arctic literature know that the killing of musk-oxen, once the animals are reached, affords about as much sport as the slaughter of tame cattle in a barnyard. Apparently, however, as long as any can be found, each sportsman able to get to their haunts must have his trophy.

We are told, also, of the shooting of seals of several species, animals "easy to hit but hard to kill", that "packed a lot of lead". No true game birds are mentioned, but the Arctic sea birds, on their nesting grounds, paid toll to a company that must have fodder for the guns that each had brought. A polar bear, missed with rifles at thirty yards, after being peppered in the face with shotguns, was finally killed. Others were slaughtered from the boat, though we were spared the details.

Altogether the story of this summer hunt is intensely disgusting and leaves one with a feeling of fear for the future, and a sense of wonder that

* Musk-oxen are totally protected throughout the year in Canada. It is unfortunate that this protection does not extend throughout their range.—ED.

the lessons to be gained from such instances of wanton slaughter are still unheeded.—NATURE MAGAZINE, July, 1931.

SNOW BUNTING IN NOVA SCOTIA.—The following notes on the Snow Bunting (*Plectrophenax nivalis*) were made at Granville Centre, Annapolis Co., Nova Scotia, during the winter of 1929-30.

I happened to be talking to a farmer one afternoon, and while we were in conversation a small flock of Snow Buntings flew past; whereupon he remarked that we were in for some snow. The following notes are the result of his remark and certainly seem to earn for this beautiful little bird the title of 'Weather Prophet'.

DECEMBER 1929

7th. Small flock of Snow Buntings flying west. Wind N.W. Average temp. 17°F. Dull. Snow in afternoon.

14th. Small flock of Snow Buntings flying south. Wind N.W. Average temp. 35°F. Slight snow. Thaw.

30th. Flock of twenty Snow Buntings in the morning flying N.E. another and larger flock flying in the same direction after lunch. Wind N.W. Average temp. 27°F. Heavy snow squalls in evening.

JANUARY 1930

1st. Large flock of Snow Buntings feeding near the farm at mid-day. Calm and bright. Average temp. 27°F.

From the first of the month to the twelfth there was no snow. Only one flock of Snow Buntings was noted, and they were feeding by the Annapolis River about six miles from the farm where these notes were made.

12th. Snow Buntings feeding round the farm again. Wind N.E. Average temp. 7°F. Snow.

16th. Small flock of Snow Buntings. Wind N.E. Average temp. 34°F. Snow, turning to rain later.

20th. Snow Buntings around late in the evening. Wind N.W. Average temp. 20°F. Snow during the night.

21st. A small flock flying north-west. Wind N.W. Average temp. 20°F. Snow.

22nd. Snow Buntings around the farm. Wind N.W. Average temp. 21°F. Snow.

23rd. Snow Buntings around the farm, though probably the same flock as yesterday. Wind N.W. Average temp. 14°F. Snow.

24th. More Snow Buntings. Wind N.W. Average temp. 17°F. Snow, but brighter and more settled.

29th. Snow Buntings again. Wind S.W. turning to N.W. later. Average temp. 28°F. Snow. Fine at intervals.

30th. Snow Buntings. Wind N.E. Average temp. 10°F. Fine. Twelve degrees below zero by the river.

31st. A single Snow Bunting. Wind N.E. Average temp. 16°F. Snow flurries.

FEBRUARY 1930

3rd. Snow Buntings about. Wind slight N.E. Average temp. 16°F. Some snow.

4th. Snow Buntings feeding. Wind N.E. Average temp. 11°F. Bright and clear.

6th. The same flock still about. Wind N.E.-N.W. Average temp. 4°F. Cold and clear.

From the sixth to the twelfth the weather was fine and settled except for a little snow on the tenth.

On the 12th and 13th two or three small flocks were observed flying N.W. The wind at the time was in the N.W. and there was an average temp. of 18 degrees on the 12th. 37 degrees, on the 13th and 36 degrees on the 14th; the unsettled conditions terminated in a blizzard.

The average temperature was taken every day from three shade temperatures at 7 a.m., mid-day and 6 p.m.

The notes finish here owing to the fact that the writer had to leave Nova Scotia.—C. W. G. PAULSON.

AMERICAN EGRET AT GUELPH, ONTARIO.—It may be of interest to some readers to know that on August 24th, 1930, in a marshy pond in Puslinch Township, about six miles from Guelph, I positively identified, with the aid of eight power binoculars, an American Egret. This bird had not the beautiful plumes characteristic of the breeding season, and its black legs were clearly observed. It was almost as large as the Great Blue Heron, but more slender, and several others were seen before and since by other observers at the same place. In order to get protection for these birds I wrote to Colonel Emmer-ton, District Game Warden, London, and he sent up a Game Warden to protect them, but told me that a few of these birds had been observed in other parts of the Province this year. My conjecture is that these birds, usually confined to Florida and the Southern States, were driven beyond their range by the exceedingly dry weather of the 1930 summer.

On December 7th I observed, and positively identified with the aid of eight power binoculars, two Song Sparrows. They were hopping about

a brush pile in a sheltered place near a pond in the City of Guelph. Their streaked breasts with characteristic brown spot in centre, and markings about head and body were clearly observed. I have never seen them here later than about November 10th., nor have any other observers so far as I have been able to ascertain. Mr. A. B. Klugh, who used to reside in Guelph, in published records gives their latest date as about November 10th. On the 7th. inst., it was quite mild here, about 34 degrees, with a light Westerly wind, and misty, and nearly all the snow had melted from the ground.—HENRY HOWITT.

GRASSHOPPER CONTROL IN EASTERN CANADA.—The Entomological Branch of the Dominion Department of Agriculture has just issued an eighteen-page bulletin on "Grasshopper Control in Canada East of the Rocky Mountains," prepared by Mr. Norman Criddle, an authority on this subject of insect control.

The bulletin discusses the life-history of the destructive species of grasshoppers and gives valuable information regarding the various me-

thods of control, particularly those relating to the destruction of the insects by poisoned baits. In the bulletin there is also technical information of value to students of these insects or those who may have charge of organizations looking to this control. In the publication are illustrations of adult grasshoppers as well as young hoppers of various species.—A.G.

HOARY CRESS, (*Lepidium Draba* L.) AT OTTAWA.—A specimen of this introduced perennial weed collected by Mr. B. A. Fauvel, in June, 1930, on land opposite the junction of Cartier and Argyle streets, Ottawa, appears to be the first from this part of Ontario. It has been reported from around Galt, Ont., as persistent in one locality for a number of years. (W. Herriot, *Ont. Nat. Sc. Bul.*, No. 8, 1913.) It has spread widely in the prairie provinces, even into the Peace River district, since its first appearance sometime prior to 1896. The Ottawa infestation covers more than a hundred square feet now, indicating that it has been growing here for some time already.—H. GROH.

BOOK REVIEW

THE FRESH WATER MOLLUSCA OF WISCONSIN.

By Frank Collins Baker of the University of Illinois: 2 vols., Part I, *Gastropoda*, pp. 507, pl. 28; Part II, *Pelecypoda*, pp. 495, pl. 105. Bulletin No. 70 of the Wisconsin Geological and Natural History Survey; Madison, 1928. Published by the University of Wisconsin.

In these beautifully printed and profusely illustrated volumes Professor Baker has presented the results of many years of intensive study of the anatomy, variation and distribution of the fluviatile molluscs of Wisconsin and of many identical or related forms occurring elsewhere in the United States and in Canada. Not only are the shells and their builders represented by excellent half-tone figures, but throughout the text there are almost innumerable illustrations of the *radulae* and the other minor as well as major anatomical characteristics of the diversified soft-bodied animals of which the shells are in most cases merely the external skeletons.

As the state of Wisconsin embraces part of the great valley of the Mississippi, with its marvel-

ously rich and varied molluscan fauna, many of the species and varieties described and figured are not found eastward in Canada, though not a few occur in the vicinity of Ottawa, and others are known from the south-westerly counties of old Ontario, where, however, but comparatively little collecting has been done. The wonder is not that so few but that so many species are common to the great interior continental basin and the Canadian tributaries of the St. Lawrence and Hudson Bay. The geological changes in glacial and interglacial periods are discussed as probable causes of this distribution, though other possible factors are not excluded.

Professor Baker's fine volumes will be found as invaluable to the Canadian student of this recondite branch of natural history as his earlier monograph on the *Limnaeidae* or Simpson's *Naiades*. He makes not a few references to what has been done by members of the O.F.N. Club and suggests that to one should be dedicated the remarkable *physa* from Meach Lake and adjacent waters, long misnamed as Baird's *P. Lordi* from British Columbia.—F.R.L.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

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RETURNS UPON BIRDS BANDED IN 1922

BLACK DUCK, No. 101,273, banded by H. S. Osler, at Lake Scugog, Ontario, on August 31, 1922, was recovered at Little Britain, Ontario, during the month of October, 1926.

RETURNS UPON BIRDS BANDED IN 1923

BLACK DUCK, No. 297,317, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1923, was shot in Camden County, Georgia, on December 12, 1929.

BLACK DUCK, No. 297,673, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1923, was shot at Newport, Delaware, during the month of January, 1927.

PINTAIL, No. 102,102, m., banded by Allen Green, at Oakville, Iowa, on March 10, 1923, was shot at Overland, Saskatchewan, on March 10, 1930.

PURPLE FINCH, No. 48,638, f., banded by M. J. Magee, at Sault Ste. Marie, Michigan, on May 8, 1923, was caught by a cat, at Tatamagouche, Colchester County, Nova Scotia, on June 17, 1929.

RETURNS UPON BIRDS BANDED IN 1924

HERRING GULL, No. 313,770, yg., banded by Wm. M. Duval, at Bonaventure Island, Quebec, on July 25, 1924, was recovered at Yarmouth Port, Massachusetts, on February 18, 1930.

BLACK DUCK, No. 297,875, banded by H. S. Osler, at Lake Scugog, Ontario, on September 16, 1924, was shot at Sea Isle City, New Jersey, on February 6, 1930.

BLACK DUCK, No. 297,897, banded by H. S. Osler, at Lake Scugog, Ontario, on September 17, 1924, was shot at Bloodsworth Island, near Cambridge, Maryland, on December 9, 1929.

RETURNS UPON BIRDS BANDED IN 1925

MALLARD, No. 322,321, f., banded by C. E. Chapman, at Oakley, South Carolina, on March 4, 1925, was shot in the neighborhood of the Shoal Lake Indian Reserve, on the Manitoba boundary, in the County of Kenora, Ontario, during the month of September, 1929.

BLACK DUCK, No. 323,851, banded by H. S. Osler, at Lake Scugog, Ontario, on September 25, 1925, was killed at Camden, Tennessee, on November 11, 1929.

BLACK DUCK, No. 323,839, banded by H. S. Osler, at Lake Scugog, Ontario, on September 25, 1925, was killed at Evansville, Indiana, on January 2, 1930.

BLACK DUCK, No. 389,444, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1925, was shot at Ripley, Tennessee, on January 3, 1930.

BLACK DUCK, No. 389,150, banded by H. S. Osler at Lake Scugog, Ontario, on October 12, 1925, was shot at Monroe, Michigan, on October 4, 1929.

DOUBLE-CRESTED CORMORANT, No. 334,026, jw., banded by Harrison F. Lewis, at Wolf Bay, Saguenay Country, Quebec, on July 26, 1925,

was shot at Vero Beach, Florida, on January, 15, 1930.

WHITE-THROATED SPARROW, No. 328,-160, banded by A. Burton Gresham, at Machray Park, Winnipeg, Manitoba, on September 19, 1925, was killed by a cat in the same locality in which it was banded, on September 22, 1929.

RETURNS UPON BIRDS BANDED IN 1926

RAZOR-BILLED AUK, No. 405,911, ad., banded by Harrison F. Lewis, at St. Mary Islands, Saguenay County, Quebec, on August 2, 1926, was recovered at Change Island, Newfoundland, on November 13, 1929.

MALLARD, No. 334,511, ad., f., banded by W. D. Steele, at Lake Tebo, nine miles south west of Sedalia, Missouri, on April 29, 1926, was shot at Last Mountain Lake, Stalwart, Saskatchewan, on November 10, 1929.

MALLARD, No. 388,590, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 30, 1926, was killed at Lake Worth, nine miles north west of Fort Worth, Texas, on January 31, 1930.

PINTAIL, No. A620,295, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on January 23, 1926, was killed at Forty mile Coulee Lake, south of Bow Island, Alberta, on October 8, 1929.

LESSER SCAUP DUCK, No. 376,902, ad., banded by A. B. Gresham, at North Kildonan, Manitoba, on April 29, 1926, was shot at Valparaiso, Florida, on December 20, 1929.

BRONZED GRACKLE, No. 279,875, fledgling, banded by George Lang, at Indian Head Saskatchewan, on July 21, 1926, was caught at Leesville, Louisiana, on December 22, 1929.

RETURNS UPON BIRDS BANDED IN 1927

GLAUCOUS-WINGED GULL, No. 232,949, nestling, banded by Theed Pearse, at Mittenatch Island, Strait of Georgia, British Columbia, on August 14, 1927, was caught on a fish hook baited with herring, at Jarvis Inlet, British Columbia, during the month of March, 1929. To extract the hook, the bird had to be killed.

RING-BILLED GULL, No. 497,176, juv., banded by Harrison F. Lewis, at Kegashka River, Saguenay County, Quebec, on August 3, 1927, was found dead on the beach at Ocean City, New Jersey, on January 28, 1930.

DOUBLE-CRESTED CORMORANT, No. 302,355, juv., banded by Harrison F. Lewis, at Fog Island, Saguenay County, Quebec, on August 3, 1927, was found at Lake Apopka, Orange County, Florida, on January 1, 1930.

MALLARD, No. 594,036, ad., m., banded by F. H. Rose, at Moiese, Montana, on October 31, 1927, was shot at Sirdar, British Columbia, on November 25, 1929.

MALLARD, No. 595,189, ad., f., banded by F. H. Rose, at Moiese, Montana, on November 9, 1927, was shot at Edmonton, Alberta, on October 15, 1929.

MALLARD, No. 596,615, f., banded by W. B. Large, at Rochester, New York, on Novem-

ber 21, 1927, was shot at Yorkton, Saskatchewan, on January 9, 1930.

BALDPATE, No. 405,717, f., banded by J. Broecker, at Portage des Sioux, Missouri, on February 21, 1927, was shot at Clandeboye, Manitoba, during the fall of 1929.

PINTAIL, No. 594,342, ad., f., banded by F. H. Rose, at Moiese, Montana, on November 4, 1927, was killed at Black Lake, East of Lake Athabaska, Saskatchewan, during the month of September, 1928.

CANADA GOOSE, No. 465,980, banded by R. H. Bruce, at Rockwood Park Sanctuary, St. John, New Brunswick, on November 23, 1927, was recovered at Clover Hill, New Brunswick, during the fall of 1929.

DOWNY WOODPECKER, No. 459,193, ad., f., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on January 10, 1927, returned in 1928 and 1929, and was found dead in a shop in the same locality in which it was banded, on January 20, 1930.

CROW, No. 456,522, ad., banded by W. E. Saunders, at Kingsville, Ontario, on January 20, 1927, was killed in the same locality in which it was banded, on January 6, 1930.

ROBIN, No. 547,387, im., banded by George Lang, at Indian Head, Saskatchewan, on July 23, 1927, was killed at Dallas, Texas, on January 23, 1930.

RETURNS UPON BIRDS BANDED IN 1928,

HERRING GULL, No. 701,907, banded by H. C. Wilson, at Sister Islands, Wisconsin, on June 21, 1928, was killed at Burgeo, Newfoundland, on February 14, 1930.

HERRING GULL, No. 566,976, fledgeling, banded by Wm. I. Lyon, at Gravelly Gull Island, Delta County, Michigan, on July 2, 1928, was killed at East Main, James Bay, Quebec, during the month of June, 1929.

HERRING GULL, No. 566,861, im., banded by Wm. I. Lyon, at St. Martin's Shoal, Mackinaw County, Michigan, on July 6, 1928, was killed at Lake St. Clair, Belle River, Ontario, on April 1, 1930.

HERRING GULL, No. 708,101, banded by Wm. I. Lyon, at Waukegan, Illinois, on July 12, 1928, was found dead at Sarnia, Ontario, reported on April 4, 1930.

CALIFORNIA GULL, No. 699,267, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles north west of Camrose, Alberta, on June 23, 1928, was shot at Calgary, Alberta, on October 16, 1929.

CALIFORNIA GULL, No. 699,478, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles north west of Camrose, Alberta, on June 26, 1928, was found dead at Hay Lakes, Alberta, on July 4, 1930.

ARCTIC TERN, No. 548,138, yg., banded by Oliver L. Austin, Jr., at Red Islands, Turnevik Bay, Newfoundland Labrador, on July 23, 1928, was found dead at Margate, Natal, South Africa, on November 14, 1928.

GANNET, No. 662,306, banded by Wm. M. Duval, at Bonaventure Island, Gaspé County, Quebec, on July 30, 1928, was caught in a fish net at Spry Bay, Halifax County, Nova Scotia, on December 2, 1929.

GANNET, No. 662,323, yg., banded by Wm. M. Duval, at Bonaventure Island, Gaspé County,

Quebec, on July 30, 1928, was caught in a fish net, at a place about three miles south of Egg Island Light, Nova Scotia, on June 22, 1929.

COMMON CORMORANT, No. 302,392, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on August 2, 1928, was shot at Mitchell Bay, Halifax, Nova Scotia, on December 9, 1929.

DOUBLE-CRESTED CORMORANT, No. 303,764, banded by Bert Lloyd, at the north end of Last Mountain Lake, Davidson, Saskatchewan, on July 21, 1928, was killed at Seyppel, Arkansas, on November 16, 1929.

DOUBLE-CRESTED CORMORANT, No. 466,970, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was shot at Vicksburg, Mississippi, on December 18, 1929.

MALLARD, No. 557,030, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was recaptured in the same locality, by R. Lloyd, on October 12, 1929, and was shot at Winner, South Dakota, on November 20, 1929.

MALLARD, No. 388,639, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 2, 1928, was shot at Forgan, Oklahoma, on December 6, 1929.

MALLARD, No. 598,058, ad., m., banded by F. H. Rose, at Moiese, Montana, on September 23, 1928, was reported from Camrose, Alberta, on December 21, 1929. The leg of this bird, with band attached, was found in the street.

MALLARD, No. 598,070, ad., f., banded by F. H. Rose, at Moiese, Montana, on September 23, 1928, was shot at South Wabiskaw Lake, Alberta, on June 20, 1930.

MALLARD, No. 598,190, im., m., banded by F. H. Rose, at Moiese, Montana, on September 24, 1928, was shot at Wynndel, British Columbia, on October 19, 1929.

MALLARD, No. 557,115, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 5, 1928, was shot at De Witt, Arkansas, on November 8, 1929.

MALLARD, No. 557,127, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 15, 1928, was shot at Stinking Bay, on the White River, Arkansas, on November 4, 1929.

MALLARD, No. 557,154, f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 17, 1928, was found at Hay Springs, Nebraska, on December 11, 1929.

MALLARD, No. A602,501, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 20, 1928, was shot at Vedder River, British Columbia, on November 11, 1928.

MALLARD, No. A602,504, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 20, 1928, was shot at Portland, Oregon, on November 27, 1929.

MALLARD, No. 557,182, ad., m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 22, 1928, was shot at Lakin, Kansas, on December 15, 1929.

MALLARD, No. 557,189, ad., f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 23, 1928, was killed at Gueydan, Louisiana, on December 26, 1929.

MALLARD, No. A602,508, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 23, 1928, was re-captured in 1928, and was shot on the Harrison River, British Columbia, on December 10, 1928.

MALLARD, No. 557,211, ad., m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 28, 1928, was shot at Scobey, Montana, on December 28, 1929.

MALLARD, No. A600,590, banded by Frank Hopkins, at Campbells-port, Wisconsin, on October 28, 1928, was caught in a gopher trap, at Roblin, Manitoba, on May 3, 1929. This bird was kept in captivity and cared for, but it failed to recover and died on May 18, 1929.

MALLARD, No. A602,540, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 5, 1928, was shot on November 15, 1928, at Sumas Prairie, British Columbia.

MALLARD, No. A602,549, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 6, 1928, was recovered at Mt. Vernon, Washington, on January 30, 1929.

MALLARD, No. A602,559, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic, British Columbia, on December 9, 1928.

MALLARD, No. A602,568, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Chehalis Indian Reservation, Harrison Mills, British Columbia, on January 15, 1929.

MALLARD, No. A602,571, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 15, 1928.

MALLARD, No. A602,572, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 10, 1928.

MALLARD, No. A602,577, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot in the same locality in which it was banded, on November 29, 1928.

MALLARD, No. A602,578, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Lake Area, Chilliwack, British Columbia, on November 18, 1928.

MALLARD, No. A602,587, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic, British Columbia, on December 30, 1928.

MALLARD, No. A602, 596, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 18, 1928.

MALLARD, No. A602,597, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot on the Sumas River, near

the Junction with the Fraser River, British Columbia, on January 20, 1929.

MALLARD, No. A602,599, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas, Washington, on December 4, 1928.

MALLARD, No. A602,606, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hamersley Prairie, Agassiz, British Columbia, on February 6, 1929.

MALLARD, No. A602,620, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Blanchard, Washington, on December 25, 1928.

MALLARD, No. A602,622, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Agassiz, British Columbia, on December 3, 1928.

MALLARD, No. A602,629, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Nicoamen Island, fifty miles east of Vancouver, British Columbia, during the month of November, 1928.

MALLARD, No. A602,642, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 9, 1928.

MALLARD, No. A602,655, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot on the Harrison River, British Columbia, on December 1, 1928.

MALLARD, No. A602,666, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at a place four miles south east of Liberty, Missouri, on December 18, 1928.

MALLARD, No. A602,669, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Pitt Meadows, British Columbia, on November 28, 1928.

MALLARD, No. A602,679, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot in Skagit County, Washington, on December 5, 1928.

MALLARD, No. A602,688, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 15, 1928.

MALLARD, No. A602,689, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Chehalis Indian Reservation, Harrison Mills, British Columbia, on January 25, 1929.

MALLARD, No. A602,697, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was found at Ganges, British Columbia, on April 8, 1929. The bird had a broken wing when found.

MALLARD, No. 656,016, ad., m., banded by T. N. Jones, at Jones Sanctuary, Union, Ontario, on November 23, 1928, was shot at a place eighteen miles west of Chatham, Ontario, on November 13, 1929.

MALLARD, No. A600,074, banded by George J. Bills, at Sauvies Island, Linnton, Oregon, on December 6, 1928, was shot at Le Goff, Alberta, during the month of September, 1929.

MALLARD, No. 656,031, ad., m., banded by T. N. Jones, at Jones Sanctuary, Union, Ontario, on December 8, 1928, was captured at Point Pleasant, West Virginia, on December 3, 1929.

MALLARD, No. 656,032, ad., f., banded by T. N. Jones, at Jones Sanctuary, Elgin County, Ontario, on December 8, 1928, was found dead in the same locality in which it was banded, on December 3, 1929.

BLACK DUCK, No. 596,831, banded by W. B. Large, at Rochester, New York, on October 7, 1928, was shot at Attawapiskat, Ontario, on July 18, 1930.

BLACK DUCK, No. A601,249, banded by K. Christofferson, at Pickford, Michigan, on November 11, 1928, was killed at Fort Hope, near the Albany River, District of Patricia, Ontario, sometime between November 20 and December 8, 1928.

BLACK DUCK, No. 656,026, ad., f., banded by T. N. Jones, at Jones Sanctuary, Elgin County, Ontario, on November 28, 1928, was found dead in the same locality, on December 14, 1929.

Baldpate, No. 601,449, f., banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on January 17, 1928, was shot at Providence, North West Territories, during the fall of 1929.

PINTAIL, No. 601,795, m., banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on January 17, 1928, was shot at Edgerston Station, Alberta, during the month of June, 1929.

PINTAIL, No. 530,303, banded by William P. Sparks, at Tehuacana Club Lake, Waco, Texas, on February 7, 1928, was killed at Red River Post, Lower Peace, Alberta, on April 30, 1929.

PINTAIL, No. 455,315, yg., banded by T. E. Randall, at Forestburg, Alberta, on July 24, 1928, was killed on November 3, 1928, and was reported by a resident of Arkadelphia, Arkansas.

PINTAIL, No. A602,525, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 29, 1928, was shot on the Nooksack River, about fifteen miles north of Bellingham, Washington, on December 13, 1928.

LESSER SCAUP DUCK, No. 388,658, juv., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 29, 1928, was shot at Redwood City, California, on January 12, 1930.

CANADA GOOSE, No. 660,530, yg., banded by R. K. Stewart, on the Yukon River, between Circle and Fort Yukon, Alaska, on July 28, 1928, was shot at a place near Kamloops, British Columbia, on November 16, 1928.

CANADA GOOSE, No. 659,052, ad., f., banded by T. N. Jones, at Jones Sanctuary, Elgin County, Ontario, on September 3, 1928, was found dead in the same locality in which it was banded, on November 13, 1928.

RED-BREASTED SAPSUCKER, No. 643,906, im., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on July 14, 1928, was shot three or four miles from the place of banding, on June 30, 1929.

CHIMNEY SWIFT, No. B59,016, ad., was banded by R. O. Merriman, at a place four and one-half miles east of Nicol Hall, Queen's University, Kingston, Ontario, on September 2, 1928. This bird was trapped at Charleston, West Virginia, on September 14, 1928, by I. H. Johnston, who not noticing band No. B59,016, placed band No. A107,528, on the tarsus of the bird. On May 10, 1929, this Chimney Swift was trapped wearing two bands and accidentally killed in the west stack of Nicol Hall, Queen's University, Kingston, Ontario.

CHIMNEY SWIFT, No. A118,307, banded by Stoddard, Stringer and Haudley, at Thomasville, Georgia, on October 17, 1928, was recovered at Arthabaska, Quebec, on July 7, 1929.

ROCKY MOUNTAIN JAY, No. 643,921, banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 14, 1928, after repeating several times, was killed in a rat trap, in the same locality in which it was banded, on December 22, 1928.

ROCKY MOUNTAIN JAY, No. 643,927, banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 20, 1928, was shot one mile from the banding station, on March 31, 1929.

ROCKY MOUNTAIN JAY, No. 643,940, banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on November 11, 1928, was killed in a fur trap, one and one-half miles from the banding station, on March 30, 1929.

STARLING, No. 624,136, banded by F. C. Lincoln, at Washington, District of Columbia, on January 14, 1928, was caught by a cat, at Cornwall, Ontario, on March 24, 1930.

BRONZED GRACKLE, No. A400,403, banded by Mrs. F. D. Hubbard, at New Haven, Connecticut, on December 23, 1928, was found at L'Anse au Beaufils, Gaspé County, Quebec, on October 7, 1929.

PURPLE FINCH, No. 609,196, banded by Miss Cora M. Teot, at New Haven, Connecticut, on January 18, 1928, was found dead at Loughheed, Alberta, on May 15, 1929.

GAMBEL'S SPARROW, No. 615,443, im., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 19, 1928, after repeating several times, was killed in a weasel trap, in the same locality in which it was banded, on October 1, 1928.

GAMBEL'S SPARROW, No. 615,535, im., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 19, 1928, after repeating several times, was killed in a trap by a blackbird, in the same locality in which it was banded, on October 1, 1928.

GAMBEL'S SPARROW, No. 615,463, im., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 20, 1928, was killed by a squirrel in a trap, in the same locality in which it was banded, on September 21, 1928.

NUTTALL'S SPARROW, No. A123,588, banded by Ernest D. Clabaugh, at Berkeley, California, on December 14, 1928, was found dead on the main road near Mill Bay, Vancouver Island, British Columbia, on July 2, 1929.

SHUFELDT'S JUNCO, No. 615,185, im., banded by T. T. & E. B. McCabe, at Indian-point Lake Barkerville, British Columbia, on July 26, 1928, was killed in a trap by a Sharp-shinned Hawk, in the same locality in which it was banded, on August 23, 1928.

LINCOLN'S SPARROW, No. 615,239, im., banded by T. T. & E. B. McCabe, at Indian-point Lake, Barkerville, British Columbia, on July 29, 1928, was killed in a trap by a Chipmunk, in the same locality in which it was banded, on August 14, 1928.

ROBIN, No. 670,529, im., banded by George Lang, at Indian Head, Saskatchewan, on July 23, 1928, was caught at Cruger, Mississippi, on February 5, 1930.

RETURNS UPON BIRDS BANDED IN 1929

CALIFORNIA GULL, No. 700,594, yg., banded by F. L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 21, 1929, was found wounded at Brawley, California, on December 15, 1929.

CALIFORNIA GULL, No. 700,604, yg., banded by F. L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found dead at Ryley, Alberta, on July 26, 1929.

CALIFORNIA GULL, No. 700,620, yg., banded by F. L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found dead at Salton Sea, California, on January 23, 1930.

CALIFORNIA GULL, No. 700,647, yg., banded by F. L. Farley, at Gull Island in Bittern Lake, twelve miles west of Camrose, Alberta, on June 21, 1929, was shot at a place ten miles east of Ponoka, Alberta, on September 23, 1929.

CALIFORNIA GULL, No. 700,793, yg., banded by Frank L. Farley, at Gull Island in

Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found at Tomahawk, Alberta, some time between June 21 and August 16, 1929.

CALIFORNIA GULL, No. 700,864, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found dead at Armena, Alberta, on August 9, 1929.

CALIFORNIA GULL, No. 700,882, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found at Cascade, Montana, on September 18, 1929.

CALIFORNIA GULL, No. 700,894, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was killed at Lake Wabamun, fifty-two miles west of Edmonton, Alberta, on August 12, 1929.

CALIFORNIA GULL, No. 700,979, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found dead at Edmonton, Alberta, on September 2, 1929.

CALIFORNIA GULL, No. 700,990, yg., banded by Frank L. Farley, at Gull Island in Bittern Lake, about twelve miles west of Camrose, Alberta, on June 21, 1929, was found dead at Cold Lake, Alberta, on August 31, 1929.

CALIFORNIA GULL, No. 701,181, yg., banded by F. L. Farley, at Gull Island in Bittern Lake, about 12 miles west of Camrose, Alberta, on June 21, 1929, was recovered at Foisy, Alberta, on July 12, 1930.

SONG SPARROW, No. A136,880, ad., banded by W. Earl Godfrey, at Wolfville, Nova Scotia, on June 7, 1929, was picked up dead in the same locality in which it was banded, on July 15, 1930.

CHICKADEE, No. B88,602, ad., banded by W. Earl Godfrey, at Wolfville, Nova Scotia, on March 26, 1929, was killed in the same locality in which it was banded, on May 13, 1929, when it flew against a window pane.

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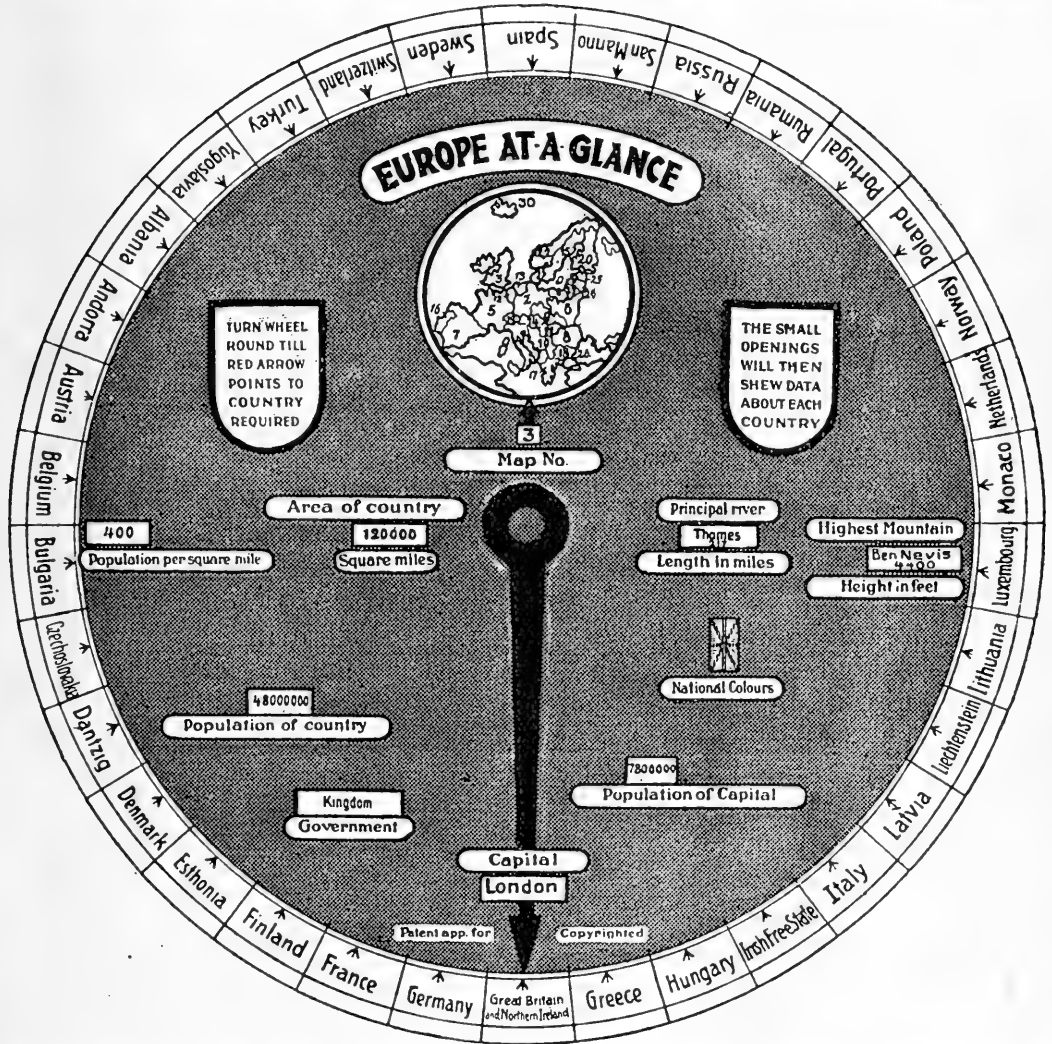
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CONTENTS

	PAGE
Blackfish (<i>Globocephalus</i>) Stranded on the South Coast of Prince Edward Island. By A. W. H. Needler.....	157
Notes on Mammals and Birds from Great Slave Lake. By H. W. Fairbairn.....	158
British and American Grouse Cycles. By Aldo Leopold and John N. Ball.....	162
Duck-Banding. By C. W. Palmer, Jr.....	167
Contributions to the Knowledge of Extreme North-Eastern Labrador. By Bernhard Hantzsch.....	169
An Annotated List of Vascular Plants Collected on the North Shore of the Gulf of St. Lawrence, 1927-1930. By Harrison F. Lewis.....	174
Notes and Observations:	
Muskrat vs. Weasel. By Sam Waller.....	179
Young of European Hare Born in Winter. By H. L. Yack.....	179
Black-capped Chickadee. By C. H. Bastien.....	179
Glaucous-winged Gulls. By C. H. Bastien.....	180
Mourning Dove in Kenora District, Ontario. By Jas. L. Baillie, Jr.....	180
Hungarian Partidges Liberated in Prince Edward Island. By R. W. Tufts.....	180
A New Check List of Birds of the World.....	180

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OTTAWA, CANADA, OCTOBER, 1931

No. 7

BLACKFISH (*Globiocephalus*) STRANDED ON THE SOUTH COAST OF PRINCE EDWARD ISLAND

By A. W. H. NEEDLER

A LARGE school of blackfish was seen inside the outer bar across the mouths of Percival and Enore Rivers, P.E.I. on Friday, August 29, 1930, by the crew of a small schooner. Apparently some of these stranded that night at the head of Percival "river" about five miles from its mouth as they were first observed ashore on the morning of August 30. The "river" or inlet in the part where they stranded is about a quarter of a mile wide and nowhere more than two or three feet deep at low tide. Just below the depth increases to six or eight feet and the inlet widens. Two or three miles towards the mouth the greatest depth is still less than twelve feet and the width is a mile or more. The bottom is of mud, sand or oyster bed throughout the inlet with eel grass lining the shores. Apparently the school ran ashore when the tide was fairly high as the

majority observed on the following Wednesday were near the high tide mark with, of course, the smallest specimens farthest in towards shore. Some, however, remained in deeper water and a few, at least, succeeded in getting away again, as some were observed swimming down the inlet towards the open on Saturday.

On Wednesday the writer examined a large number and identified them as blackfish (*Globiocephalus* sp; probably *G. melaena* Traill). One hundred and fifty-two (152) were counted most of them being on one stretch of shore about two hundred yards long. As some had been cut up and taken away and some escaped there must have been close to two hundred or perhaps more in the school when it entered the bay.

The following (Table I), a random sample, were measured. The condition of the blackfish five



Blackfish stranded at Percival River, P. E. I.

(Photograph by H. P. Sherwood)

days after stranding did not always permit determination of the sex.

TABLE I

Length in feet	Number		Sex Un- known	Total
	Male	Female		
6.....	1	1	..	2
7.....	..	..	..	..
8.....	..	..	1	1
9.....	..	1	1	2
10.....	..	1	1	2
11.....	..	2	2	4
12.....	..	3	3	6
13.....	1	8	..	9
14.....	4	2	2	8
15.....	2	6	1	9
16.....	5	14	3	22
17.....	4	2	..	6
18.....	4	4	1	9
19.....	5	..	..	5
20.....	4	..	..	4
21.....	2	..	..	2
22.....	2	..	..	2

Of those of which the sex was determined 56% were female and it is probable that a large proportion of the doubtful cases were also female. The largest female was eighteen feet long while forty per cent of the males were larger than this and the largest twenty-two feet in length. The

average length of the males was 17.6 feet, and of the females 14.6 feet.

One, at least, of the females was pregnant and the two six-foot specimens were recent births with part of the placental attachment remaining. They were well developed and this is probably close to the size at normal birth although the births were possibly premature and due to the stranding.

In addition to the above school about fifty were stranded on an exposed shore near Borden, P.E.I., on August 15 or 16, 1930. Here, too, the shore was level and gently sloping. When the writer examined them they had all been more or less cut up but the remains were sufficient to enable certain identification as *Globocephalus*. The individuals were of about the same size as those at Percival river.

On October 4 one or two dozen were observed swimming about in the harbour of Summerside, P.E.I. A few were shot and one of these was examined. It was found to be of the same species.

In addition a number of reports of blackfish were obtained from both the north and south coasts of Prince Edward Island, especially the latter. There is no doubt that in the summer of 1930 they were unusually abundant in Northumberland strait where they had not been seen for many years.

NOTES ON MAMMALS AND BIRDS FROM GREAT SLAVE LAKE

By H. W. FAIRBAIRN



THE field observations included in this report were made during the summer of 1929 while the writer was attached to a field party in charge of C. H. Stockwell from the Geological Survey at Ottawa. The accompanying map shows the location of the area under review and the approximate boundaries between the life zones in the district. While most of the observations were made in the Hudsonian, a few are also included from the Canadian zone.

The timber is predominantly spruce, with poplar, birch, and tamarack in lesser amount. Banksian pine occurs regularly although its limit of distribution is not far to the north-east. Although restricted as to number of species, the trees attain a size usually associated with much lower latitudes, and are dwarfed only in the most exposed localities. In that part of the area included in the Hudsonian zone there is practically no true soil and the rock hills and ridges attain a maximum relief of about 700 feet. Immediately to the west the country is monotonously flat, its soil representing ancient

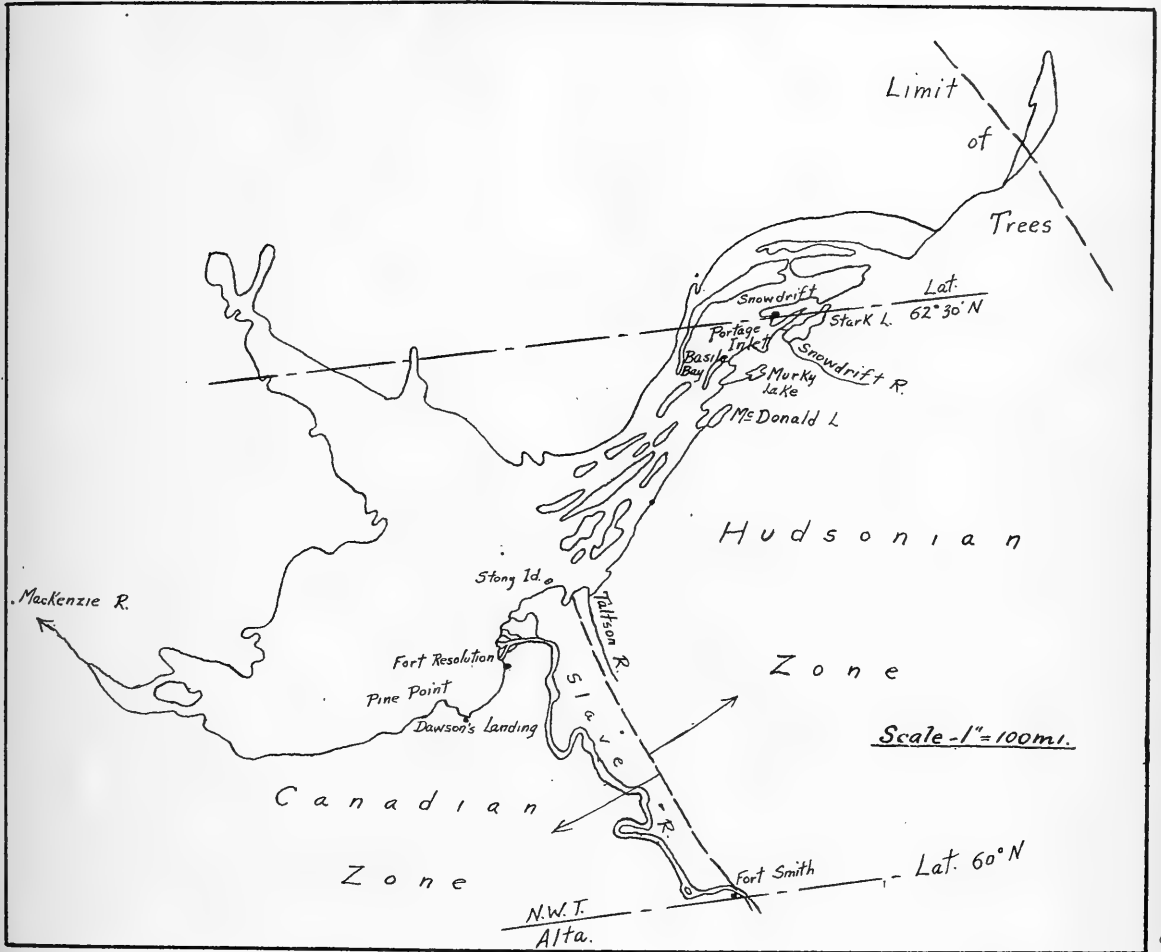
delta deposits of the Slave River.

As the south-east shore of Great Slave Lake was off the main travel routes it was practically unknown to any save the Indians until Blanchet's surveys were made a few years ago. Since then a trading post has been established at Snowdrift and various exploration parties have traversed the shore and the large lakes to the south.

The most complete biological report covering northwestern Canada is that of E. A. Preble¹ who worked in this country more than twenty-five years ago. The writer made liberal use of this memoir in comparing notes and wishes to recommend it not only for its biological value but also for the information of general interest which it contains concerning the region.

No attempt was made to collect any specimens and field identification was made with Zeiss binoculars or the unaided eye. No doubtful species

¹ E. A. PREBLE—Biological Investigation of the Athabasca-Mackenzie Region. North American Fauna, No. 27, U.S. Biol. Survey.



Great Slave Lake area

have been included, however, and the writer feels that the list is accurate, even if incomplete. Sub-specific names are used in accordance with the normal geographic range of the species and do not represent actual identification as such.

The writer is indebted to the other members of the party, Messrs. Stockwell, Derby, Gilbert, and Ogilvie, for their interest and assistance in collecting the data necessary for this work.

MAMMALIA

Alces americana—EASTERN MOOSE.—The Indians at Snowdrift report that moose are fairly common and they frequently hunt them with varying success. On August 11 one was seen swimming along the shore of a bay in Stark Lake. Later in the year a yearling was seen at close quarters in the same locality. Moose tracks, however, were observed in many other places so that the species is of fairly regular distribution.

Sciurus hudsonicus—HUDSON BAY RED SQUIRREL.—Abundant in all the spruce woods and in winter is an unwelcome guest in many traps set for more valuable pelts. In August one was seen swimming across the entrance to a bay in Stark Lake. The water was quite rough and the little animal swam fully 100 yards in the cold water before landing. It appeared to be somewhat numbed by the effort but was able to scramble up the nearest tree to safety. Their industry, if misguided at times, is attested by the great piles of spruce cones and fungi which they collect during the summer months.

Peromyscus maniculatus borealis—ARCTIC WHITE-FOOTED MOUSE.—Observed only around caches and trappers' cabins but is probably abundant and of regular distribution.

Microtus drummondii—DRUMMOND VOLE.—On two occasions these diminutive creatures took possession of our bedrolls. Although these were

the only observations made of the species it is probably just as common in this area as reported elsewhere in the district.

Ondatra zibethica spatulata—NORTHWEST MUSKRAT.—Noted commonly from the Slave delta and once from the east end of McDonald Lake. In suitable localities it comprises a large part of the winter's catch of fur but in the rocky east end of Great Slave Lake it is not common.

Lepus americanus—VARYING HARE.—Observed only twice but is probably more common than this would indicate. According to the trappers the animal has recently been in one of its periodical declines but is now increasing in numbers.

Ursus americanus—BLACK BEAR.—Regularly distributed throughout the area centering about Snowdrift. They were noted from Portage Inlet, Snowdrift River, Murky Lake, and McDonald Lake, all of them being the black phase. In this latitude the species has an unusually long period of hibernation but individual animals which had not hibernated have been taken in December.

Mustela cicognanii richardsonii—RICHARDSON WEASEL.—Noted from Dawson Landing, west of Resolution. The species was not seen at the east end of the lake and no information was obtained regarding it.

Of the fur-bearing animals not included in the above list minks were reported to be the most common, the value of the annual catch rivalling that of muskrat. Martins are never plentiful and fishers have disappeared from most localities. According to the Indians at Snowdrift beavers are common in certain sections south of Great Slave Lake. Foxes are fairly common while lynxes are very irregularly distributed.

AVES

Podilymbus podiceps—PIED-BILLED GREBE.—Noted from Murky Lake and Pine Point. The species is rare in this region according to previous observers.

Gavia immer—LOON.—Less common on the open water of Great Slave Lake than in sheltered bays and smaller lakes to the south.

Gavia arctica pacifica—PACIFIC LOON. Found in the vicinity of Basile Bay but less common than *G. immer*.

Stercorarius parasiticus—PARASITIC JAEGER.—One was seen at Resolution in June.

Larus argentatus—HERRING GULL.—Abundant, nesting on the bare rocky islands. The downy young were common in early July. Later in the summer mixed flocks of adults and young of different species congregated on the rocky shores but after September 15 only an occasional juvenile was seen. They are the chief scavengers of these

northern waters and may be depended on to remove all fish and game refuse from a camping ground.

Larus californicus—CALIFORNIA GULL.—Common, and associates with the other species of gulls.

Larus brachyrhynchus—SHORT-BILLED GULL.—Common, and associates with *L. argentatus* and *L. californicus*.

Sterna caspia—CASPIAN TERN.—One bird noted from Resolution.

Sterna hirundo—COMMON TERN.—Common; and associates with the gulls. None were seen on Great Slave Lake after September 1.

Pelecanus erythrorhynchus—AMERICAN WHITE PELICAN.—Twelve of these great white birds were seen on the rapids at Fort Smith in late June. They were very wary and sunned themselves on the rocks fully half a mile from shore. This northern colony seems to be holding its own at present, although its numbers have often been depleted in the past.

Mergus serrator—RED-BREADED MERGANSER.—Breeds commonly on Great Slave Lake. Juveniles were still unable to fly in early September.

Anas platyrhynchus—MALLARD.—Small flocks of males were noted from the Slave delta and Basile Bay in early summer. Abundant on the lower Slave river in late September.

Clangula hyemalis—OLD-SQUAW.—Common in migration along the south shore of Great Slave Lake in September. They were easy to approach and practically fearless of a gun.

Oidemia deglandi—WHITE-WINGED SCOTER.—Common in the vicinity of Basile Bay in July where small flocks, presumably of males, were found. The species became more abundant late in the season and large flocks were seen on the lower Slave River in September.

Branta canadensis—CANADA GOOSE.—Noted occasionally in flight but apparently does not breed close to Great Slave Lake.

Cygnus columbarius—WHISTLING SWAN.—Two swans were seen near Stony Island in September flying southward.

Grus (mexicana or canadensis?)—SANDHILL or LITTLE BROWN CRANE.—Two cranes were seen on the mud flats at the mouth of the Slave River on June 14, but the distance at which they were observed made it impossible to determine the species.

Totanus flavipes—LESSER YELLOWLEGS.—One bird was seen in a small slough in Basile Bay.

Crocethia leucophæa—SANDERLING.—Small flock noted near Stony Island in September.

Actitis macularia—SPOTTED SANDPIPER.—Common along all the shores traversed.

Squatarola squatarola cynosuræ—AMERICAN BLACK-BELLIED PLOVER.—Juveniles were common at Resolution in September.

Canachites canadensis (probably subspecies *canadensis*)—SPRUCE GROUSE.—Common throughout the area.

Bonasa umbellus—RUFFED GROUSE.—Common in the vicinity of Dawson's Landing in September. Noted also from Slave delta.

Circus hudsonicus—MARSH HAWK.—Noted once near Murky Lake. The rocky country about Great Slave Lake is unsuitable to this species.

Haliaeetus leucocephalus alascanus—NORTHERN BALD EAGLE.—Common and of regular distribution both east and west of Snowdrift. Ten pairs of these birds were noted from an area of about 1000 square miles. This gives an average area per pair of 100 square miles, only about half of which is land surface. The majority of the nests were on steep cliffs overhanging the water; others were in the tops of spruce trees on small, low islands. In either case they were not easily accessible. The scarcity of the larger species of hawks in this locality is a notable feature in connection with the distribution of the eagles.

Falco columbarius columbarius—EASTERN PIGEON HAWK.—Fairly common about Snowdrift and on Murky Lake in August.

Cerchneis sparverius—AMERICAN SPARROW HAWK.—One bird noted from the mouth of the Taltson River in June.

Asio flammeus—SHORT-EARED OWL.—Observed several times along Murky Channel in August.

Ceryle alcyon—BELTED KINGFISHER.—Absent over most of the area traversed due to lack of nesting sites. Noted once in Murky Lake and is common in the older parts of the Slave delta.

Picoides arcticus—ARCTIC THREE-TOED WOODPECKER.—Observed in muskeg near Snowdrift.

Picoides americanus—AMERICAN THREE-TOED WOODPECKER.—Noted once in a muskeg at the east end of McDonald Lake.

Colaptes auratus borealis—BOREAL FLICKER.—Common throughout the area but not seen after September 1.

Sayornis phoebe—PHOEBE.—Regularly distributed from Resolution at least as far as Snowdrift. Not noted after August 15.

Nannus borealis—OLIVE-SIDED FLYCATCHER.—Breeding on small island at Snowdrift and apparently irregular in distribution.

Empidonax traillii alnorum—ALDER FLYCATCHER.—Observed at the mouth of the Taltson River in June but not seen eastward.

Empidonax minimus—LEAST FLYCATCHER.—Common at the mouth of the Taltson River in June but not seen eastward.

Otocoris alpestris (probably subspecies *hoyti*)—HORNED LARK.—Abundant at Resolution in September.

Perisoreus canadensis—CANADA JAY.—Abundant throughout the area, but not an inveterate thief as in more populous localities.

Corvus corax principalis—NORTHERN RAVEN.—Common and of regular distribution throughout the area.

Agelaius phoeniceus—RED-WINGED BLACKBIRD.—Common in June in the Slave delta.

Euphagus carolinus—RUSTY BLACKBIRD.—Noted once in Murky Lake in late August but does not breed in any numbers in this type of country.

Quiscalus quiscula æneus—BRONZED GRACKLE.—One bird, probably a straggler, was seen near Snowdrift in July.

Pinicola enucleator (probably subspecies *leucura*)—PINE GROSBEEK.—Fairly common on Star Lake in August.

Passerculus sandwichensis—SAVANNA SPARROW.—Common from Resolution to Taltson River but not noted eastward.

Passer domesticus—HOUSE SPARROW.—Common at Fort Smith. None were seen at Resolution so that this is probably their northern limit of distribution in the Mackenzie district.

Zonotrichia leucophrys gambeli—GAMBEL'S SPARROW.—Abundant in early summer and breeding both on the mainland and the small rocky islands.

Spizella monticola—TREE SPARROW.—Common in September but not breeding in any numbers about Snowdrift.

Spizella passerina—CHIPPING SPARROW.—Noted from Fort Smith and Resolution, but not eastward.

Junco hyemalis—JUNCO.—Abundant and breeding everywhere. Their numbers are greatly augmented during migration.

Petrochelidon lunifrons—CLIFF SWALLOW.—Two small colonies were seen on Stark Lake. The species is not as abundant here as in some other parts of the northwest.

Hirundo erythrogastra—BARN SWALLOW.—Irregular in distribution, breeding at the trading posts and also in unused trappers' cabins.

Riparia riparia—BANK SWALLOW.—Common along the lower Slave River. The species was not noted to the east as nesting sites are scarce.

Vireosylva olivacea—RED-EYED VIREO.—Observed along the Slave River to the lake, but not eastward.

Vireosylva gilva—WARBLING VIREO.—Noted at Fort Smith but not further north.

Vermivora peregrina—TENNESSEE WARBLER.—Observed at the mouth of the Taltson River in June.

Dendroica aestiva—YELLOW WARBLER.—Common in June at the mouth of the Taltson River. Breeding in Basile Bay.

Dendroica coronata—MYRTLE WARBLER.—Common and regularly distributed throughout the area.

Dendroica atricapilla—BLACK-POLL WARBLER.—Noted at the mouth of the Taltson River in June.

Penthestes hudsonicus—HUDSONIAN CHICKADEE.—Common and regularly distributed throughout the area.

Hylocichla guttata pallasii—EASTERN HERMIT THRUSH.—Regularly distributed but not abundant east of Resolution.

Planesticus migratorius—ROBIN.—Common and usually nesting in small spruce trees. Absent from the area around Snowdrift after August 1. The migratory route is apparently south along the main rivers as the birds were very abundant there during September.

BRITISH AND AMERICAN GROUSE CYCLES

By ALDO LEOPOLD AND JOHN N. BALL



HINKERS about game conservation have usually been skeptical about the feasibility of applying management to American grouse, especially American prairie chickens. It has been assumed that the violent fluctuations experienced by all species of grouse made the potential crop uncertain, and efforts to produce a crop correspondingly unattractive. The average sportsman has probably not reasoned the matter out in exactly these terms, but when he speaks of prairie chickens, as "hopeless" or the ruffed grouse supply as beyond human control, he probably means much the same thing.

The authors recently read for the first time the monumental work of the British Committee of Inquiry on "The Grouse in Health and Disease."¹ If more American sportsmen and ornithologists would read these volumes carefully, they would soon be convinced, as we were, that the management of cyclic grouse is anything but hopeless. That property in grouse which causes them to fall ready victims to disease epidemics is apparently offset by a corresponding facility in recovering their normal numbers, provided only the environment be favourable and the shooting on each parcel of range under strict and intelligent control. The British success in increasing and stabilizing grouse is an obvious fact, backed by a century of experience, and is not altered by any like or dislike for their methods of harvesting the crop, once it has been produced. The latter question is not here under discussion.

A digest of the Grouse Report, comparing British and American grouse from the viewpoint of management, has been published by the authors in a separate paper.² It is here desired to present a companion study comparing their respective fluctuations. The data available to us are summarized on the accompanying chart, consisting of three sets of American curves and two sets of British curves.

SOURCES OF DATA

A. NORTH AMERICAN GROUSE AND RABBITS.—This curve is the summation of some 540 reports gathered during the Game Survey³ on the status of grouse and rabbits, by species, in various states and provinces, during particular years. The data become scattered behind 1909, and very thin behind 1898, hence the curve stops there. Some of the 540 reports are from the game and ornithological literature, but most were made to Leopold verbally or in correspondence by sportsmen, game wardens, and naturalists, totalling nearly 200 persons. It is regretted that this number is so large as to preclude individual acknowledgments.

The geographic distribution of the reports and the species to which they pertain, are as follows:

Region	Ruffed Grouse	Other Grouse	Snow-shoe Hares	Cotton-tail Rabbits	Total
Far North.....	5	20	20	..	45
Southern Canada	60	44	48	..	152
Northern U.S. and Rocky Mts.	143	61	26	9	239
Central U.S.....	7	15	..	40	62
Southern U.S....	24	18	..	..	42
	239	158	94	49	540

The vertical ordinate has no numerical validity, Curve A simply connecting the *most frequent* of five grades of abundance reported for each particular year. The spread or dispersion of the remainder of the reports is indicated by the hatched zone, which covers 90 per cent of the total reports for each year.

The number of reports of course decreases as the dates recede. The time-distribution is:

1926-1930... 135 reports	1911-1915... 56 reports
1921-1925... 131 "	1906-1910... 47 "
1916-1920... 94 "	1901-1905... 35 "

These data are separate and distinct from those entering the Wisconsin curves (C-1 and C-2),

although obtained and compiled in the same manner. They are also separate from both the B curves. The source and exact locality of each report is available in Leopold's records.

Curve A is heretofore unpublished, although the graphed data for the separate states have been circulated privately in the form of a blueprint entitled "Cumulative History of Game Cycles in North America."

B. CANADIAN GROUSE AND RABBITS.—B-1 (sharptail) and B-2 (ruffed grouse) were published by Norman Criddle⁴ in *The Canadian Field-Naturalist* for April, 1930. They represent the numbers of grouse on his place at Aweme, Manitoba, as estimated by his father and himself. His original graph contains a curve for grasshoppers, and a rainfall record, which are here omitted. As in my own curves, Criddle's vertical ordinate has no numerical validity, but is based on a judgment-comparison between years, but since these comparisons have been all made by one man from his own field observations, they are doubtless superior to mine in accuracy.

B-3 is the Hudson Bay Company's purchases of rabbit skins, as published by Ernest Thompson-Seton in "The Arctic Prairies,"⁵ page 102. Seton's curve goes back to 1821, but the section behind 1850 is here omitted. The number of skins in the section here reproduced runs up to 150,000 in the high year 1865, but the numerical scale is omitted for simplicity.

C. WISCONSIN GROUSE AND RABBITS.—C-1 (pinnated and sharptail) and C-2 (all grouse and rabbits) were published by Leopold in the Game Survey, Chart 8, page 142. They are summations calculated in exactly the same manner as A, from similar data. The spread of the data for C-2 is here added for comparison with the spread in A, the hatched zone including 90 per cent of the total reports for each year.

A much more accurate and thorough study of grouse fluctuations covering a longer period is now being made by Ralph T. King, of the University of Minnesota, under a fellowship of the Sporting Arms and Ammunition Manufacturers' Institute.

D. SCOTCH GROUSE KILL.—D is the kill of red grouse from four moors as follows:

Moor	Period Covered	Author
1. Douglas Castle (Lan-arkshire).	1858-1909	Malcolm & Maxwell "Grouse and Grouse Moors," ⁶ p. 278.
2. A moor in Inverness-shire.	1897-1909	British Committee, "Grouse in Health and Disease," p. 474.
3. A Scotch moor.....	1866-1886 1894-1904	Same; p. 456.
4. Carron Moor (Moray-shire).	1897-1909	Same, p. 388.

The kill on each moor for each year was first computed as a per cent of its own average. The average of all the percentages available for each year was then calculated and plotted. Hence the curve represents the departure from average (100 per cent) for all four moors collectively, during each year. The rising trend of the curve represents the increasing success of management.

E. SCOTCH GROUSE DISEASE (INVERTED).—E-1 is the frequency of reports of red grouse disease, as mapped by years in Vol. II of the "Grouse in Health and Disease." The dots on these yearly maps representing the number of localities reporting disease (these maps occur in the limited edition only) were counted, and plotted as per cent departures from the average number, but the vertical scale was *inverted*, so that any parallelism with the kill curve (D) could be the more readily visualized. Since E-1 is inverted, its peaks represent disease-free years, and its troughs years of numerous disease reports.

E-2, which occurs in numerous fragments, is a compilation by Leopold of the textual references to high and low red grouse crops, high and low kills, record bags, and disease years occurring in the Grouse Report, in Malcolm and Maxwell's book, and in MacIntyre's paper on "Cycles of Game Birds,"⁷ appearing in "Game and Gun," June, 1930, page 286. The vertical ordinate is an arbitrary judgment (in three abundance classes) on the consensus of textual references available for each year. Usually where more than one reference was available, they all agreed.

E-3 (Black Game) consists of a few fragments of textual references by Malcolm and Maxwell, and by MacIntyre, graphed in the same manner as E-2. Both of these writers consider this species as synchronizing with red grouse in its fluctuations, hence its admission here.

INTERPRETATION OF DATA

AMERICAN FLUCTUATIONS.—There is an incapable parallelism between A, B, and C.

The low of 1927 shows on all three, except that in the North American curve (A) it falls in 1926 or 1928. Interpreted in the light of the hatched zone, 1928 appears to be the preferable date for the all-American low, as compared with 1927 for Wisconsin and Ontario.

The high of 1923 is apparent in all three curves as a broad flat-topped "mesa" of four years' duration, beginning in 1920 or 1921, and falling off in 1924 or 1925.

The low of 1918 is apparent in all three, except that in Wisconsin it came a year late (1919) except in prairie chickens, which followed the all-American date, 1918.

The preceding high shows the first blur. The years 1910 to 1915 are all relatively high in all three curves. The all-American curve shows a major peak in 1910 and a lower one in 1912-13. Criddle peaks in 1912, 1913, or 1914, with ruffed grouse peaking later and falling later than sharp-tail. Wisconsin shows peaks in 1909, 1912, and 1915 both for pinnated and all species, the ruffed grouse (being the heaviest component of all species) again lagging behind in the final drop. Taking everything together, the years 1912 or 1913 would seem to be the mean high.

The preceding low Criddle and Seton fix at 1907, with the projection of the all-American curve in agreement, although now so meagre as not to be given great weight. The Wisconsin curve, interpreted with due weight for the hatched zone, would indicate 1905 or 1906. The year 1906 may be taken as a rather blurred median date for this low.

We now climb back to a pronounced high in about 1902, unanimous except for Seton's Hudson Bay rabbits. Again we have the flat-topped "mesa" 2-4 years in duration, with a doubt as to its true centre. Criddle would have it 1903 or 1904 in both grouse; Wisconsin 1901 in both prairie chickens and all species. This time ruffed grouse show no lag in any of the curves, but click with the other species.

Preceding this is a pronounced low, but with Criddle and Wisconsin at variance as to its date. Criddle says 1897 or 1898, Wisconsin 1899.

Wisconsin, backed by Seton, climbs back to a high in 1896 or 1897, while Criddle is still low. The number of observations in the Wisconsin curve has by now become meagre, whereas Criddle and Seton are presumably as well-supported as ever. Since they conflict, the date of this low must be left unresolved.

To sum up, the available data on North American grouse (but possibly not rabbits, especially Hudson Bay rabbits) substantially synchronize in their fluctuations back to the high of 1902, at which point the data become too meagre for further comparisons. The periods and intervals are as follows:

	NORTH AMERICAN GROUSE CYCLE			
Interval	10 or 11		10 or 11	
High	.....1902.....	.....1912 or 3.....	.....1923.....	
Low	.....1906.....	.....1918.....	.....1927	
Interval	14		9	

Evidently 2½ periods have elapsed between 1927 and 1902, which gives an average of a fraction over 10 years, as compared with the 9-year figure arrived at by Leopold in the Game Survey for Wisconsin.

Seton likewise deduced a 10-year period from B-3, plus his corresponding curves for other fur-bearers. He says (p. 109) "The high points for each species are with fair regularity 10 years apart." This independent conclusion for an earlier period carries the extremely important inference that the period of the American cycle is not growing shorter, as MacIntyre claims it is in the British Isles.

It is not here intended to imply that the American cycle has a uniform period, or that it has not. An average is in any event needed for prediction in game management and administration.

BRITISH FLUCTUATIONS.—There is parallelism between the various British curves comprising D and E. It is apparently greater than would occur by chance alone.

A certain lag between D (kill) and E-1 (disease frequency) is to be expected. The literature makes it clear that heavy kills are often made during the first year of an outbreak of disease, the heavy population being assumed to induce the outbreak. Accordingly E ought to precede D in both trough and peak. This will be called the "anticipated lag."

The British curves for 1909-1929 are too meagre to support conclusions. It is hoped that some British author will compile and publish the kill since 1910 on the four moors covered by the Grouse Report and Maxwell up to that date.

There are possible highs about 1923 and 1915, and lows about 1929 and 1914.

There is a partially substantiated high about 1909 and a low about 1908.

Beginning now with the full data, there is a clear high in the kill for 1907, E-1 showing the anticipated lag to the left, to the extent of two years.

There is an unanimous low in 1903. There is a clear high in the kill for 1901, E-1 showing the anticipated 1-year lag to the left.

There is a low about 1897, E-1 lagging one year to the left as anticipated.

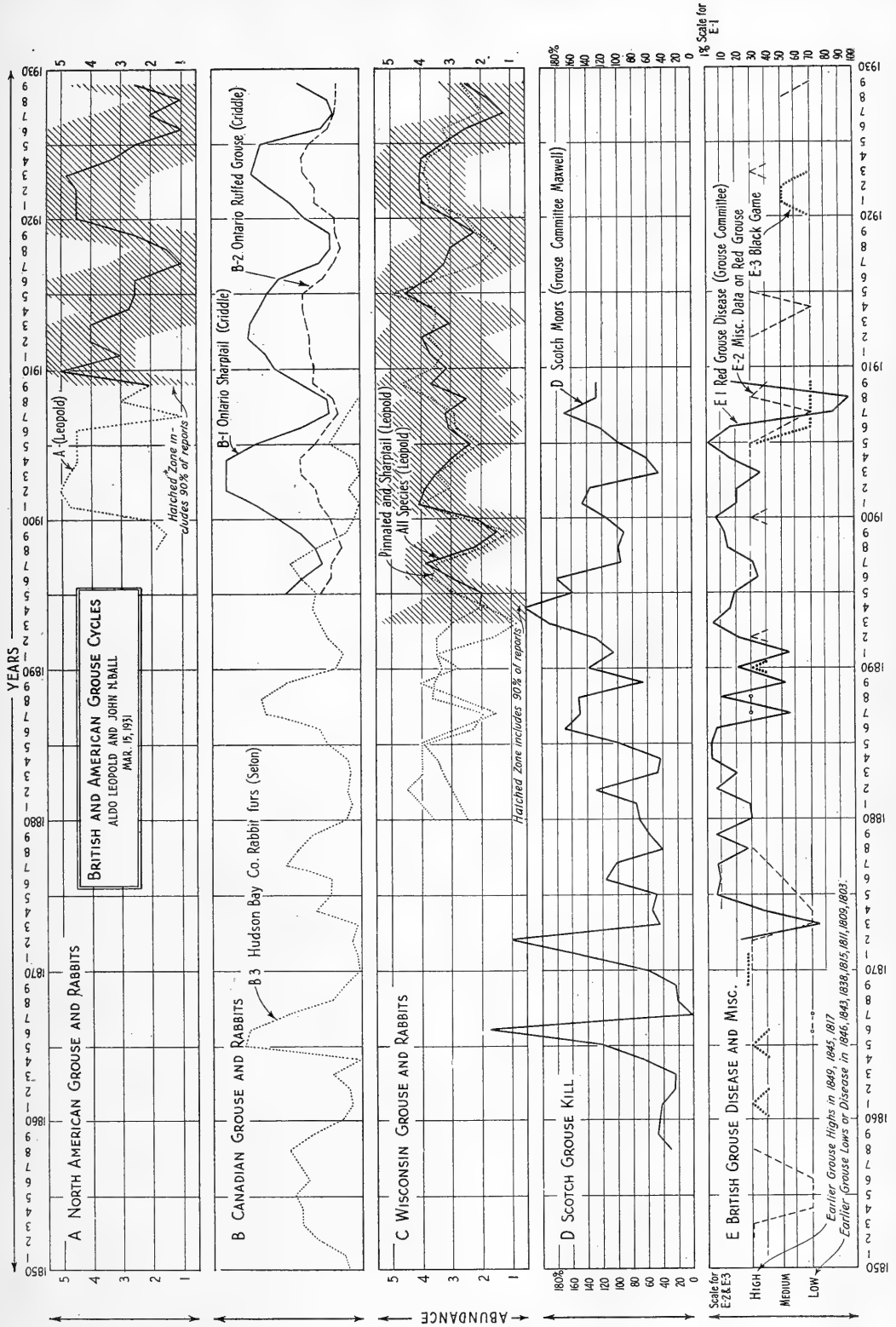
There is a clear high in 1894, E-1 lagging one year to the left as anticipated.

There is a blurred low in 1889 or 1891. There is a clear high in 1886, E-1 lagging 1-2 years to the left as anticipated.

There is a low in 1883 or 1884, a unanimous high in 1882, and a low in 1878, but contradicted by E-2, which shows a high.

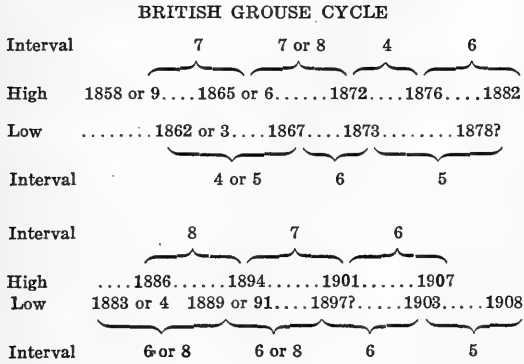
There is a high in 1876, and a unanimous low in 1873.

By all the literature and tradition, 1872 was a record-breaking year.



There was a low in 1867, a high in 1865 or 1866, a low in 1862 or 1863, and a moderate high about 1858 or 1859. Management and kill records began during this period, so our data end, and hence our inquiry.

To sum up, the data on British grouse available to us show periods and intervals as follows:



Evidently seven periods elapsed between 1908 and 1863 (45 years), an average period of $6\frac{1}{2}$ years, as compared with the 10-year period arrived at for American grouse.

With markedly differing periods, the one not constituting a multiple of the other, the occasional synchronism on the chart between British and American curves must be ascribed to chance.

The statement of the Grouse Committee that the British cycle consists of "the good year, the very good year, the record year, the bad disease year, the recovery, the average, and the good average" (7-year cycle), is approximately correct in the light of this analysis of their own records.

The bag on the four moors covered by Curve D fell lower than 50 per cent of the normal or average during only 14 years out of the 51-year period covered. Crop failures, in other words, occur only one year out of four.

OLDER BRITISH RECORDS.—A thorough search would doubtless reveal old shooting journals which would make possible the extension of the British curves behind 1850. One such journal by James Edward, the second Earl of Malmesbury,⁹ has come to our notice, but the kills recorded include mainly partridges and waterfowl, with a few black game. Evidently his estate (Heron Court in Hampshire) was marginal for black game, the kill never exceeding 10 head, and aggregating 81 head. The intervals at which any were killed, however, are suggestive, as shown in the table in the next column.

BLACK GAME AT HERON COURT

Some Killed	Max. Kill	Interval	None Killed	Interval
1802-6	1802	}	1807	}
1808-10	1809		1811-12	
1813-17	1814	}	1818	}
1819-24	1822		1825-26	
(except 1821)				

It is only the extreme regularity with which Malmesbury shot over this region which warrants the inclusion of so meagre an aggregate kill. To the extent that the data can be credited with any significance, they corroborate the 6-year cycle.

The footnote on Chart E cites five lows and highs in *red grouse* gathered from various authors, which synchronize with Malmesbury's *black game* in about half of the instances, and contradict in half.

CONCLUSIONS; BRITISH-AMERICAN COMPARISON.—Both British and American grouse fluctuate rhythmically.

The internal synchronism in each country is sufficient to show clearly when mass data are plotted as either means or spreads, the lags between localities not quite obscuring the general trend.

There is no significant synchronism between Britain and America, the periods being different. This would seem to refute the theory that cycles are basically due to fluctuations in solar radiation or sun-spots, unless such fluctuations operate through entirely different biological channels in America and Britain respectively.

The recent periods in each country are nearly of constant length, the British period varying from four to eight years and averaging $6\frac{1}{2}$; the American period varying (less conclusively) from nine to 14 and averaging 10 years.

There is no evidence that the periods in either country are growing shorter, as one author thinks is the case in Britain.

Recovery is faster in British than in American grouse, but the peaks are longer (*i.e.* have flatter tops) in America. Both of these characters probably reflect the difference in period. There is some indication that management, which began about 1870, has lengthened the British peaks (or shortened the depressions).

The degree of fluctuation in British kills often exceeds 90 per cent of the average kill. Probably the fluctuation in actual population density is as

great or greater. There are no comparable American figures on degree of mortality, but this agrees with the conjectures advanced in the Game Survey.

In spite of these fluctuations, game management as applied to British grouse is a great success with no undue proportion of lean years. Why then should not equal success attend the hoped-for management of American grouse?

It hardly seems necessary to add that the development of an American biological technique for grouse management, patterned after the European experience, does not imply the adoption of European laws and customs concerning the utilization of game or the distribution of shooting privileges. On the contrary, as pointed out in the Game Policy,⁸ grouse usually occur on cheap land suitable for public acquisition and management on a large scale. So far, however, there is

no grouse management in America, on either public or private land. It presents a virgin field for pioneer work by biologists, administrators, and sportsmen.

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DUCK-BANDING

By C. W. PALMER, Jr.



TO ONE who loves the outdoors, and particularly to the student of bird life bird banding offers considerable attraction. It is an all-absorbing outdoor pastime, always productive of unusual and interesting incidents. At the same time, it is of great value to conservation. It is realized now as never before, that the conservation of our wild life as well as of our other natural resources is vitally important to our national welfare. Just recently, a survey of the National Council of the National Economic League placed conservation twenty-first in a list of fifty-four national problems. To administer the conservation of wild life efficiently, more facts are needed regarding their habits and, to this end, there are being established various fellowships and research programmes delving into the life histories, habits and environments of the various species. Each banding station is a cog in the wheel of this research, and, to most of us, it is a great satisfaction to feel that, in our spare time, we can do something of economic value while enjoying the out-of-doors.

"Bird banding in America, dates from around the time of Audubon, who, about 1803, used silver wire to mark a brood of Phoebes. He was rewarded the following season by two of his marked-birds returning to nest in the same vicinity. In the early part of the present century several banding or marking schemes were projected, one of which resulted in the organization in December,

1909, of the American Bird Banding Association. The work accomplished by that association, together with the development of the method of systematic trapping, demonstrated the possibilities of extensive banding operations. With a realization that the information obtained would be of great value in connection with the administration of the migratory-bird treaty act of July 3, 1918, the Biological Survey in 1920 took over the work of the American Bird Banding Association."

To indicate more clearly how interesting it can be, just suppose for a moment you had at various times banded some of the following birds. Would you not experience a keen thrill in learning that a "Swainson's Hawk," (banded by you), wearing a celluloid ring, which is described as being red on the inside and black on the outside, and marked "50 Canada", was killed in the western part of Buenos Aires Province, Argentine, South America? Such a case was reported in *The Canadian Field-Naturalist* for April, 1931.

One of the longest flights on record is that of an Arctic Tern, No. 548,656, which was banded when less than five days old by Oliver L. Austin, Jr., at Red Island, Turnevick, Newfoundland Labrador, on July 22, 1927. Records of *The Canadian Field-Naturalist* show that this bird was found dead October 1, 1927, just seventy days after the date on which it was banded, on the Greve de Marsilly, near La Rochelle, France.

The straight distance from Labrador to the coast of France is about 4,200 miles.

What seems to be an absolutely unique banding return was made near Charleston, South Carolina, during August, 1929. On June 13 of that year a rookery was visited on Youghal Plantation and many young herons were banded. On August 9, five of the bands put on in this rookery were taken from the stomach of an alligator which was shot a mile and a half away. That the saurian was killed in that section indicates that herons were taken as they flew out to the marsh to feed. Alligators frequented the waters of the rookery itself and no doubt ate many young which fell from nests, but it is interesting to note that herons form a part of the food supply of these reptiles to such an extent.

The longevity record for banded birds was recently broken when an osprey, banded as a fledgling at Gardiners Island, New York, June 15, 1914, was shot at West Durham, North Carolina, April 4, 1930, nearly sixteen years later.

During the past two winters at the du Pont Experimental Game Farm, near Carney's Point, New Jersey, when regular work has been slow and consisted merely of caring for breeding stock for the following season, we have conducted a banding station in the marshes on the smokeless powder plant property.

In the spring of 1930, a small trap was located in the marsh adjacent to the farm which Black Ducks were "using" and over 150 of them were trapped and banded. It was set in water about knee deep and a long strip of wire mesh was run out into the canal to guide the ducks to the entrance to the trap. This was then baited heavily with corn and other grains. We met with fair success with this trap, but it was soon realized that it was much too small. So, in January of this year [1931], a larger one was built on the same site, about 10' x 20' and 6 feet high above water level. The advantage of this larger trap was immediately seen.

Due to the freezing up of the marshes, we were unable to do anything until the 30th of January, but the very first day it was put into operation it netted us twenty-four ducks—twenty Black Ducks and four Mallards. Of this number, five were birds we had banded the previous year. The second day was even better and thirty-eight Black Ducks were trapped, two of these also being "repeats." From then up until the present time we have been banding ducks daily, except when, on one or two occasions, an unusually high tide brought the water level up above the funnel entrances to the trap.

Nearly thirty of the ducks banded last year

have been recaptured this year and we have had reports from the Biological Survey of approximately a dozen more shot by hunters during the past hunting season from Pamlico Sound, North Carolina, to Quebec. Ten of the birds we have retrapped this year have been trapped again and again and one of the remarkable things about them is that they seem to have no fear of, or objection to, the repeated trapping and handling.

Of 267 ducks banded this year, 118 have returned to the trap repeatedly, several having been retaken nine and ten times. In checking our dates on the retrapping of these birds, we find that no great interval of time elapses between the liberation and retaking. For example: Duck No. A-688069 was trapped on February first; it was trapped again on the 11th and 12th, skipped the 13th, was then retrapped on the 14th, 15th and 16th, skipped two days, only to be retrapped on the 19th and then jumped to the 21st and 25th, being trapped in all a total of nine times in a period of fifteen days.

This repetition is not confined to this year's birds, as those banded last year have been trapped again and again. For example: Duck No. A-656691 was banded on the 11th of February, 1930, retrapped on the 2nd of February this year, again on the 21st and 25th and on March 4th, 8th and 15th.

On two occasions the copper bands placed on ducks last year were worn so thin that they had to be replaced with new ones this year. This is unusual, though, as none of the others seemed to be so very much worn.

To one interested in the out-of-doors and in the conservation of bird life, this banding work is a delight. But one must have a keen interest in the work and be unafraid of cold and discomfort.

This is particularly true in banding ducks and other water birds. Most of the work is done during the winter when we have the ducks down out of Canada on their winter ranges, and a duck marsh can be surprisingly cold! Usually there is little to break any wind that might be sweeping—and it invariably is—across the very marsh in which one's trap is located. Hip boots and woolen socks seem little protection from freezing water. Each duck requires individual attention and, in catching him, there's much mud wallowing and splashing of water. The duck is "plenty moist" when picked up and gloves are superfluous. Handling small bits of copper, pointed pliers and wild ducks with this protection is next to impossible. How one's hands do tingle after the tenth or eleventh duck is sent winging on his way! But if you enjoy the out-of-doors, it's really worth while.

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

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(Continued from page 146)



AS ALREADY remarked, the one large room in a small wooden house on the hill with a ground-room had been turned over to me, where the results of my collecting activity continued to pile up. Since the little house had the disadvantage of not being rain proof, a polar bear skin and several dog skins were spread out over my bed, which had been hammered together from a large box; there was often not a single dry spot on the ceiling, until finally they covered the roof partly with tin, and had the north and west sides of the house covered with protecting walls of pieces of sod. From then on it was comfortable in my room, especially when the fire was still crackling in the little iron stove and the lamp was burning in the evening. The doors had to be opened now and then in order to renew the air—the one small window was not arranged for that; then the drying bird skins, skulls, human bones from graves, plants, moss for packing, etc., caused a mixture of many different odours. Besides I had visits very frequently from Eskimos, who were not entirely odourless, often as many as eight to ten people at the same time in the evening, who warmed themselves in my place and dried themselves, got tobacco and raisins, looked at me and Paksau at our work, calmed the children in windy weather, brought me some kind of natural history object, or were invited in the evenings to tell me stories. Those were pleasant hours with smoking pipes, when an intelligent half-Eskimo woman, Mrs. Clara Lane, or the mission trade assistant, Mr. Voicy, an inhabitant of my house, and a half-blood also, served as interpreters, since they knew English. At other times I visited the people in their tents, giving them great pleasure, as they considered it an honour. For hours at a time I would sit with them, and felt quite satisfied in the circle of these unpretentious people. There was always something to do. I arose with the break of day and often went to bed at midnight. When the others had left me, and the family of my neighbour had

long been sleeping the sleep of the righteous, I was still sitting there, writing or doing other work in which I did not wish to be disturbed. As a rule I had my meals with the kind-hearted mission people, who were very busy with the building of the house; at other times only on Sunday did I have the opportunity to be with them longer. They helped me in my work, as much as their time and their views permitted them to do. They took much trouble on my account, so I did not like to bother them. All this I acknowledge in the most grateful manner.

In addition to my domestic duties, whenever possible, I spent the forenoon or afternoon of every day in hunting excursions or trips of observation. Only in an occasional case did I remain entire days or even two days at home continuously, then joining the Eskimos. One time I travelled with two men and a woman, who were to gather driftwood for the missionaries, quite a distance down Ungava bay. On the way home on the second day we had to take refuge in an inlet on account of the weather, where our party grew to perhaps twenty-five persons. Five families came with children and dogs from George River, apparently from the caribou hunt. [P. 122]

Paksau, too, who with three large boys had been away a couple of days in my boat to gather winter wood also, came madly along with full sail, so that we were anxious and afraid for him. The coast has so many reefs, and the old boat would not have stood a hard knock. He was, however, just as strong as clever; we waved to him joyously and celebrated a wet, but happy reunion. Also the "Kablunak" (my nick-name), was welcomed with friendly handshaking on all sides, and this I permitted with great pleasure. The old custom of rubbing noses is no longer in vogue. I pitied the poor children and women, who did not have a dry thread on them. Since the men had fastened their four kayaks to the wooden boat the last part of the trip, and had climbed into the boat, partly to be more protected, and partly to lend a hand with the oars, and sail, the heavily-laden little boat sank so deep into the water, that the waves threw spray over everybody and of course they had to bail out of the boat continually. The dogs, also dripping, were a pitiful sight. They slunk about in a depressed mood, whined, yawned, and shook themselves.

It was an especially interesting excursion which took me after the one mentioned to Ikkeasak country, to the north-west peninsula, enclosed

by Ikkerasak and Tunnusuatsuk, which for ages has been a chief dwelling place of the northern Eskimos. I joined three families, who had been residents there a few years before. They now intended to pitch their tents for some weeks in the innermost corner of the Tunnusuatsuk, and from this place the men intended to carry their kayaks across the mountain range to the Tunnusuksok and there hunt, particularly for seals. The people, who meanwhile had learned to know me better, and were never unapproachable to sensible explanations, offered voluntarily to take me to their former dwelling place and to be helpful to me, to hunt for some graves here also, with the purpose of emptying them. Naturally their good intent which of course was [P. 213] not entirely free from material motives, judging from previous experiences, was correspondingly rewarded. A strong young man as well as a clever girl rowed my boat, while another followed heavily loaded with wife and children, the three men accompanied us in their kayaks. At last I set foot upon the land of Tunnusuatsuk, seen previously, filled with curious feelings and recollections concerning the past of this peculiar people, that lived here for many generations, until now it is approaching its ruin and destruction. It is a shame, that my companions could not tell me what traditions they associate with the venerable place where, perhaps, they were born. For near and far there were no other such fresh green valleys, covered with high grass, in which ancient paths lead. Besides some well-preserved earth houses, one saw whole rows of fallen ruins, in which the driftwood spars and whale bones had sunk together, which once may have covered many families protectingly. There were tent rings, fire places and naturally heaps of bones in great numbers. We visited perhaps a dozen graves; some of them were relatively speaking well preserved. I should have liked to stay a couple of days in this interesting locality, in which we were everywhere surrounded by silent and yet such eloquent witnesses of human past, in order to undertake a thorough inquiry, and make as complete collections as possible, in order to rescue all that was of ethnographical interest, but I had to be careful not to lose the confidence of the people by too great demands. Had more time been at my disposal, everything would have been accomplished gradually. So I contented myself with the collection of some old skulls and pelvis bones from fallen graves, as well as a mouldy and a well preserved skeleton, the latter of which belonged to the aunt of my kind guides (now baptized Christians). Also a quantity of tools were found, the number of which could have been increased considerably

by a diligent search, in which my little companion proved to be very wise and clever. Approaching evening [P. 214] forced me finally to leave the place, and in a splendid phosphorence of the sea, which threw up sparks in our pathway wherever our oars struck the water, sparkling like a thousand pearls, I journeyed homeward with the young Eskimo man through the night, and the slowly descending fog.

Gradually the weather became rougher and more unfavourable, the days shorter, the stay in the open less productive of results. But the autumn of 1906 was said to be especially mild and favourable. But the regular snowfall and cold would have pleased me more than the continuing rain and storms with a few degrees of warmth. The second half of October, after I had left Killinek, beautiful late autumn days are said to have come which compensated in a measure for the unfavourable summer; the Killinek bay was not entirely free of ice until September 22nd, aside from some icebergs, which running aground have stood their watch there for years. The bay did not freeze over until November 29th, a thing that seldom happens so late (*Missionsblatt der Brüdergemeine*, 1907, p. 271). A rather heavy snowfall set in at Killinek in the middle of September, but the white covering vanished again before the end of the month, at least in deeper locations and on the southern slopes. In the autumn of 1905 half a meter of snow had fallen by September 15th that did not go away at all. In the beginning of October, 1906, the snow was more abundant, and the ponds began to freeze over slowly. But a sled journey could not be thought of up to the time of my departure on October 11th, because the snow was too clear and loose.

From July 27th until October 11th I noted temperature observations as regularly as possible, but refrain from publication of these, first, because a little meteorological station was established from 1906 on through the efforts of the missionary, Mr. Waldman, the results from which are being published in London; secondly, the readings without a fixed point of observation are very changeable and therefore uncertain. I almost always carried one or two thermometers with me, in order to take the temperature more frequently than the regular notations of 8 o'clock in the morning, 2 o'clock and 9 o'clock [P. 215]. Then it is soon shown what conditional value even the most scrupulous observations may have. At my little house, which was situated scarcely 20 to 25 meters higher than the mission building, it was not seldom 1° to 2° C. (1.8° to 3.6° F.) colder than there, but if I ascended to the edge of the highland, perhaps 80 to 120 meters above the sea,

the temperature sank occasionally 1° to 2° more. If this had remained a regular thing, the observations would have retained their value. The contrary often was the case. Whenever the tide or the wind filled the bay with ice, and it began to blow across this to the land, Mr. Waldmann in his little observation station close by the beach often had a few degrees less warmth than I up on the mountain heights, where the sunbeams of the long summer days did their work uninfluenced. Elsewhere there were sunless lake valleys, in which icy cave temperature prevailed, not far from grassy gorges with southern exposures, where the thermometer rose at once. Also windy and wind-protected places afforded, when measured without sunshine or in shady places, many kinds of different results. So I lost faith in the temperature notes possible for me to take, which even in neighbouring localities now and then showed quite different results, not like one another at all. In August the temperature varied, aside from the ice-covered sea and without regard for passing exceptional cases, (also measured only in the day not at night after 9 o'clock,) in general between +4° and +8° C. [39.2° and 46.4° F.]. Only on the 16th did it rise at noon in a sky slightly overcast up to 11° C. [51.8° F.], on 17th in quite clear sunny weather even up to 14° C. [57.2° F.] warmth; on this day even at 9 o'clock in the evening. At 9 o'clock +10° C. [50° F.] but sank on the next morning to +4° C. [39.2° F.]. 1st half of September: 0° C. [32° F.] to 4° C. [39.2° F.], 2nd half of September: -2° [28.4° F.] to 5° C. [41° F.]. October 1st to 11th: -5° C. [23° F.] to +3° C. [37.4° F.]. In the winter months December to March the temperature is said according to the reports of Rev. Perrett and the missionary, Mr. Waldmann, as a rule to waver between -10° C. [14° F.] and -25° C. [-13° F.], only occasionally to sink -25° -35° C. [-13° to -31° F.] and, as an exception, to still lower degrees. (Compare also Mr. Waldmann's table of temperatures from December 1st, 1904, to August 17th, 1905, in Report of an official visit, etc., 1906, p. 76 [P. 216].

In April the influence of the sun begins to make itself felt, which becomes so strong in May and June, that even the Eskimos have to shade their eyes with snow glasses. July and August are the warmest months, which melt the snow and ice on most levels sooner or later. Indeed the weather in those parts is just as undependable and different as in our districts. The traveller always has to reckon with this fact.

Winds blow almost continually, occasionally for days from the same direction; during my stay in the country often from the west; frequently inside of a few hours they will take an entirely different

direction. Now and then they are so violent, that it is difficult, even dangerous to travel overland, hence a boat voyage on the sea is quite impossible. It happens often that people removed a few hours from Killinek, but on the other side of Ikkerasak, have to wait days, even weeks, before they are able to reach the station. Now and then shortage of food results as the cause of this. In stormy weather, it seems as if the land animals were all blown away. I have taken half-day excursions with Paksau, without seeing even a bird. And as a kayak traveller the Labrador Eskimo of the present time ventures little. Calms very seldom last any length of time, but often occur about noon or evening or at other times between the change of the directions of the wind.

Rain belongs to the everyday occurrences even if as a rule it brings to earth only a small quantity of water. Quite rainless days with a clear sky were rare, at least during my stay in north-eastern Labrador, several such following after one another being observed only twice or three times. Usually the weather changed every few hours; early in the morning, fog; noon, rain; evening, sunshine, in case it did not prefer to sweep its gloomy gray mood over the whole day. At best the August weeks were in a measure invariable. But you could never praise the day before the evening. At night an abundance of dew formed in clear weather, which forced us to cover carefully all the tools, also the fire-wood [P. 217] or to take them into the tent; later in the year heavy hoar-frost. The characteristic forms of precipitation consisted mostly of moist fog or fine drizzling rain, which soaked everything. Thick, chilly fog appeared suddenly on the sea also in sunny weather, to vanish as a rule after a certain length of time. Now and then you saw sharply bordered cloud masses rolling away on the sea. Heavy rain in very large drops was somewhat rarer than the fine, drizzling rain, but several times continued for days, and brought an abundance of water to earth, which everywhere ran to the valleys in rivulets and small streams. From the beginning of September snowfalls began, became more frequent in the middle of the month, often alternated with rain. At the beginning of October consider able amounts of snow fell several times. But they vanished quickly under the influence of sunshine and wind. At this time of the year the change in the weather was peculiar. I remember many a hunting trip for ptarmigan when at one time the maddest snow storm was whirling about us, and the clear snow flakes were flying before us, sweeping over the plateaus, and covering the slopes so deeply, that you sank far into it, if you did not pay close attention where you were going;

a quarter of an hour later, though, the wide landscape lay before our enchanted eyes in a complete calm, the laughing sunshine fell across the blinding white levels, while dark blue shadows spread mysteriously across the gorges and rocky precipices. After a short time the splendour was gone again, the heavens became gloomy, and the wild dance began anew. The often repeated "bad" weather lessened a great deal the results of work, theoretically possible. Many times hours and days came, which brought full recompense for all the lack of good days; hours so delightful and bright, that you cannot imagine more beautiful ones; hours, for one of which I gladly took the days full of rain and storm. Then I sat up in the grass and looked down, looked on the sparkling, trembling sea, where the little, light waves chased each other in merry play, looked out across to the distant white mountain tops, which towered up so far away and yet so [P. 218] tangibly clear in the clear, bluish air, allowed myself to be fanned caressingly by the greeting sunshine, which probably came from home, from gaily moving streets to me, dreaming in my loneliness.

There is the following to report concerning special phenomena in the sky. Thunder and lightning with the exception of those slight discharges on July 26th were not perceived with certainty. Mirages were rarer also than in the ice. Several times toward noon in somewhat hazy air indistinct mock suns [parhelia] became visible. In the wide ring, which surrounded the true sun, the two mock suns standing horizontally from it, became visible. The phenomenon seemed peculiar, but in no way beautiful. The moon though appeared in more beautiful splendour. It was surrounded very often by rings and halos, which appeared much clearer and with more colour than in our country. More rarely I observed in the centre of the ring mock moons [paraselene]. The beaming light of the constellations appeared to me to be stronger than here at home; repeatedly I could write with little lead-pencil letters in my note book and read this clearly besides seeing far into the distance, as far as Kallaruselik and the southern peninsula Nuvualuk. The brilliancy of the stars, sparkling so splendidly paled then in the presence of the queen of the night. Almost every evening, before I went to sleep, I stood outside a little while and looked up at the sky, filled always in clear weather by the same admiration of the shining northern firmament until disturbed by the howling of the dogs that followed conscientiously with their disagreeable voices not only the rising of the moon, at least of the full moon, to speak accurately, but also its further course. Their excitable nervous system

seems to be influenced strongly by the moonlight. Not until the latter part of the Autumn do the northern lights appear frequently, and mostly also only in those white veil-like streamers, like moonlight, which cross the sky in undulating bands, strips and clouds, often shining brightly and then turning into flickering lights, so that the whole firmament flames up, then subsides or appears only here and there more clearly. I did not observe completely formed crowns of lights [P. 219]; also the greenish and reddish colour of the streamers and bands showed slight intensity. In spite of this the observation of the changing sky charmed me so, that I often forgot weariness. Were they then truly the souls of the departed, who, as the Eskimos say, whisk about up there? In August I have observed wonderful sunsets several times in which flaming rays continued until far into the darkness. They reminded me of the northern lights. In general the changing play of colour of the sky by day and by night belongs to the most beautiful phenomena of these lands. The reason for this is perhaps the purity and clearness of the air.

The development of the flora is dependent entirely upon the climatic conditions. It has been explained that this is unfavourable in these districts, compared with neighbouring localities. The reason for this may partly lie in the exposed insular situation in the middle of a sea, free of ice only a few months of the year, partly in the almost completely rocky nature of the district. As a rule the development of plants does not begin before June, even if some specially sheltered sunny places may show exceptions. The vegetation unfolds noticeably in July with great speed, so that it has reached a high point by the end of the month. Some species, as *Pyrola rotundifolia*, do not bloom as a rule before August; as a rule though this month represents the time of formation of the seed. As shorter days and cooler temperatures come, certain tender flowers perish very quickly, for example, the yellow Arctic poppy (*Papaver nudicaule*); others, for example, the Alpine five-fingered grass (*Potentilla alpestris*) until late in the autumn display a surprisingly abundant development of six, ten, and still more foliated blossoms, which are not easily killed by days of snow and frosty weather. If September is warm in the vicinity of Killinek, large quantities of berries ripen. I found such especially in *Arcostaphylos alpina*. It only pays to gather them in exceptional years, however much this is done by the Eskimos in districts of Labrador situated farther south. [P. 220] As a consequence of my late arrival in the country and travelling until the middle of September my plant collection was a

very incomplete one, though quite a number grew mouldy in my wet dwelling and on journeys, lost leaves and blossoms, were thrown away but later were not replaced by other specimens. I join, therefore, in order to give an approximate presentation of the flora of our district, the list of the plants collected by me with that of L. E. Borden, who collected on July 28th and 29th, 1904, likewise in the vicinity.¹

The Eskimos of Killinek, to a number of the most intelligent of whom I showed my little herbarium, knew names for only a few species, which I add. The missionary, Mr. Hettasch in Hoffenthal, who has been busy with the flora of Labrador for years, maintained the same also for the other mission stations. Use of the plants takes place in slight degree; I add this also with what was told me about it.

List of a number of species of plants collected in the most north-eastern part of Labrador

- XXX *Alectoria ochroleuca* var. *cincinata* (Fr.)—Tingaujat.
 XXX *Cladonia sylvatica* (Hoffm) REINDEER LICHEN, [Renntierflechte] Nerkagasek ?
 XXX *Cladonia bellidiflora* Ach.
 XXX *Dactylina arctica* (Hook) Nyl.—Nerkat.
 XXX *Siphula ceratitidis* (Wbg.) Fr.—Nijaurasat. -
 XXX *Cetraria nivalis* (L.) Ach.—[Tartschen flechte], TARGET LICHEN, Nerkagasek. Is eaten in exceptional cases.
 XXX *Nephroma arcticum* (L.) Koajaut.
 XXX *Racomitrium lanuginosum* (Ehrh.) Brid.—[Astmoos], BRANCH MOSS, Mannik—Used as lampwick.
 XXX *Cystopteris fragilis* Bernh.—[Blasenfarn].
 XXX *Equisetum arvense* L. var. *campestre* Milden [Schachtelhalm]. box culm.
 XXX *Lycopodium Selago* L.—[Bärlapp]—BEAR MOSS, Kakkilanatut.
 XXX *Trisetum subspicatum* P. B.—Nappakotaujok.
 X *Hierochloa alpina* R. & S.—[Darr Grass] HOLY GRASS.
 XXX *Poa alpina* L. [Rispelgras] MEADOW GRASS.
 XX *Poa arctica* R.Br.
 XXX *Festuna ovina* L. var. *alpina* (Gaud.) Koch. and *F. borealis* Lge.—[Schwingelgras] FESCUE GRASS, Iviksukak.

¹List of Plants collected in 1904 during the cruise of the *Neptune*. By L. E. Borden, M.D., and named by Mr. J. M. Macoun—Appendix III, p. 320, to A. P. Low, Cruise of the *Neptune*, Ottawa, 1906.

XXX Collected by me alone.

XX Collected by Borden and myself.

X Collected by Borden alone.

The identification of the Phanerogams and the vascular Cryptogams collected by me was done most kindly by Dr. Th. Wolf and Dr. B. Schoeler in Dresden, that of the willows by Mr. O. V. Seemen in Berlin, that of the lichens by Dr. A. Zahlbruckner in Vienna.

- XXX *Elymus arenarius* L. var. *villosus* E. Mey.—[Haargras] HAIR GRASS, Singailit—Placed in boots.
 XXX *Eriophorum angustifolium* Roth.—[Wollgras] COTTON GRASS, Killingnatut.
 XXX *Eriophorum Scheuchzeri* Hopp—Pualun-goak—Placed in mittens.
 X *Eriophorum vaginatum* L.
 XXX *Carex rigida* Good.—[Riedgras] SEDGE.
 XX *Carex hyperborea* Wahlbg.
 X *Tofieldia borealis* Wahlbg. [Kelke] ?
 X *Salix anglorum* Cham. [Weide] WILLOW—The willow cotton is used occasionally for starting fires.
 X *Salix herbacea* L.
 X *Salix Labradorica* Rydb.
 XX *Salix reticulata* L. Kigutanginagutit.
 X *Salix Uva-ursi* Pursh.
 XXX *Salix Cutleri* Tuckerm. Orpit.
 XX *Oxyria digyna* Hill—[Ampfer] SORREL. Kungulik—Leaves eaten raw as relish.
 XX *Polygonum viviparum* L.—[Knöterich], KNOT GRASS, Tuglat—Leaves eaten as a relish mixed with seal oil as a salad.
 XXX *Silene acaulis* L.—[Leimkraut] SILENE.
 X *Lychnis apetala* L.—[Lichtnelke] CROW FLOWER.
 XXX *Stellaria humifosa* Rottb.—[Mièrè] CHICKWEED.
 XXX *Stellaria cerastioides* L.
 X *Stellaria longipes* Goldie.
 XX *Cerastium alpinum* L.—[Hornkraut] MOUSE-EAR CHICKWEED. Pilluk—Entire plant eaten.
 XXX *Alsine verna* L. var. *propinqua* Rich.—[Meirich].
 XXX *Ranunculus nivalis* L. [Hahnenfuss] CROW-FOOT.
 XX *Ranunculus pygmaeus* Wahlbg.
 XXX *Papaver nudicaule* L. [Mohn] POPPY.
 XXX *Cochlearia grœnlandica* L.—[Löffelkraut] SPOON-WORT. Kungalëujat—Eaten.
 XXX *Cardamine pratensis* L. [Schaumkraut] ?
 X *Draba Bellii* M.H.M. [Hungerblümchen] HUNGERFLOWER.
 XX *Arabis alpina* L. [Gänsekraut] WALL CRESS.
 XX *Rhodiola rosea* L.—[Sedum], Tuglerunak—Put on wounds and also eaten.
 XXX *Saxifraga cœspitosa* Kch. var. *grœnlandica* (L.) [Steinbrech].
 X *Saxifraga cernua* L.
 XXX *Potentilla nivea* L. var. *macrophylla* Lehm.—[Fingerkraut], FIVE-FINGERED GRASS.
 XX *Potentilla emarginata* Pursh.
 XX *Potentilla alpestris* Hall. P. (= *maculata* auct. var.)
 XX *Dryas octopetala* L. var. *integrifolia* (Vahl).

- X *Astragalus alpinus* L. [Tragant] TRAGACANTH.
 X *Empetrum nigrum* L.—[Krähenbeere].
 X *Epilobium latifolium* L. [Weidenröschen] WILLOW HERB.
 X *Epilobium spicatum* Lam.
 XX *Pyrola rotundifolia* L. var. *grandiflora* (Rad.) D.C. (= *pumila* Hook ?)—[Birnkraut] PEAR-WEED.
 XX *Arctostaphylos alpina* Spr.—[Bärentraube] BEAR BERRY, Kallakotit—Berries of this and other species eaten with relish; prophylactic for rash (Kallak).
 X *Vaccinium uliginosum* L. [Trunkelbeere] Kigitangerek.
 X *Bryanthis Taxifolius* Gray.
 X *Diapensia Lapponica* L.
- XX *Armeria vulgaris* Willd. var. *Labradorica* Wahlbg. [Grasnelke].
 XX *Veronica alpina* L. [Ehrenpreis]
 XX *Pedicularis flammaea* L. [Rodel.]
 XX *Campanula uniflora* L. [Glockenblume] BELL-FLOWER.
 XX *Erigeron uniflorus* L. [Berufkraut] Ussat.
 X *Erigeron debilis* Gray.
 XX *Antennaria alpina* R. Br. [Katzenpfötchen]. EVERLASTING.
 XX *Taraxacum officinale* Webb. var. *ceratophorum* (Ledeb.) D.C.—[Löwenzahn] DANDELION. Missaktak—Leaves and stems eaten.

(To be continued)

AN ANNOTATED LIST OF VASCULAR PLANTS COLLECTED ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE, 1927-1930

By HARRISON F. LEWIS

(Continued from page 135)



HAT the elevation of this coast that has gone on since the last glaciation is still in progress, and that at a fairly rapid rate, at least on the part of the coast between Natashquan and Bradore Bay, is readily observed. It impresses itself very strongly on the local fishermen, who, while lacking any generalized ideas on the subject of such movements, are forced by their experience, much to their own perplexity, to recognize the local reality of this one. Shoals that gradually rise above sea-level, passages and harbours that become too shallow for use, and structures built at the shore that gradually become removed from it are among the indisputable signs of such a change that they see.

The most definite evidence of the present rate of rise of this coast that has come to my attention is furnished by certain iron ring-bolts set in the solid rock at La Tabatière to furnish attachments for heavy nets used in the important seal-netting practised at that place. This netting is carried on in November and December, and in order to avoid as far as possible any disturbance of the nets by the new ice that frequently forms at that time of year, every endeavour is made to keep the nets and their fastenings below the level of the ice. Among other precautions, the ring-bolts that form the shore fastenings of the nets are set in the rock just as low down as it is possible to get a suitable uncovered rock surface to work on at extreme low water of the lowest spring tides. The continual rise of the coast, however, brings these ring-bolts higher and higher, until they

reach positions where they are uncovered for a considerable period at every low tide, spring or neap, when so much trouble with ice in the season of the seal-fishery results that a new set of holes must be drilled lower down in the rock and new bolts must be set in them. This process is repeated again and again at intervals of 20 to 30 years. Seal-fishing by this method has been carried on at La Tabatière for more than 100 years, and I have seen there old bolt-ends, much eaten away by rust, that were presumably set at the lowest accessible point at low water of spring tides, and that, while still fast in their places in solid rock, are now above the highest point reached by the sea at high tide.

In 1928 Mr. Hiram Robertson, who conducts a seal-fishery at La Tabatière, showed me a ring-bolt in place that he personally had set in the rock 22 years before and that he was about to replace by a new ring-bolt set at a lower level, as far down as he could place it at the lowest tide. The vertical distance between the center of the old ring-bolt and the point where the center of the new one was to be was 29 inches. If we consider this as indicating roughly the amount of rise that this part of the coast has undergone in 22 years we find that the rate of rise is more than an inch a year, or is nearly eleven feet in a century! Possibly local factors, such as the configuration of the rock surface at the point in question, influenced somewhat the precise points chosen by Mr. Robertson for the setting of these two bolts and so the rate of rise may be somewhat less than that stated, but all the data on the subject that

I have been able to discover indicate a rate of rise in the region near La Tabatière of at least six feet, and probably somewhat more, in a century. Precise observations on this subject are much to be desired, as the question is important in its relation to biology, geology, history, and navigation. The comparatively rapid rise that is evidently going on undoubtedly affects the local distribution of plants, and is particularly effective in carrying strand plants, especially those that seek the strand for the sake of the lime that it contains, to higher elevations. Deposits of sea-shells formed by sea-birds at moderate elevations above the shore may also, if contained in impervious rock basins, be elevated, with their calcicolous plants, to heights so great that the birds no longer frequent them, without losing their characteristic calcicoles for a long time.

On page 14 of his "Botanical Exploration", St. John (1922) says, "Little is known of the flora of Manowin Island, which has calcareous, fossil-bearing rocks . . .". My curiosity was strongly stimulated by this sentence, for, as viewed from the deck of the mail-steamer, which passes close to it, Manowin Island certainly appears to be formed of igneous, rather than sedimentary rocks, while the "Pilot Guide" (1916) states of all the "Seven Islands", of which Manowin is one, "Seven islands are high and steep, of primary rocks . . .".

On September 12, 1928, I visited Manowin Island and spent several hours on it and in its vicinity. This island, wherever I observed, it is of igneous rock, and in general has a typical flora of oxylophytes and indifferent plants. *Thalictrum confine*, *Gentiana Amarella* and *Campanula rotundifolia* were found growing on it, but their presence is explained by the fact that they were growing on a raised beach, which probably still contained some lime derived from sea-shells.

Close north-east of Manowin Island, and connected with it at low tide, is, however, a small island called Caye à Chaux. It is composed of Silurian limestone, the strata dipping to the north-east. At low tide it is about a quarter of a mile long and 800 feet wide, but on account of its gently sloping shores its dimensions are reduced at high tide to a length of about 500 feet and a width of about 400 feet. Its highest point is only some 10 or 15 feet above high tide level, and it is entirely exposed to south-east storms, with the result that vegetation on it is very scanty. I recognized on it only the following vascular plants: *Elymus arenarius*, var. *villosus*, *Juncus balticus*, var. *littoralis*, *Smilacina stellata*, *Ribes hirtellum*, *Lathyrus maritimus*, var. *aleuticus*, *Epilobium angustifolium*, *Conioselinum chinense*,

Primula laurentiana, *Lomatogonium rotatum*, f. *americanum*, *Plantago* sp. and *Campanula rotundifolia*. Evidently this small, exposed island had not yet succeeded in developing a marked calciphilous flora. A description of it was published by James Richardson in 1869.

Another point which I long desired to visit is the summit, 1264 feet high, of Mount Cartier, which is the highest of the three "Bradore Hills", conspicuous elevations a few miles inland north-east of Bradore Bay. I finally succeeded in climbing to this summit in company with Mr. E. C. Abbe on July 22, 1929. The result was disappointing. No relict plants were observed and the summit was found to be of granitic rock which was clearly shown by the presence of erratics to have been subject to glaciation. On the northern side of this and of other similar summits in the neighbourhood were areas of red sandstone.

Since it is seldom that one finds on this coast more than three or four species of ferns associated together at one place, it is worthy of special mention that in and about a basaltic dyke ravine on the hill just east of Mutton Bay no less than nine species were found growing in an area with a diameter of one hundred yards. These species were: *Woodsia ilvensis*, *Cystopteris fragilis*, *Thelypteris spinulosa*, *Thelypteris Phegopteris*, *Thelypteris Dryopteris*, *Athyrium angustum*, var. *rubellum*, *Polypodium virginianum*, *Osmunda Claytoniana*, and *Osmunda cinnamomea*. A sample of basalt from this ravine was submitted to the division of Chemistry of the Mines Branch of the Canadian Department of Mines for analysis and was reported to contain 1.29 per cent of calcium. This calcium content and the excellent shelter provided within the ravine were probably effective factors in the production of the rich and varied fern growth found there.

ANNOTATED LIST

The names in large and small capitals are those of introduced plants.

In connection with each plant listed, localities of collection are named in order from west to east.

The total number of plant names in the list is 567.

POLYPODIACEAE

Woodsia ilvensis (L.) R. Br.

Matamek River, Sept. 5, 1928, crevices in small cliff beside river near mouth. Mutton Bay, July 23, 1928, crevices in small cliff, side of basaltic dyke ravine. Recorded by St. John from "Brest: riviere a la Truite" only. Range extension, 410 miles W.

Cystopteris fragilis (L.) Bernh.

Betchewun, June 3, 1928, crevice in limestone

ledge. Mascanin, Aug. 20, 1928, crevice in granite cliff in dense, shady, coniferous woods. Blanc Sablon, July 11, 1928, rocky bank of stream, east slope of main valley.

Onoclea sensibilis L.

Bradore Bay, July 13, 1928, brookside on calcareous sandstone.

Thelypteris spinulosa (O. F. Müll.) Nieuwl.

Lake Island, July 18, 1927, steep sloping side of rocky draw. Aylmer Sound, Aug. 18, 1927, turfy slope of island. Abundant everywhere in the region.

Thelypteris Phegopteris (L.) Slosson.

Harrington Harbour, July 25, 1928, thicket on sand bluff on mainland. Bradore Bay, June 30, 1927, shaded brookside on granitic rock at head of bay.

Thelypteris Dryopteris (L.) Slosson.

Kegaska, Aug. 15, 1928, thicket back of mussel-shell beach on Kegaska Island. Lake Island, July 18, 1927, turfy draw between rocky eminences. Bradore Bay, P.Q., June 28, 1927, wet gravelly hillside on calcareous sandstone.

Thelypteris Robertiana (Hoffm.) Slosson.

Betchewun, Aug. 26, 1928, crevices in limestone ledge.

Athyrium angustum (Willd.) Presl., var. *rubellum* (Gilbert) Butters.

Mutton Bay, July 23, 1928, basaltic dyke ravine. Recorded by St. John from "Charnay: Etamamiou river". Range extension, 54 miles E.

**Athyrium angustum* (Willd.) Presl., var. *laurentianum* Butters.

Seven Islands, Sept. 12, 1928, raised boulder beach, on Manowin Island. Lourdes de Blanc Sablon, Aug. 26, 1927, and July 12, 1928, shallow depression on mossy, open slope of hill of calcareous sandstone. While collections from both of these places appear to come within the description of variety *laurentianum*, yet they differ notably, those from Manowin Island representing a large, complex extreme and those from Lourdes de Blanc Sablon representing a small, simple extreme.

Asplenium viride L.

Betchewun, June 3, 1928, crevices in limestone cliff.

Cryptogramma Stelleri (Gmel.) Prantl.

Ste. Genevieve Island, Aug. 23, 1928, low, shaded limestone cliff.

Pteridium latiusculum (Desv.) Maxon.

Mascanin, Aug. 20, 1928, dry, open hillside. Observed also at Magpie and on Manowin Island, at Seven Islands.

Polypodium virginianum L.

Matamek River, Sept. 5, 1928, clefts in

small cliff beside river near mouth. Mutton Bay, July 9, 1927, crack in side of granite boulder. Great Mecatina Island, July 17, 1930, crevices in granite boulders. Observed also in two other small stations at Mutton Bay and at Cross Harbour, Little Mecatina Island. Recorded by St. John, as *P. vulgare* L., from "Letellier: Seven Islands" and possibly from "Mingan seigniory: Mingan river, falls of" (report of D. N. Saint Cyr.). Range extension (from Mingan River), 234 miles E.

OSMUNDACEAE

Osmunda Claytoniana L.

Mutton Bay, July 9, 1927, basaltic dyke ravine. Bradore Bay, July 22, 1929, steep rocky slope between Mount Cartier and the head of the bay. Most easterly station cited by St. John is "Brouague: Shekatika River". Range extension, 47 miles E.

Osmunda cinnamomea L.

Lake Island, July 18, 1927, turfy slope. Mutton Bay, July 23, 1928, in hollow on hillside. Bradore Bay, July 22, 1929, rocky brookside between Mount Cartier and head of bay.

OPHIOGLOSSACEAE

Botrychium Lunaria L.

St. Augustin, July 20, 1928, upper part of sandy beach on Gull Island in St. Augustin Bird Sanctuary, about 3 miles west of St. Augustin Island. Blanc Sablon, July 11, 1928, damp, mossy bank, about 100 feet elevation, east side of river.

Botrychium silaifolium Presl.

Natashquan, Aug. 5, 1927, and Aug. 18, 1928, sand dunes. Kegaska, Sept. 4, 1927, opening in sandy woods. Recorded by St. John as *B. ternatum* (Thunb.) Sw., var. *rutæfolium* (A. Br.) D. C. Eaton.

Botrychium virginianum (L.) Sw., var. *europæum* Ångström.

Betchewun, Aug. 25, 1928, and Sept. 3, 1929, grassy clearing. Determined by Dr. F. K. Butters. Recorded by St. John as *B. virginianum* (L.) Sw., var. . . .

EQUISETACEAE

Equisetum arvense L.

Betchewun, June 5, 1927, grassy area on limestone near shore. Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland.

**Equisetum arvense* L., f. *ramulosum* (Rupr.) Klinge.

Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland.

- Recorded from Sheldrake by Frère Marie-Victorin (1927).
- Equisetum arvense* L., f. *decumbens* (G.F.W. Meyer) Klinge.
Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland. Greenly Island, June 29, 1927, gravelly hillside on calcareous sandstone. Recorded by St. John as *E. arvense*, var. *decumbens* Meyer.
- **Equisetum arvense* L., var. *boreale* (Bongard) Rupr.
Natashquan, Aug. 7, 1927, border of fresh marsh by Little Natashquan River. Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland. Head of Bradore Bay, June 30, 1927, sandy river bank on granitic rock. Greenly Island, June 29, 1927, gravelly hillside. Recorded from a number of localities by Frère Marie-Victorin (1927).
- Equisetum sylvaticum* L., var. *pauciramosum* Milde.
Mistanoque Harbour, June 24, 1927, grassy bank on Shekatika Island. Rocky Bay, June 24, 1927. Blanc Sablon, June 28, 1927, turfey hillside on calcareous sandstone, west side of river.
- Equisetum sylvaticum* L., var. *pauciramosum* Milde, f. *multiramosum* Fernald.
Baie Johan Beetz, Aug. 22, 1928, wet black spruce swamp. Kegaska River, June 25, 1928, face of turfey, sandy bank facing the sea near mouth of river. Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland.
- **Equisetum palustre* L., var. *americanum* Vict., f. *luxurians* Vict.
Thunder River, Sept. 2, 1928, tidal mud bank (fresh) near mouth of river. Recorded from "Natashquan River" by Frère Marie-Victorin (1927).
- Equisetum limosum* L.
Natashquan, Aug. 7, 1927, fresh marsh by Little Natashquan River. Bradore Bay, June 30, 1927, bushy brookside on tundra at head of bay. Blanc Sablon, July 11, 1928, turfey, sandy bank, east side of river.
- **Equisetum limosum* L., f. *verticillatum* Döll.
Kegaska, Sept. 4, 1927, slow-flowing brook, 18 inches water.
- Equisetum scirpoides* Michx.
Betchewun, Aug. 25, 1928, mossy hillside.
- Lycopodium Selago* L., var. *patens* (Beauv.) Desv.
Betchewun, June 15, 1929, open border of clearing in mixed woods.
- **Lycopodium inundatum* L.
Mingan, Aug. 31, 1928, muddy, dried-up pond margin.
- Lycopodium annotinum* L.
Natashquan, Aug. 5, 1927, sandy woods. Wolf Bay, Aug. 13, 1927, wet, mossy woods. Bradore Bay, June 30, 1927, mossy woods at head of bay.
- Lycopodium annotinum* L., var. *pungens* (La Py-laie) Desv.
Bradore Bay, June 28, 1927, damp, boggy hilltop on calcareous sandstone. Blanc Sablon, Aug. 26, 1927, mossy hillside on calcareous sandstone.
- Lycopodium clavatum* L.
Coacocho, June 19, 1928, in sphagnum beside woodland path.
- Lycopodium clavatum* L., var. *megastachyon* Fernald and Bissell.
Magpie, Sept. 1, 1928, sandy roadside.
- **Lycopodium clavatum* L., var. *laurentianum* Vict.
Betchewun, Aug. 26, 1928, border of woods.
- Lycopodium obscurum* L.
Matamek River, Sept. 5, 1928, deep, shaded coniferous woods near mouth of river.
- Lycopodium obscurum* L., var. *dendroideum* (Michx.) D. C. Eaton.
Thunder River, Sept. 2, 1928, sandy ridge. Magpie, Sept. 1, 1928, hummock in swamp. Mascanin, Aug. 20, 1928, dry open hillside, in reindeer moss.
- Lycopodium sabinæfolium* Willd., var. *sitchense* (Rupr.) Fernald.
Seven Islands, Sept. 11, 1928, sandy hillside in jack-pine woods. Romaine, Aug. 10, 1928, dry, sandy raised beach. Blanc Sablon, Aug. 26, 1927, mossy hillside on gneiss in valley of Blanc Sablon River. Recorded by St. John as *L. sitchense* Rupr.
- Lycopodium complanatum* L.
Seven Islands, Sept. 11, 1928, sandy hillside in jack-pine woods.
- **Lycopodium complanatum* L., var. *canadense* Vict.
Seven Islands, Sept. 11, 1928, in sandy jack-pine woods. Mingan, Aug. 31, 1928, in coniferous woods. Natashquan, Aug. 5, 1927, among sand dunes. Recorded from various localities in this region by Marie-Victorin (1925).

LYCOPODIACEAE

- Lycopodium Selago* L., var. *appressum* Desv.
Wolf Bay, Aug. 13, 1927, bare, rocky summit. Mistanoque Harbour, June 24, 1927, on Shekatika Island.

ISOETACEAE

- Isoetes echinospora* Dur., var. *Braunii* (Dur.) Engelm.
Kegaska, Sept. 4, 1927, slow-flowing brook,

in 2 feet of water. Lake Island, July 18, 1927, gravel bottom of pond in 4 inches of water.

TAXACEAE

Taxus canadensis Marsh.

Quarry Island, June 2, 1928, shady coniferous woods. Recorded by St. John as *Taxus canadensis* Willd.

PINACEAE

Pinus Banksiana Lamb.

Matamek River, Sept. 5, 1928, high sandy plain near mouth of river. This collection was made, and the tree was found to be common, about three miles east of the nearest part of the Moisie River.

Larix laricina (Du Roi) Koch.

Salmon Bay, July 1, 1927, sphagnum bog behind beach. Bradore Bay, June 28, 1927, turfy hillside.

Picea canadensis (Mill.) B.S.P.

Natashquan, Aug. 18, 1928, sandy woods near shore. Especially common on the sand accumulated near river mouths.

**Picea canadensis* (Mill.) B.S.P., f. *parva* Vict.

Bradore Bay, June 29, 1927, damp brookside on calcareous sandstone. Recorded and described by Marie-Victorin (1927a).

Picea mariana (Mill.) B.S.P.

Baie Johan Beetz, Aug. 22, 1928, in sphagnum bog. The most abundant tree of the region.

**Picea mariana* (Mill.) B.S.P., f. *semiprostrata* (Peck) Blake.

Bradore Bay, June 29, 1927, damp brookside on calcareous sandstone.

Abies balsamea (L.) Mill.

Lake Island, July 29, 1927, sheltered area at foot of bank. Often prostrate in exposed situations.

Juniperus communis L., var. *montana* Ait.

La Tabatière, July 7, 1927, gravelly hillside. Common throughout.

Juniperus horizontalis Moench.

Betchewun, June 5, 1927, shallow soil on limestone near shore, and June 6, 1927, top of limestone shingle beach of Wood Island. Watshishu, Aug. 21, 1928, on an outer island. St. John speaks of it as "common as far east as Mingan islands, local from there to the strait of Belle Isle", but it is common on the numerous small granitic islands at and near Watshishu telegraph office, 20 miles east of the Mingan Islands. Observed shedding pollen at Watshishu, May 26, 1928.

**Juniperus horizontalis* Moench, f. *alpina* (Loud.) Rehder.

St. Genevieve Island, Aug. 23, 1928, top of

limestone boulder just above beach. Recorded from "Ile Herbée, archipel du Vieux-Fort (Saguenay County)" by Marie-Victorin (1927a), on the basis of a collection by St. John.

SPARGANIACEAE

**Sparganium chlorocarpum* Rydb., var. *acaule* (Beeby) Fernald and Eames.

Natashquan, Aug. 18, 1928, erect in wet marsh beside Little Natashquan River, in 3 inches of water.

Sparganium angustifolium Michx.

Kegaska, Aug. 14, 1928, small pond on Green Island, in 18 inches water. The Bluff Harbour, Aug. 1, 1927, small, fresh pond on a large island, in 2 feet of water. Pointe au Maurier, July 13, 1927, small, shallow pond in tundra, in about 6 inches water. Blanc Sablon, Aug. 26, 1927 in a deep brook, an affluent of the Blanc Sablon River from the west.

**Sparganium glomeratum* Laestad.

Natashquan, Aug. 5, 1927, shallow pond, in 6 inches of water, and Aug. 13, 1929, and July 31, 1930, shallow pond border. Determined by Prof. M. L. Fernald, who informs me that these are the first collections of this species in North America.

**Sparganium minimum* Fries.

Natashquan, Aug. 7, 1927, shallow pool in fresh marsh by Little Natashquan River, in 6 inches water.

Sparganium hyperboreum Laestad.

Natashquan, Aug. 5, 1927, drying, muddy pond margin. Natashquan, Aug. 7, 1927, pond in fresh-water marsh beside Little Natashquan River, in 6 inches of water. Blanc Sablon, Aug. 26, 1927, in a deep brook, an affluent of the Blanc Sablon River from the west.

POTAMOGETONACEAE

Potamogeton natans L.

Havre St. Pierre, Aug. 28, 1928, small pond in bog, in 1 foot of water.

Potamogeton epihydrus Raf.

Bradore Bay, Aug. 27, 1927, slow-flowing brook, in 1 foot of water, on calcareous sandstone.

Potamogeton microstachys Wolfg.

Natashquan, Sept. 8, 1927, small pond in village, in 1 foot of water. Kegaska, Sept. 4, 1927, in 1 foot of water in slow-flowing brook, and Aug. 14, 1928, in 18 inches of water in small pond on Green Island. Bradore Bay, Aug. 27, 1927, in 1 foot of water in slow-flowing brook, on calcareous sandstone. Recorded by St. John as *P. alpinus* Balbis.

Potamogeton gramineus L.

Natashquan, Aug. 5, 1927, in 6 inches of water in shallow pond, and Aug. 18, 1928, dried-up pond bed. Recorded by St. John as *P. heterophyllus* Schreb.¹

**Potamogeton gramineus* L., f. *terrestris* Schlecht.

Natashquan, Aug. 18, 1928, dried-up pond bed.

Potamogeton perfoliatus L., var. *gracilis* Fries.

Blanc Sablon, Aug. 26, 1927, Blanc Sablon River.

Potamogeton filiformis Pers., var. *borealis* (Raf.) St. John

Ste. Genevieve Island, Aug. 23, 1928, shallow pool with marl bottom, in 2 inches of water.

**Potamogeton filiformis* Pers., var. *Macounii* Morong.

Fog Island, Aug. 9, 1928, in 6 inches of water in shallow pond. Lake Island, July 18, 1927, shallow pond near shore.

Potamogeton vaginatus Turcz.

Blanc Sablon, Aug. 26, 1927, Blanc Sablon River. Recorded by St. John as *P. moniliformis* St. John.

Zannichellia palustris L.

Natashquan, Aug. 7, 1927, pool in brackish marsh near mouth of Little Natashquan River.

Ruppia maritima L., var. *rostrata* Agardh.

Mascanin, Aug. 20, 1928, shallow pool in salt marsh, in 4 inches of water.

**Ruppia maritima* L., var. *exigua* Fernald and Wiegand.

Wolf Bay, Aug. 13, 1927, saline shore at head of bay, between tide marks.

Zostera marina L.

Harrington Harbour, Sept. 1, 1927, shallow cove.

Zostera marina L., var. *angustifolia* Hornem.

St. Charles Island, Aug. 27, 1928, sheltered cove.

JUNCAGINACEAE

Triglochin palustre L.

Matamek River, Sept. 5, 1928, in 2 inches of water in shallow pool on rock near shore near mouth of river.

Triglochin maritimum L.

Natashquan, Aug. 7, 1927, edge of brackish marsh near mouth of Little Natashquan River. Whale Head, July 10, 1927, turfy saline border of cove head at Jas. Mauger's harbour.

Scheuchzeria palustris L., var. *americana* Fernald.

Natashquan, Aug. 17, 1928, wet sphagnum bog. Observed also at Thunder River. Recorded by St. John as *Scheuchzeria palustris* L.

ALISMACEAE

**Sagittaria cuneata* Sheld.

Mingan, Aug. 30, 1928, mud-hole beside Little Manitou River. Kegaska, Sept. 4, 1927, slow-flowing brook, in 2 feet of water.

(To be continued)

NOTES AND OBSERVATIONS

MUSKRAT VS. WEASEL.—Chief John James Sinclair of the Lake St. Martin (Saulteux) Indian Band, has told me that about thirty years ago, Edwin Sanderson, who now lives at Fairford, once came across a trail as he was coming along Basket Creek from Basket Lake on his way to Davis Point, Lake Manitoba. This trail was in the snow and showed signs of a struggle between two small animals. He followed it for about two hundred yards, and it became more blood-marked all the time. At last the trails parted and he noticed that one was the trail of a muskrat. This he followed for about one hundred and fifty yards and he came across a dead muskrat. He went back and followed the other trail, which was of an ermine, and he found the ermine dead in its tracks about one hundred yards along the trail. The fight had taken place that morning.—SAM WALLER.

three young under conditions which to my mind indicated that they had been born only recently. The snow around them was bloodstained. The young were frozen when discovered.

Later the same day, and in the same vicinity, I shot a female hare which, from the appearance of her reproductive organs, I judged to have been the mother of the three young.

During the following winter (December, 1929, and January and February, 1930) I examined several female European hares and three of them contained young, two each in the case of two of them, and one in the case of the third. From the condition of the reproductive organs of a fourth it was evident that she had recently given birth to young. It would be interesting to know whether this is the usual habit of these hares and, if so, whether it will persist here. These observations were made in the neighbourhood of Warkenton, Ontario.—H. L. YACK.

YOUNG OF EUROPEAN HARE BORN IN WINTER.—During the first week of January, 1929, while following the track of a European hare, I found

BLACK-CAPPED CHICKADEE.—On July 13, 1930, at 11 a.m., a bright sunny day, I watched a

Black-capped Chickadee feeding on tent-caterpillars. The bird was in a cascara tree, on the north side of a cabin at Pitt Meadows, B.C. I observed it from a window of the cabin, the window being open, and at a distance of about 12 feet, on a level with my eyes, the light being diffused, and using 6-power glasses. The tree was heavily infested with tent-caterpillars. The bird was seen to grasp a caterpillar at one end with its beak, and apparently sucked out the contents, much as a school boy sucks an egg. The empty tube was then dropped. The operation was repeated 12 times while I was watching. Later on searching below the tree, I found the remains of many caterpillars. I have since heard Mr. S. F. Rathbun, of Seattle, Wash., say that he has observed this, but I do not know that it has been previously reported.—C. H. BASTIEN.

GLAUCOUS-WINGED GULLS.—On August 5, 1930, just after sundown, my attention was attracted by a flock of 50 or 60 Glaucous-winged Gulls, flying in short circles at a height of about 20 feet above the roadway. This was in the western part of Vancouver, in a district that is largely occupied by small houses. I stopped my car and got out to see better what was occurring. A large hatch of the moths of the tent-caterpillar was emerging from a vacant lot, overgrown with brush. As the moths flew upward the gulls were busily catching them on the wing. Some of the gulls could be seen to be visibly distended. I watched

this for 15 or 20 minutes when, as no more moths were rising, the gulls slowly flew towards the seashore.—C. H. BASTIEN.

MOURNING DOVE IN KENORA DISTRICT, ONTARIO.—The Royal Ontario Museum of Zoology is in possession of a bird of this species (*Zenaidura macroura carolinensis*) which was found dead (frozen to death) on October 15, 1930, at North-pines (near Sioux Lookout), Kenora district, by Mr. Bert Gotham.

The bird was forwarded in the flesh, for identification, to the Department of Game and Fisheries at Toronto, where it remained in cold storage until it was turned over to the Museum on November 14. The specimen is in immature plumage and, so far as the writer is aware, is the first specimen to be taken in the north-western part of Ontario.—JAS. L. BAILLIE, JR.

HUNGARIAN PARTRIDGES LIBERATED IN PRINCE EDWARD ISLAND.—On April 17th, 1930, twelve pairs of Hungarian partridges were liberated in Prince Edward Island. These were secured by Mr. J. D. Jenkins and others of Charlottetown from Colonel R. B. Willis of Halifax and from the information at hand, ten pairs were liberated on the Mount Stewart Road near Charlottetown and the other two pairs in the vicinity of Tyron. It appears that there was a considerable increase during the spring and summer of 1930 and from all reports the introduction to date has been a success.—R. W. TUFTS.

A NEW CHECK LIST OF BIRDS OF THE WORLD

The Museum of Comparative Zoology announces that the first volume of a Check List of the Birds of the World by James Lee Peters is now in press and will be issued shortly.

The classification followed for the higher groups is that proposed by Dr. Wetmore, with the sequence of genera and species according to the author's own ideas where no authoritative treatment has been published. The first volume will contain about three hundred genera and one thousand seven hundred species and subspecies covering the following orders:

Struthioniformes
Rheiformes
Casuariiformes
Apterygiformes
Tinamiformes
Spenisciformes
Gaviiformes
Colymbiformes
Procellariiformes

Pelecaniformes
Ciconiiformes
Anseriformes
Falconiformes

The only recent attempt to list most of the species in these groups was that made in the first volume of Sharpe's Hand-list published in 1899 and consequently now thirty-two years old and out of date.

It is expected that at least ten volumes will be required to complete the work. The second volume is in active preparation and preliminary work on others is under way.

The new Check List is *not* a Museum publication and will not be distributed to the Museum's exchange list, but will be sold by the Harvard University Press, who are the publishers.

Subscriptions are now invited and may be addressed to the Harvard University Press, Randall Hall, Divinity Avenue, Cambridge, Massachusetts. Price will be five dollars per volume.

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CONTENTS

	PAGE
Notes and Observations on Some Manitoban Birds. By Bertram W. Cartwright.....	181
Notes on the Brachyuran Crabs of Northern British Columbia. By Donald C. G. MacKay..	187
Insect Parasites of Vertebrates and Host Phylogeny. By A. W. Baker.....	189
Some Notes on the European Hare. By Stuart L. Thompson.....	192
Some Notes on Mammals, Birds and Ferns of Kazubazua District, Quebec. By Eli Davis..	193
Contributions to the Knowledge of Extreme North-eastern Labrador. By Bernhard Hantzsch	194
An Annotated List of Vascular Plants Collected on the North Shore of the Gulf of St. Lawrence, 1927-1930. By Harrison F. Lewis.....	199
Notes and Observations:—	
Chimney Swifts. By Susan K. Squires.....	204
The Mockingbird in Ontario. By J. Murray Speirs.....	205
Carolina Wren Breeding at Toronto. By Robert V. Lindsay.....	205
Little Blue Heron in Ontario in March. By Jas. L. Baillie, Jr.....	206
A Gray Red Squirrel. By Jas. L. Baillie, Jr.....	207
Book Reviews:—	
Report on a Game Survey of the North Central States. By H.F.L.....	207

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NOTES AND OBSERVATIONS ON SOME MANITOBAN BIRDS

By BERTRAM W. CARTWRIGHT



THE FOLLOWING notes and observations cover the most outstanding records from my note books of the past three years. In presenting them, I take pleasure in acknowledging assistance in the field from two brilliant young bird students: Terence M. Shortt (now on the staff of the Royal Ontario Museum of Zoology) and Robert Harris of Deer Lodge, Winnipeg. My thanks are due also to A. G. Lawrence of Winnipeg for many courtesies and to the Dominion Ornithologist, Mr. P. A. Taverner, whose encouragement and advice is always available.

Phalacrocorax auritus. DOUBLE-CRESTED CORMORANT.—With Ferris Neave, Roger Neave and Michael A. Timonin, I visited a breeding colony of this species on a little rocky island 5 miles north-east of Grindstone Point in Lake Winnipeg on June 23, 1928. This colony of 164 nests is recorded by Dr. Harrison F. Lewis (1929)¹. Alexander Bajkov, in charge of the Fresh-water Biological Station under the Biological Board of Canada, at Gimli, Manitoba, now reports an extensive colony on the reefs between George and Little George Islands in Lake Winnipeg. Discovered and photographed early in August, 1930, Bajkov describes the colony as very large—several thousand birds.

Chen caerulescens. BLUE GOOSE.—Hundreds of thousands of Blue Geese concentrate over thousands of acres of low lying ground in the spring in Manitoba. The territory lies twenty-five miles west by north of Winnipeg with the village of Meadows the centre of abundance. C. L. Broley, A. G. Lawrence and the writer have ranged the territory at every opportunity during the past three spring seasons and the number of geese seems to grow with each season. It was not until 1927 that local naturalists woke up to the fact that a unique and magnificent spectacle was presented for their study at their very doors and that in spite of the fact that Dr. Fred Cadham reported 10,000 Blue Geese in 1922. Following Dr. Cadham's report, Dr. A. M. Davidson, A. G. Lawrence and the writer motored out but were stalled on the mud roads and although 4,000

geese were counted in two hours, flying north in flocks of seven to four hundred, their identity was not definitely established owing to distance at which they were observed. It is really only during the past three years that roads in the goose territory have been improved sufficiently to make access possible at the season immediately following the melting of the snow. On April 21, 1929, the great migration came in from due south. On this day, A. G. Lawrence, L. T. S. Norris-Elye and the writer were about four miles due south of their feeding grounds and witnessed the arrival of thousands of geese. They were passing overhead all day, mixed flocks of Lesser Snow and Blues, with the proportion of Blues to Snows of about 10 to 1. Many flocks, which varied in numbers from four or five to several hundreds would be composed entirely of Blue Geese, others would have a sprinkling of Snows but in no case did we see a flock with Snow Geese in the majority. On their feeding grounds, the geese congregate in huge flocks scattered over miles of territory and their numbers are completely bewildering. C. L. Broley, who ranged their territory diligently, estimated their numbers at half a million with the two species in about equal numbers. Lawrence and the writer agree with the estimate but personally I consider the proportion of Blues to Snows is easily 75 to 25. The white geese are very conspicuous amongst the dark-bodied Blues and in consequence intrude themselves upon the notice somewhat out of proportion to their actual numbers. The first arrivals in 1929 were on April 19 and they departed in the night of May 9 and on May 10 we were able to find only about 500 geese in the territory and these mostly Lesser Snows. In April, 1930, the vanguard appeared on April 13 when Lawrence and I saw about 700 come in from the south in a series of flocks. The blues were about 10 to every one Lesser Snow. On April 18 Terence Shortt, R. Harris and I went to Meadows and saw the geese in hundreds of thousands. They appeared to be in greater numbers than ever before and the proportion of 10 to one Blues to Lesser Snows held good. On April 29 the first of the migrants passed over my house which is 25 miles due east of the Meadows district and on May 1st they

¹ 1929. "The Natural History of the Double-crested Cormorant", Ottawa, Canada. Dec. 9, 1929, pp. 1-94, pl. 6.

were reported flying high above the Red River early in the morning. On the same date they were reported from Selkirk, near the mouth of the Red River, at dawn, passing north low down in "millions". From that point, they go northeast to Hudson Bay. They are not reported in any numbers from any point on Lake Winnipeg.

Enquiry amongst residents of the territory they haunt in spring elicits the information that up until about 1925 the Lesser Snow Geese were in the majority but from that year on, the Blue Geese have increased in numbers each season until they now completely dwarf the Lesser-Snows. Victor Hagborg, a resident of the district for 30 years, told me that in his experience, the geese never appeared in greater numbers than they do now.

When C. G. Harrold recorded his "Notes on the Lesser Snow and Blue Geese at Whitewater Lake, Manitoba" (1928)², he was of the opinion that the main flight of Blue Geese was through Ontario. J. Dewey Soper in his recent publication "The Blue Goose" (1930)³ speaks of the mystery of where the Blue Geese spend the time intervening between their departure in mid-March from Louisiana and their arrival on their breeding grounds in Baffin Island on June 5th to 15th. These notes will dispel some of the mystery but if the birds leave Louisiana in mid-March and do not reach Manitoba until April 13th to 21st, then there must be some other stop-over place not yet recorded.

Anser albifrons. WHITE-FRONTED GOOSE.—On May 10, 1929, C. L. Broley, J. B. Wallis and the writer escorted Harold H. Bailey and his son Merritt of Miami, Florida, to the Blue Goose territory but unfortunately the geese had migrated during the night and only a few stragglers remained. Amongst these, Broley and Bailey noted three White-fronted Geese and shortly afterwards, the same three birds flew past J. B. Wallis and me and were independently identified by us. Wallis and I were about one mile north of the rest of the party at the time. The species is rare in this locality but more common in western Manitoba.

Aix sponsa. WOOD DUCK.—Always regarded as rare in Manitoba, there has been a notable increase in records over the past three years. Eight specimens came to light in hunters' game bags during 1928 and five were added during the 1929 season. All were males and it is noteworthy that all came from the Scantbury district, southeast of Lake Winnipeg. The first recorded female

specimen was taken by Erling P. Gibson and his son on September 15, 1930, 5 miles north of Libau, Manitoba. This also is close to Scantbury but on September 19, 1930, J. J. Douglas shot a male at Dead Lake, 8 miles north of Plumas, Manitoba, which is about 20 miles west of the south end of Lake Manitoba.

Falco rusticolus gyrfalco. GYRFALCON.—A wounded falcon found by Miss S. Aaron on September 28, 1929, near Stony Mountain, Manitoba, is *F. r. gyrfalco*. The mounted specimen is now in the Faraday School collection. The following data were taken shortly after the bird was chloroformed, by myself:—Length, 23.1; folded wing, 15.9. Feet, bill and cere—blue grey. Iris—dark brown. Shot damage prevented sex being determined.

Another specimen of this sub-species was received by Prof. V. W. Jackson from Edwin Donald of Birtle, Manitoba, where it was shot on October 14, 1929. It is now in the Agricultural College Museum. Both birds are immatures and represent the only records of any form of Gyrfalcon taken in southern Manitoba in the last ten years.

Anas platyrhynchos × *Anas rubripes*. HYBRID MALLARD × BLACK DUCK.—This interesting specimen was shot at Netley Cut in the delta of the Red River by J. J. Close on October 21, 1930, and presented by him to the Manitoba Provincial Museum. The bird looks more like the Black Duck than Mallard but this is due to the head being almost typically Black Duck. The neck and breast are dark but with the rich chestnut colour of the male Mallard quite conspicuous. The rest of the underparts are similar to the Black Duck but the markings are much finer and lighter. The back is dark like that of the Black Duck but the upper tail coverts have the green sheen of the Mallard. The tail itself is like that of the Black Duck. The white edging of the secondaries and greater coverts of the Mallard is reproduced in the hybrid but not so completely.

Falco mexicanus. PRAIRIE FALCON.—An immature female of this species collected at Deer Lodge, Winnipeg, Manitoba, on September 6, 1929, by T. M. Shortt is the first recorded specimen for the province. The following day, a second specimen secured in the same locality by the same keen young ornithologist, was also an immature female. Three more were observed, sometimes hunting together during the weeks following, and were all eventually shot by a chicken rancher at Sturgeon Creek, about three miles west of where first observed. On September 29, 1929, I was called by R. Fryer to identify a hawk shot by this rancher and wounded. I

² 1928. Notes on the Lesser Snow and Blue Geese observed at Whitewater Lake, Manitoba. *The Auk*, 45: 290, July, 1928.

³ 1930. The Blue Goose, J. Dewey Soper. Dept. of the Int., Ottawa, Canada. 1930.

found it was another Prairie Falcon. The bird was chloroformed and is now in my collection. It was another immature female. The other two carcasses were located by R. Fryer and O. Gibson but were too far gone to save. The specific status was determined beyond question.

A falcon seen on August 22 and 25, 1915, and sketched by A. G. Lawrence, shows the characteristic underwing pattern of *F. mexicanus* and is undoubtedly a valid sight record.

Norman Criddle saw two falcons at Aweme, Manitoba, in the fall of 1929 which he suspected were of this species and J. B. Wallis saw a "very pale Duck Hawk" at Rosebank, Manitoba, on September 8, 1929.

A single specimen was noted at Brooklands, about two miles from where the first specimen was taken, by H. and T. M. Shortt on September 28, 1930.

Grus americana. WHOOPING CRANE.—One noted at Manhattan Beach, Pelican Lake, Manitoba, by D. P. Duncan, on August 16, 1929. Probably the same bird was observed again by Mr. Duncan at the same place in August, 1930. I am indebted for both reports to J. B. Wallis, who tells me that Mr. Duncan is well acquainted with both species of cranes.

Rallus virginianus. VIRGINIA RAIL.—Rare in Manitoba. An adult was picked up dead by C. L. Broley at Portage la Prairie, Manitoba, on September 1, 1929. Now in the collection of T. M. Shortt.

Gallinula chloropus cachinnans (Bangs). FLORIDA GALLINULE.—This unexpected addition to the provincial check list was made on July 12, 1931, at Sandy Bay Indian Reserve, Twp. 18, Range 9, W. 1 Mer., by O. Chagnon, O.M.I. The specimen, which I examined in the flesh at the taxidermist's, was taken in a steel trap in the marsh. The Rev. Father Chagnon, in communicating the above data, states that he does not think the species is of regular occurrence and has no reason to believe that there were any others in the locality. He states that old Indians in the reserve had never seen a Florida Gallinule before. The specimen has been added to the Sandy Bay Residential School collection.

Tryngites subruficollis. BUFF-BREADED SANDPIPER.—On August 3, 1930, at the West Kildonan brick ponds, in a pasture within a hundred yards of the nearest water, T. M. Shortt and I observed a flock of 21 Buff-breasted Sandpipers. The following morning three specimens were collected at one shot and the flock returned after flying off in close formation and alighted about the fallen birds. Rowan (1927)⁴ remarks on this habit of returning again and again to dead or wounded

birds. I know, had we been so minded, a large part of the flock could have been destroyed. A habit like this makes one pessimistic of the future of the species, aggravated as it is by their habit of keeping very close together. When feeding, they walk leisurely about snapping up insects which they disturb in the grass. A noticeable feature, which quickly identified them, is their pigeon-like bobbing of the head when they walk and when they run, which they do very rapidly the head bobs back and forth so quickly as to give a flickering effect. Rowan (*loc. cit.*) says they crane their necks when they run. We did not observe this. When alarmed, they "freeze" in whatever posture they happen to be in and will remain so for an astonishing time. The spell is broken by one bird moving its head to preen or pick something up and the whole flock then relaxes and resumes feeding. On the short green grass where we observed them, they were not inconspicuous, even when immobile. All 3 specimens collected were females and very fat.

Recurvirostra americana. AMERICAN AVOCET.—An adult taken in the fall of 1924 by a hunter at Scanterbury, Manitoba, was seen by me at a local taxidermist's. The species is rare in southwestern Manitoba and this record extends its occurrence eastwards by some 200 miles.

Stercorarius parasiticus. PARASITIC JAEGER.—A typical phase adult specimen was shot at Scanterbury, Manitoba, on September 25, 1929, by Cuthbert Raven and is now in the Agricultural College Museum. Apparently the first record for southern Manitoba.

Strix varia. BARRED OWL.—Quite rare in Manitoba. Only recent records are October 17, 1926, North Kildonan, Winnipeg, Manitoba, specimen taken on banks of the Red River by J. R. Morton is now in A. G. Lawrence's collection.

On October 13, 1929, Donald Smith picked up a dead owl of this species, two miles north of Lockport, Manitoba, also on the Red River and not more than 10 miles from where the 1926 specimen was taken. Smith's record is an immature female and is now in the Kelvin Technical School collection.

Otus asio subsp. ? SCREECH OWL.—This interesting little owl, not recorded by Seton (1909) in Manitoba⁵, is now quite common in the timber along the Red and Assiniboine Rivers. Authorities differ as to which race our bird should be referred to and Mr. P. A. Taverner tells me that

⁴ 1927. Notes on Alberta Waders Included in the British List, William Rowan, M.Sc., F.Z.S., M.B.O.U. *British Birds*, 20: 186, January 1, 1927.

⁵ British Association Handbook, Winnipeg, 1909. "Fauna of Manitoba" (Birds and Mammals). Ernest Thompson Seton.

Manitoba specimens are consistently paler than the eastern bird.

Speotyto cunicularia hypugæa. BURROWING OWL.—Seton (*loc. cit.*) says this species was quite unknown in Manitoba in the early '80's but it is now not uncommon in some parts of the province. On April 23, 1927, I found a pair near Murray Park, Manitoba, about 7 miles north-west of Winnipeg. On May 14, 1927, I found another pair in the same locality and collected a set of six eggs from about 5 feet in along a ground squirrel's burrow. The runway of the unoccupied burrow was "paved" with shredded horse dung and I noticed when digging, that beneath this, the ground was still frozen. The vertical depth was about two feet. As horse men frequented this field, I carefully filled in the excavation and stamped it down, tough sods and heavy clay together. Upon leaving, I noticed only one owl returned to the mound and for the first time, the disturbing thought came that I had buried the female alive. I decided however that she would have another way out as there were several other burrows immediately around. I visited the place again on May 20 and found that a new burrow had been made through the packed mass I had put back. As there was no mound at the surface I was forced to conclude that I had indeed imprisoned the female and that she had burrowed her way out. Some writers have doubted whether the species ever constructs its own burrows but this experience indicates that they certainly are capable of doing so.

In my collection is a set of 10 eggs of the Burrowing Owl collected at Whitewater Lake, Manitoba, by the late C. G. Harrold in May, 1926. They came into my possession in 1929 from H. Hatton. No other data are available.

Surnia ulula caparoch. AMERICAN HAWK OWL.—On June 23, 1929, A. G. Lawrence and I collected a family of five in juvenal plumage, three females, two males, at Riverton, Manitoba. A farmer informed me they had been raised in a nest about 20 feet up in a dead spruce nearby. At Kalevala, Manitoba, in the same latitude as Riverton, E. S. Norman reports the species as present in the breeding season in 1915⁶. As far as I know, this is the southern limit for breeding birds in Manitoba. Norman has since found nests and eggs at Kalevala.

Asyndesmus lewisi. LEWIS' WOODPECKER.—The first record for this species in Manitoba was reported by R. M. Blakely⁷ (1930). On November 24, 1929, T. M. Shortt and I went out to see it at

the Agricultural College where it had taken up quarters in a telephone pole near the Dominion Rust Research Laboratory. Mr. Blakely informs me that it had been feeding on the frozen fruits in the nearby college orchard. We had been watching the woodpecker for some time as it journeyed from one pole to another—much impressed by its curious crow-like flight and peculiar outline which suggested to my mind a miniature seal with wings,—when it broke into an excited chattering, high-pitched and rapid and we saw a Northern Shrike swoop down to attack. The woodpecker, lodged safely on top of a pole chattered furiously in tones more of defiance than fear but watching every move of the shrike, which perched on the tip of a tree a few yards away. In a few minutes the Woodpecker flew to another pole with the shrike immediately in pursuit. This time, the shrike alighted on the wire about six feet from the woodpecker and then flew up and hovered directly above it some twelve feet and then stooped like lightning, zooming up from a foot above the woodpecker's head to repeat several times. At each stoop, the shrike snapped its mandibles so viciously that we all heard the sound very distinctly at about fifty yards distance. The woodpecker again flew to another pole and after another vain chase, the shrike gave up the attack and disappeared over one of the college buildings. I have read somewhere that this species does not store acorns like the White-headed Woodpecker does so it is interesting to record that this individual certainly did so according to R. M. Blakely who informed me that it rounded off the sharp edges of a wide weather-crack in one of the poles into which it stored many acorns one on top of the other. Blakely photographed this cache.

Corvus corax principalis. NORTHERN RAVEN.—This species is very rare in the settled part of the province and is but rarely recorded even from the less settled regions. A specimen taken by Wm. Gladu in the marshes north of Selkirk, Manitoba, on October 3, 1930, is now in the Faraday School collection.

Between December 1st and 8th, one Raven was noted by H. D. Whellams, Jr., at War Eagle Lake, 6 miles west of Rennie, Manitoba.

F. M. Burbridge reported seeing a pair of Ravens on July 7, 1930, at Minaki, Ontario, Lake of the Woods. This date suggests a nesting pair.

Sialia currucoides. MOUNTAIN BLUEBIRD.—A. Burton Gresham's record on May 5, 1928, of one at Richer, Manitoba, south-east of Winnipeg, marks a further considerable extension eastwards in the range of this western species. The bird was under observation for some time.

⁶ Additions to the Birds of Shoal Lake, Manitoba. E. S. Norman, *The Can. Field-Nat.*, 34: 154, Nov., 1920 (issued March 11th, 1921).

⁷ "Lewis' Woodpecker in Winnipeg, Man." R. M. Blakely. *The Can. Field-Naturalist*, 46: 96, April, 1930.

Lanius ludovicianus migrans. MIGRANT SHRIKE.

—On May 29, 1930, Robert Harris discovered the nest of a pair of shrikes in a thorn bush. The nest was about 4 feet up and just completed. The first egg was laid on May 31 and one each day following until June 5 when the clutch of six was complete. As the shrikes were interfering with our studies of the nesting habits of Traill's Flycatcher in a small poplar bluff close by, I collected both parents and the nest and eggs. On one of our daily visits to the nest, we surprised the male feeding in a poplar. He dropped the remains of his victim which he had completely devoured except for the wings, which were those of Traill's Flycatcher. The specimens were collected on the evening of June 6, 1930, and I was surprised to see they were *L. l. migrans*. They constitute the first records for the race in Manitoba. Dr. Alden H. Miller kindly confirmed the identification of these specimens and three others which I sent to him at the same time were confirmed as *L. l. excubitorides* although Dr. Miller pointed out that they were not typical of this race as found in Saskatchewan. One of the White-rumped Shrikes referred to above was taken by T. M. Shortt at Dugald, Manitoba, about 15 miles east of where the Migrant Shrikes were taken. It is interesting to note that both the male and female taken at the nest were typical *L. l. migrans*. We have been much puzzled in the past in field identifications of our shrikes to note the great variety of shades in the rump colour but all the specimens I had seen prior to June 5 were undoubtedly correctly referred to *excubitorides*.

It will be clear from the above that the ranges of both races overlap in eastern Manitoba but it is not clear that they interbreed.

When I sexed the female Migrant Shrike the eggs in the ovaries were so small that if I had not known that she had just completed laying a clutch of six eggs, I would have taken her for a non-breeding bird.

Lanivireo flavifrons. YELLOW-THROATED VIREO.

—This species, hypothetical in Seton's list of 1909 (*loc. cit.*) is now well established at Deer Lodge, Winnipeg, and is extending its territory yearly. In 1927 I found the second nest to be known in the district, through the male singing from it while carrying on incubation duties. In 1928 six breeding pairs were noted, while in 1929, with the assistance of T. M. and A. Shortt, 12 nesting pairs and five nests were located. all in the same district. On May 24, 1929, R. M. Thomas noted the species at St. Charles, Manitoba, 4 miles west of Deer Lodge and on July 14, 1929, R. Harris observed it at Emerson, Manitoba on the U.S. border.

Vermivora ruficapilla. NASHVILLE WARBLER.—

On May 14, 1930, a heavy migration of this species was noted by T. M. Shortt and myself at Deer Lodge, Winnipeg. In twelve years' records made in this locality, this is the first time I have observed them. One pair lingered after the migration had passed and on June 17, T. M. Shortt and I found the nest after many hours' searching on several days. The nest was located at the base of a rotted oak stump in second growth poplar scrub, skillfully concealed and sunk amongst, and overhung by, grass. It contained two eggs plus three Cowbird's eggs. One of the Nashville's eggs was so thin-shelled that it was transparent and collapsed when I attempted to pick it up. It was unfertile. The other was on the point of hatching. The three Cowbird's eggs were interesting in that one contained a fully-formed embryo, one was about half incubated and the third was fresh. On May 24 and 25, 1930, I was at West Hawk Lake, Manitoba, near the Ontario boundary where I noted the species in large numbers, one of the commonest warblers. A male was collected on May 24, on a little island in West Hawk Lake. Winnipeg is in the Transition life zone and West Hawk Lake is in the Canadian life zone.

Comsothlypis americana pusilla. NORTHERN PARULA WARBLER.—On May 25, 1929, at the Caddy Lake (known locally as Cross Lake) end of the West Hawk-Caddy Lake portage, 15 miles north of Waugh, Manitoba, and very close to the Manitoba-Ontario boundary, I found a small colony of this sub-species. On July 2, 1923, the late C. G. Harrold collected a specimen at Waugh, Manitoba.

Oporornis agilis. CONNECTICUT WARBLER.—On July 11, 1928, Norman Criddle and J. B. Wallis reported this species near Sandlilands, Manitoba, with young in the vicinity. L. T. S. Norris-Elye and C. L. Broley noted several in the same locality on June 30, 1929. An adult male collected at this time is now in Norris-Elye's collection. The territory is similar to that described by Huff (1929)⁸ as the habitat of this species in Minnesota. As Broley and Norris-Elye saw some of the birds carrying food, no doubt a breeding colony is located here.

Icterus spurius. ORCHARD ORIOLE.—On May 31, 1929, the first recorded specimen for the province was picked up dead by A. Mount in the North Kildonan bird sanctuary, Winnipeg. The specimen is now in A. Burton Gresham's collection. On June 4, 1929, F. Rogers saw one in south Winnipeg and on June 13, E. Keighley noted one in west Winnipeg. Mrs. E. J. McMillan reports that on

⁸ 1929. The Nest and Habits of the Connecticut Warbler in Minnesota. N. L. Huff. *The Auk*, 46: 455, Oct., 1929.

July 1, 1929, she found about five nesting pairs at Cypress River, Manitoba, and remarks that no difficulty should be experienced in separating the species from the more familiar Baltimore Orioles as the song, behaviour and appearance are all very different. She first encountered the species about three years ago in the Edwin district, south of Portage la Prairie, Manitoba.

Ammodramus savannarum bimaculatus. WESTERN GRASSHOPPER SPARROW.—The discovery of this species in Manitoba is recorded by Taverner (1927)⁹. He and Hoyes Lloyd found them in the south-western corner of the province in June, 1921, and the late C. G. Harrold collected specimens in the same locality—Whitewater Lake—in 1924 and 1925.

On June 13, 1930, T. M. Shortt detected a stranger on the pasture land of the Silver Heights Farm at Deer Lodge, Winnipeg, and took me at once to hear it. The song was new to me also and the birds were so wary they would not allow a closer approach than 50 yards. The following day I collected a male and the stranger resolved itself into the Grasshopper Sparrow. There were three singing males and after lingering in the locality for 4 days, during which time R. Harris, T. Shortt and I gave them a lot of attention, they moved north about a mile. We had decided that they had failed to attract any mates but when we rediscovered them in their new location it was evident they were breeding. On July 12 this was confirmed when A. G. Lawrence came out with T. Shortt and me to make their acquaintance. A female flushed between Lawrence's feet and disclosed the nest with 4 eggs and two newly-hatched Cowbirds, the first breeding record for the province.

On July 1, 1930, T. M. Shortt found another small colony near Rosser, Manitoba. Five singing males were noted.

The male collected by me on June 14, 1930, is referred to this sub-species following Taverner's precedent (*loc. cit.*).

Passerherbulus lecontei. LECONTE'S SPARROW.—This elusive little grass sparrow is common in suitable locations. It has been noted in numbers at Riverton, Gimli and near Winnipeg. R. Harris, T. M. Shortt and the writer after a determined search, over a tufty grass patch barely an acre in extent at Deer Lodge, Winnipeg, found a nest with 5 fresh eggs on July 8, 1929. This was evidently a second laying as this patch was haunted by only one pair and during the period of our abortive search which extended over six weeks, they brought off a brood of young. Within a week of when the young were seen on the wing,

the new nest with fresh eggs was found. This suggests that the young of the first nest are cared for by the male while the female is busy with the second laying. The nest was built in the heart of a "cow-lick" tuft of grass in a marshy spot from which the water had disappeared though still spongy underfoot. The base of the nest was about three inches clear of the ground and is compactly built of sere fine grasses and almost cylindrical in shape. It measures three and one-half inches from crown to base in front and four inches at the back. It is deeply cupped, the inside measurement being two inches. The outside diameter is barely two and one-half inches, inside one and one-half inches. From front to back, however, the diameter is three inches outside and two inches inside. It will be seen therefore that the nest conforms to the shape of the characteristic grass tufts of marshy spots.

The eggs closely resemble those of the Western Savanna Sparrow in ground colour and markings but are much smaller, roughly about two-thirds the size, and the markings are much finer with more of a tendency to wreathing about the larger end.

How closely the female sits, even on fresh eggs, may be judged from the fact that the three of us had been standing together in one place for fully three minutes when the bird flushed from within a few inches of the foot of one of us and thus revealed by accident what many hours' search and watching had failed to reveal. The female was collected and is now in my possession together with the nest and eggs.

Chondestes grammacus. LARK SPARROW.—This species is but rarely reported in Manitoba on migration. Two small nesting colonies are known to me. One in North Kildonan Bird Sanctuary, Winnipeg, and the other at Birds Hill, Manitoba. Both these colonies have been known for several years, but have not been observed in detail.

In May, 1921, I made my first acquaintance with the species when I observed a flock of 40 feeding on the Portage highway at Sturgeon Creek, near Winnipeg, in close proximity to a number of male Harris Sparrows. I was much astonished to see a Lark Sparrow detach itself from its fellows and commence a courting display before a feeding male Harris Sparrow. The Lark Sparrow strutted and pouted around and spread its magnificent tail fanwise above its back, parading backwards and forwards like a proud turkey-cock. The object of this display seemed somewhat bored and after a time flew from the roadway into an adjoining field but the Lark Sparrow followed. The display commenced again and when the strutting individual came too close, the Harris Sparrow would peck at it and drive it

⁹ 1927. Some Recent Canadian Records, P. A. Taverner *The Auk*, 44: 217, April, 1927.

back. The next move was into the branches of a thorn bush, the Harris Sparrow above; the Lark Sparrow, after a short time on the ground beneath, hopped onto the lowest branch and gradually worked upwards towards the object of its attention, quivering the wings, fanning the tail, and uttering low chipperings in endearing tones. The head was held well back and breast puffed

out. This extraordinary display of a male of one species before a male of another species has not been paralleled in my experience. The performance, which I watched through from start to finish, lasted about half an hour. The Harris Sparrow flew back to its flock and after feeding under the bush for a few minutes, the Lark Sparrow rejoined its companions.

NOTES ON THE BRACHYURAN CRABS OF NORTHERN BRITISH COLUMBIA

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THE PRESENT observations concerning the Brachyura or "the true crabs", of the northwestern coast of Canada, were for the most part, incidental to a study of the commercial crab, *Cancer magister* Dana, carried on by the writer for the Biological Board of Canada. The Brachyuran crabs listed below were collected during the summer of 1930 on the western coast of British Columbia from the mouth of the Skeena River to that of the Nass River. In most cases five measurements are given for a characteristic specimen of the species being described. These measurements, for the sake of brevity, are numbered as follows:

(1) Length in millimeters as measured along the median line of the carapace from the anterior to the posterior margin exclusive of curvature.

(2) Length of the rostrum as measured from the tip to the posterior line of the upper margins of the orbits.

(3) Greatest width, exclusive of curvature.

(4) Length of the right cheliped or claw.

(5) Length of the first pair of ambulatory legs from the articulation of the coxa with the sternum to the tip of the dactylus.

SUBTRIBE BRACHYGNATHA

SUPERFAMILY OXYRHYNCHA—THE "SPIDER CRABS"

Family—Majidae.

Oregonia gracilis Dana—"the graceful decorator crab".

Many specimens of this species were found from low-tide mark to deep water. As its name suggests, the graceful decorator is usually found well covered with, and often completely hidden by, masses of attached seaweed, sponges, algæ, hydroids and bryozoa. As a consequence it is rendered inconspicuous and, when stationary, blends closely with its surroundings. Specimens were secured in the vicinity of the mouth of the Nass River and near Prince Rupert.

Size (medium-sized female): (1) 47 mm. (2) 12 mm. (3) 26 mm. (4) 69 mm. (5) 44 mm.

Hyas lyratus Dana—the "toad crab" or "lyre crab".

Several small specimens of this peculiar crab with the lyre-shaped carapace bearing blunt tubercles were found near Metlakatla and two large egg-bearing females in the vicinity of the mouth of the Nass River. The smaller specimens were decorated about the rostrum and legs with seaweed and algæ whereas the two more northern specimens had carapaces thickly covered with barnacles reaching 12 mm. in height. The latter specimens were almost entirely obscured by such and other marine growths, the tips of the chelipeds presenting a contrast by their clean shiny pinkish-white appearance. One specimen had a heavy growth of sponges on the merus of the right cheliped.

Size (a large egg-bearing female): (1) 71 mm. (2) 14 mm. (3) 55 mm. (4) 72 mm. (5) 94 mm.

Pugetia gracilis Dana—the "graceful kelp crab".

This is a very common kelp crab in the vicinity of Prince Rupert, being found on kelp off-shore, in tide pools and on the shore at low tide among the seaweed. The colour varies from greenish-brown to reddish depending upon the colour of the local seaweeds. Reddish-brown was the predominant colour about Kaien and Digby Islands. In nearly all the specimens obtained this species was found with the rostrum decorated with algæ or seaweeds and in a few cases the carapace, chelipeds and ambulatory legs as well.

On July 14, a very peculiar specimen of *P. gracilis* was collected between Prince Rupert and Metlakatla. It would appear that it is partially albino since all the carapace with the exception of the rostrum and the tips of the spines is of a shiny white colour. The remainder of the body presents a mottled appearance, white being interspersed with the normal reddish-brown.

Size (medium sized male): (1) 51.5 mm. (2) 13 mm. (3) 37 mm. (4) 67 mm. (5) 70 mm.

Chionoectes bairdi Rathbun.

This is an uncommon species in northern British Columbia though it has a remarkably wide

distribution having been reported from Greenland to Nova Scotia on the Atlantic and from Alaska to northern British Columbia on the Pacific as well as in Siberia and Japan. Only one specimen was secured and this near Nass Harbour in the course of trawling for shrimps.

Size (small male): (1) 31.5 mm. (2) 5.5 mm. (3) 32.5 mm. (4) 34 mm. (5) 71 mm.

SUPERFAMILY BRACHYRHYNCHA

Family—Canceridæ.

Cancer productus (Randall)—the "red crab" or "rock crab".

The rock crab is an abundant species on the rocky shores about Prince Rupert and is frequently caught during the course of commercial crab-fishing though it is seldom used for food in British Columbia. It is very rarely found on muddy or sandy shores and not a single specimen was found by the writer in the course of a week's crab-fishing at Nass Harbour when over eighty dozen commercial crabs were caught. It is also worthy of note that of well over one hundred specimens examined throughout the season not a single female of the species was discovered. In general, the rock crab is free from marine growths, though a few were found with barnacles on the carapace or chelipeds.

Size: Large specimens from the neighbourhood of Prince Rupert measure 140 to 150 mm. across the carapace.

Cancer magister Dana—the "big crab" or "edible crab".

This is the common edible crab of the Pacific coast and the one usually found in the markets either in the fresh or in the canned state. The colour appears to depend somewhat upon the nature of the bottom inhabited, those from the Nass having carapaces impregnated with a greyish-black substance which, while not destroying their edibility, renders them less saleable. The proportion of sexes in that northern region as based on 981 crabs was found to be 1.9 males to 1 female. In striking contrast to this is the condition near Prince Rupert where much more intensive fishing is carried on. There the proportions were found to be 2.9 females to 1 male and as high as 8 females to 1 male in individual catches. Inasmuch as egg-bearing females and crabs of less than 165 mm. in width are protected by law, the females remain relatively constant whereas the proportion of males is thought to indicate the intensiveness of the fishing. What are believed to be flat worms (*Planaria*), possibly parasitic, were found adhering to 83.7% of the females and barnacles were found attached to 45% of both males and females.

Size: Judging by 793 edible crabs measured through, rather than round, the carapace at the point of greatest width, the males near Prince Rupert were found to average 173 mm. and the females 150.1 mm. The legal minimum size being 165 mm., 73.4% of the males were of legal size and but 10.9% of the females. In general, however, the crabs of the extreme northern part of British Columbia are larger than those near Prince Rupert and not infrequently reach 200 mm. in width.

Cancer oregonensis (Dana).

This is a small crab reported to range from the Aleutian Islands to Lower California. Unlike other *Canceridæ* the anterolateral and posterolateral margins of the carapace do not form an angle thus giving the carapace a more circular shape. Altogether there are 12 or 13 distinct teeth on each side of the carapace which reaches its greatest width near the 7th or 8th tooth. *C. oregonensis* may be further distinguished by its hairy walking legs and black-tipped chelipeds.

This crab was found in considerable numbers on a rocky island between Prince Rupert and Metlakatla. It was also found in considerable numbers on a pontoon of the Prince Rupert dry-dock. This pontoon had been submerged for many years and the specimens collected therefrom were, in many cases, covered with iron rust. Two additional specimens were collected in Morse Lake, a salt water lagoon near Prince Rupert, during the ordinary course of crab-fishing. In all cases specimens came from a depth of at least 12 or 15 feet below high tide mark, none being found during frequent shore examinations. During July, the writer examined and measured a total of 169 crabs of this species. Sizes ranged from 4 to 41 mm. as measured through the greatest breadth of the carapace. The average width was 23.9 mm., while that for the males was 22.4 mm. and that for the females 24.6 mm. It may be noted here that the width of the type specimen of the species as recorded by Dana is 23.0 mm. and that Rathbun records a large female with a width of 47.1 mm. Eleven specimens or 6.5% of the 169 referred to above had soft shells in July and but one was carrying eggs at that time. The proportion of the sexes was 64 males to 104 females.

Size: the average width of females was 24.6 mm. and that of males 22.4 mm.

Telmessus cheiragonus (Tilesius)—the "horse crab".

This is a peculiar yellowish-brown crab having the carapace and walking legs covered with stiff hairs arranged in irregular rows. The horse crab is not abundant near Prince Rupert and is rarely seen by the crab-fisherman. A few specimens

were caught by the writer in hoop-nets near Digby Island at the entrance to Prince Rupert harbour and a few carapaces were found on the shore near the Digby Island dock.

Size (male): (1) 88 mm. (2) 16 mm. (3) 64 mm. (4) 84 mm. (5) 130 mm.

Family—Grapsidæ.

Hemigrapsus nudus (Dana)—the "purple shore crab".

This species is found abundantly on rocky shores, a dozen or more frequently being found under a single rock. The carapace is almost square in shape and purplish in colour. The legs are without hair in contrast to *H. oregonensis*, a crab very similar in appearance and to be found in the same habitat. Great variations occur in

markings and colour. Several egg-bearing females were observed in June, 1930.

Size (large male): (1) 36 mm. (3) 41 mm. (4) 62 mm. (5) 42 mm.

Hemigrapsus oregonensis (Dana)—the "yellow shore crab", "mud crab", or "hairy shore crab".

This species closely resembles *H. nudus* in shape and size but differs in lacking red spots in its chelæ, in having hairs on its ambulatory legs and in being yellowish-grey in colour. As in the case of *H. nudus*, the distribution is very general. A few egg-bearing females were noted during June and July, 1930.

Size (small male): (1) 12 mm. (3) 14 mm. (4) 14 mm. (5) 15 mm.

INSECT PARASITES OF VERTEBRATES AND HOST PHYLOGENY

By A. W. BAKER

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IN RECENT years many students of various groups of parasites have come to realize that there is, apparently, a significant relationship between the specificity of obligate parasites and host phylogeny. So numerous are the examples which may be cited from various animal groups in illustration of this relationship that one is led to believe that there is involved a general, but nevertheless definite, biological principle. This might be briefly stated in this manner—that parasites provide a key to the genetic relationships of their hosts.

Various workers have pointed out that certain species of parasites, in the groups in which they were working, are possessed in common by groups of related host species. These workers have developed the idea, more or less independently, that conditions on, or in, the body of the host have remained practically unchanged over long periods of time while the host individuals themselves have been subjected to various and changing environmental conditions and geographical isolation. While body temperature, presumably blood composition, character of pelage and density of population on, or in, the host have remained relatively constant the host has been subjected to the changing environmental influences to which I have referred. Variations which might become implanted in the host and established through geographical isolation would presumably have no part to play in controlling the evolution of the parasite. The result has been that the evolutionary progress of the parasite has been slow while the host has given rise to new species and even to groups of generic and family significance. In

other words the parasite which is common to several related host species is the form which was parasitic upon the common ancestor of these host species.

An interesting feature of a study of this problem is that a number of men arrived at the same general idea quite independently. The first person really to make reference to the question of host relationships and parasites was Vernon Kellogg working on the Mallophaga or biting lice of birds and mammals. In 1896 he lists a large number of species of Mallophaga common to both North American and European birds and says:—"The occurrence of a parasitic species common to European and American birds . . . must have another explanation than any yet suggested. This explanation, I believe, is, for many instances, that the parasitic species has persisted unchanged from the common ancestor of the two or more now distinct but closely allied bird-species." Kellogg developed this idea in later papers both with respect to birds and mammals. Von Ihring had in 1892 made a passing reference to the occurrence of a parasite on its host in different geographic regions and in 1902 he made much use of host parasite data in a study of geographical distribution. Zsochokke in 1898-99 made definite use of cestode parasites in attempting to establish the common origin of South American and Australian Marsupials. Harrison working on Mallophaga claimed to have arrived at the idea independently of Kellogg and in later papers he did much to apply the theory to various groups. Williams writing in 1909 on an epidemic among the New England Indians in

1616-20 showed that he realized the significance of parasitic diseases of man in relation to the origin and distribution of human races. Hadwen, working with the *Oestridæ*, the bots and warbles, had been impressed with the question of parasites and host relationships as early as 1916, though his published papers do not refer to it. Darling in 1921 made independent use of the theory with respect to hook worm infestation of man. Metcalf, at about the same time, working on ciliate infusorian parasites of frogs discussed host relationships and distribution. Metcalf has elaborated this work in later papers and with Harrison has undoubtedly made the most complete survey of the field. We see then that at least eight men developed this theory quite independently of one another,—each, at first, from evidence secured in the group in which he was working.

The theory, or method, if sound, and the writer believes it to be so, has wide application not only with respect to host phylogeny, but also with respect to questions of geographical distribution and paleogeography.

It is interesting to note that despite the fact that this principle is accepted by many parasitologists, and that quite an extensive literature is available on it, practically no reference is made to it in general text books of zoology or parasitology. An outstanding exception is Wenyon's *Protozoology*.

My interest in the problem of parasites and host relationships has come from my work on the Mallophaga or biting lice of birds and mammals. As I collected and studied material in this group I became more and more impressed with the idea, even though at the beginning I had of course only Kellogg's first reference to the question. Later papers of other workers and additional records of my own confirmed me in my belief. As I repeatedly found species from American hosts which were apparently identical with European material from related hosts I became convinced that the explanation could only be that the parasite species has come down unchanged from the common host ancestor.

I could cite here numerous examples of Mallophagan species common to American and European host species. I could not better illustrate the point in question, however, than by referring to a small collection of Mallophaga sent to me for examination by Professor Spencer of the University of British Columbia and reported upon by him before this Society. It must be borne in mind that this is a small collection taken at random and not selected particularly for my purpose. The material, taken in British Columbia, includes two species from the Raven, two

from the Banded Pigeon, one from the Blue Heron and one from the Steller Jay. All of these but one were new host records and four were new American records. Let us note the host relationships in Europe of these Mallophaga taken on birds in Canada which are all American species. Both species from Raven have been recorded by European writers from various species of *Corvus*. One species from Banded Pigeon is recorded from various species of *Columba* in Europe and the other is the common *Esthipterum columbæ* of domestic pigeons the world over. The species from Blue Heron is recorded from various species of *Ardea* in Europe. The species from Steller Jay, though I have not had an opportunity to examine the type, is apparently a form described from a Blue Magpie of Southern Europe and a member of the same family as the Steller Jay. Of the six species in the collection four are recorded from hosts of the same genera in Europe. One is found the world over on a domesticated species of the same genus as its British Columbia host and the sixth is recorded from a member of the same host family in Europe.

If we had no more evidence than that offered by this little group of Mallophagan species, collected at random, we should be forced to admit that it is at least strikingly suggestive. And we could produce numerous records of Canadian Mallophaga equally striking.

Many other workers in the group have made much use of Mallophaga with respect to avian and mammalian phylogeny. The relationship between Australian and South American Marsupials has been borne out by the relationship of the Mallophagan parasites. Harrison has determined that the biting lice of *Apteryx* form a definite group of a genus found otherwise only on Rails. He has suggested a primitive close relationship which had been previously suggested by Gadow on purely morphological grounds. We have numerous records where Mallophagan parasites occur on definitely related hosts. Accepting the suggested thesis then evidence such as that with respect to *Apteryx* and the rails may be of much value in determining doubtful phylogenetic relationships of hosts.

The suggestion may be advanced that the establishment of a species on two hosts not otherwise apparently closely related may be due to straggling to and resultant establishment on the second host. It is a fact, however, that even where such straggling must continually occur, establishment of the straggling parasite on its unnatural host is extremely rare. Owls and other birds of prey provide excellent opportunity for the establishment of parasites of their prey upon

themselves; yet I know of no record in the literature of the occurrence of a mammal louse upon such bird hosts and no record of the establishment of a species from a passerine bird. Cuckoos should provide an admirable illustration of straggling, if stragglers become established, because of the certain infection of the young in the nest. There is, however, no record of lice of foster parents on cuckoos—only records of true cuckoo-infesting species. And by the way, these latter are not constant in occurrence since the only possible transference of the species must take place at mating. With bird species in which parents incubate the eggs, transference, of course, takes place to the young in the nest.

There must be a reason why Mallophagan species seldom become established on unrelated hosts. To the writer it must be that the chemical constitution of blood, skin and plumage of the unnatural host is such that its body not only does not provide an attractive source of food and shelter, but may possibly provide actual lethal conditions for the straggling parasite.

Argument might be advanced that many cases might represent instances of parallel development. Relationships of the parasite species are too exact, however, and examples are far too numerous for such an explanation. All members of the genus *Tetrophthalmus* are parasitic within the gular pouches of various species of pelicans. All exhibit this specialized form of parasitism and all have their body structure, especially the tracheal system, modified in relation to this mode of life.

The Anoplura or sucking lice provide numerous examples. Let us cite one. The members of the genus *Pediculus* of man have their nearest relative in species of the genus on anthropoid apes. The genus also occurs on the South American monkey *Ateles*, but the work of Friedenthal shows that on the basis of composition of the blood and hair this new world monkey shows certain differences from other tailed monkeys and certain relationships to the anthropoids. So that even if *Ateles* secured its *Pediculus* from man its establishment on the host might be presumed to be because of these very related peculiarities of its blood composition. On the other hand Ewing, after a comparison of *Ateles* lice with those of prehistoric North and South American mummies, concludes that if *Ateles* lice came from man they did so in

very ancient times. The lice of other monkeys belong to a related but distinct genus *Pedecinus*. On the basis then of the louse fauna the blood relationship of man and the anthropoids is closer than that of the anthropoids and other monkeys save *Ateles*.

With regard to the *Oestridæ*, the horse bots, ox warbles, etc., the specificity of the group in respect to host relationship is evident. At the American Association meeting in 1916 Hadwen made the statement that he was convinced from his work, that the bots were very ancient parasites. That evening Cockerell showed photographs of bot larvæ from the Tertiary period in the Lower Eocene of which *Eohippus* had its origin!

In other groups of animal parasites work is being done to aid in determining host relationships and geographical distribution. The Protozoa, Cestodes and Trematodes provide numerous examples. It is interesting to note that in many cases the relationships of these forms from other groups support the evidence offered by insect parasites of the same hosts. For example, the lice of the ostrich and the American rhea are apparently closely related, being distinguished from all other Mallophaga by a peculiar asymmetry of the sclerotized border of the clypeus. A species of tapeworm occurs in both hosts. The Nematode genus *Echinonema* includes two species, one in an Australian Marsupial and one in a marsupial of South America. I have already referred to the relationship of the louse parasites of these forms. We spoke of the apparent blood relationship, or resemblance of the New World *Ateles* to man and anthropoids. In Sandground's infection experiments with *Strongyloides fulliborni*, a common parasite of Old World monkeys including anthropoids, he secured infection to the eighth day in man and to the sixth day in *Ateles* and not in any other forms.

I have dealt only with insect parasites of vertebrates. How far this suggested principle may be supported by evidence from insect groups parasitic upon insects and other inveterbrates I do not know. I would suppose, however, that the evidence would be much more meagre than with respect to the former groups since many insect parasites of other insects are facultative rather than obligative in the specificity of their parasitism.

SOME NOTES ON THE EUROPEAN HARE

By STUART L. THOMPSON



THE European Hare is becoming almost a daily (and from the following, a nightly) occurrence in the vicinity of Toronto.

The history of the introduction of this species into the province has been dealt with elsewhere in *The Canadian Field-Naturalist* and need not be further mentioned here. Anyone who knows the animal and who has seen its speed and activity can understand its ever-increasing range from the point of introduction.

As different observers in various localities are adding to our knowledge of this newcomer among our fauna, the following brief notes may be of interest.

On February 2nd, 1931, a clear night with a full moon tempted me out for a snow-shoe tramp. While crossing an open space I came upon the track of a European Hare running at full speed over the snow. I followed it backward and found it led from a large hole in the snow which evidently harboured the animal not long since. It was clear that the hare had been spending the night here, but why he had left suddenly did not appear.

On March the 8th we were visited by a high east wind with snow which, in a few hours, covered the country several inches deep. About midnight I was out alone snow-shoeing, a light snow was falling. As I was crossing a large field, not far from the place of the above February observation, I saw amid the encircling gloom of the night, at about 150 yards distance, a faint dark object moving on the dim level background of white. It is well-known that farmer's cats are given to nocturnal sallies but this object ran in long uncatlike bounds. It could only be a European Hare. While I stood watching it I could see it halt, evidently watching me. The animal's sight must be keen for I merely took one or two steps in its direction and it was off again. Had I crossed its line of vision at right angles my movement would have been most apparent but, approaching it straight on, visible movement, thus reduced to a minimum, must have been difficult to detect especially in the gloom.

Circling round I brought myself to its trail and followed it back to discover the facts. At about 100 yards from my original track I found a large open hole in the snow, with many lumps of snow scattered about. These lumps were not only all fresh, but all on the north side of the hole, *i.e.*, the side at which the hare had burst

forth at my approach. The snow was about eight or ten inches deep, so that the animal must have been well below the surface as it crouched. The floor of the hole was trodden flat and the sides were somewhat soft and "packy", what might be described as warmed snow, as though the hole had been occupied for some time. Three feet from the hole was his first track, three feet more his second and then beyond came the customary six and eight foot bounds.

Naturally I looked about for the track that led into the hole. There was none. It had long since been snowed over. But I did find three or four lumps of snow to the *south* side of the hole at a couple of feet distance. These were half covered in the newly-fallen snow and corresponded in consistency to the stiffer crust beneath.

To recall the weather of the preceding 24 hours: First came a strong driving wind with flying snow which piled up some eight inches or so deep. At mid-day the snow ceased, but the wind continued with a lower temperature thus leaving a smooth wind-swept surface stiffened into a crust. At about 4 or 5 p.m. the snow began to fall again, so that about midnight a new stratum of loose snow was laid down. According to the signs left and taking the weather and its changes into account, it would seem that about 4 or 5 p.m. a European Hare had been wandering about, perhaps nibbling at the weed tops that showed above the snow, leaving little or no tracks on the wind-swept crust. As dusk closes round him, with a fresh storm coming on, he decides to spend the night here. The snow is quite deep, there is no shelter on an open field, so he digs himself in. In digging, the lumps of crust are thrown out to the south, and in he crawls facing north. At first his brown back must have been a conspicuous patch on the white ground, but the falling snow kindly rectifies this, not only covering his back over out of sight of any Horned Owls but obliterating his back track, leaving only rounded forms over the lumps he dug out. So he rests several hours, as the inside walls subsequently showed. At midnight he hears approaching footsteps and springs forth to escape. Personally I have never been buried in a snow-drift to ascertain how distinctly sounds may be heard, but it would seem that the hare's hearing is very acute, to hear the soft crunch of snowshoes at 100 yards, or so distance. Scent is out of the question for the wind was blowing from the east and I came from the south, and sight can hardly be con-

sidered, for he was evidently well covered and the night was dark. However the warning came, it was in ample time.

I followed his trail a mile or so through the night over several fields. It revealed nothing but long dashes with occasional pauses for observation. I hardly expected anything else. He did not dig in under stress though he did so at his leisure, originally at 4 or 5 p.m. It would be interesting to know if this habit of spending the

night in a snowdrift has been learned under new conditions or has the European Hare brought it here with him? Be that as it may, it is strange what observations bring to light at midnight amid the gloom of a snow storm.

See also:

DYMOND, J. B., European Hare in Ontario. *The Canadian Field-Naturalist*, 36: 142, November, 1922.

ANDERSON, R. M., Further Notes on the European Hare in Ontario. *The Canadian Field-Naturalist*, 37: 75, April, 1923.

SOME NOTES ON MAMMALS, BIRDS AND FERNS OF KAZABAZUA DISTRICT, QUEBEC

By ELI DAVIS



THE WRITER, in company with Mrs. Davis and Mr. W. E. Saunders, spent a most enjoyable holiday from September 9th to 13th, 1930, at Whitefish Lake, about fifty miles north of Ottawa and ten miles east of Lac Ste. Marie, Quebec. The primary object of our expedition was to trap small mammals, but we were prepared to take a lively interest in anything that was offered in the line of nature study.

The country in the immediate vicinity of our camp was very rocky and hilly and for the most part heavily wooded. Maples predominated on the more level areas while the sides of the hills and edges of the lakes were covered with conifers.

While walking down the road looking for a suitable place to camp we discovered several plants of *Aspidium Goldianum* (Goldie's Shield Fern) growing beside the road. This was taken as a good omen for the success of the trip. We had seen this fern growing wild before but this was the first time that we had discovered a plantation of it for ourselves. Camp was made on the edge of a clearing overlooking a corner of Whitefish Lake.

Half a mile to the north, on much higher ground, is a small lake about a mile in diameter, which empties into Whitefish through a little stream which through part of its course runs underground. This stream enters a ravine in the woods and after travelling among tumbled, moss-covered rocks for a hundred feet disappears from sight, to burst out into the sunshine below the clearing. In this ravine we found dozens of plants of *Polystichum Braunii* (Braun's Holly Fern). It is a thrilling experience to find a new station for two rare ferns in the course of a few hours.

Most of our trapping operations were carried on around the above mentioned little lake and stream. The bait used in our Victor mouse traps

was cheese and oatmeal. Six hundred and eighty-three trap nights yielded the following list:

Parascalops breweri. BREWER'S MOLE.—One taken in a run across a road leading from main road down to the little lake. This was the only run observed.

Sorex cinereus cinereus. CINEREOUS SHREW.—Five taken in as many different situations.

Sorex fumeus fumeus. SMOKY SHREW.—Three taken among conifers within a few feet of the lake.

Sorex palustris albibarbis. WHITE-CHINNED WATER SHREW.—One caught one foot from and one foot above the lake. It had rained hard all night and we were prepared for a very slim catch in our traps. I had covered most of my trap line without finding anything and then found this shrew and a Smoky Shrew close together.

Microsorex hovi intervectus. NORTHERN PIGMY SHREW.—One taken beside stream in a small open grassy place, surrounded by thick woods and one beside the lake.

Blarina brevicauda brevicauda. LARGE SHORT-TAILED SHREW.—Ten, taken in all situations.

Canis. WOLF.—One heard at night but we could not determine the species.

Tamias striatus lysteri. NORTHEASTERN CHIPMUNK.—Only one collected, although these animals were quite common in the hardwood area around our camp.

Sciurus hudsonicus gymnicus. EASTERN RED SQUIRREL.—Very common, we estimated a pair to every acre in the hardwood area in the vicinity of our camp.

Peromyscus maniculatus gracilis. WHITE-FOOTED MOUSE.—Twenty-two taken in all situations.

Synaptomys cooperi cooperi. COOPER LEMMING MOUSE.—One caught in same open place as *Microsorex*. Female sub-adult with four embryos. (Probably *M. h. intervectus*.)

Clethrionomys gapperi gapperi. GAPPER RED-BACKED MOUSE.—Nineteen found among both hardwoods and conifers at edge of lake.

Microtus pennsylvanicus pennsylvanicus. MEADOW VOLE.—One caught in hardwood area two hundred yards from edge of clearing.

Napæozapus insignis insignis. WOODLAND JUMPING MOUSE.—Six taken along stream in hardwoods and among conifers at edge of lake.

Several Pileated Woodpeckers were seen. Mr. Saunders saw one sitting crosswise on a limb eating wild cherries.

Barred Owls called every night during our stay. Two could often be heard at the same time.

We moved camp September 13th to Danforth Lake, about ten miles west of Kazubazua where we stayed four nights. Camp was pitched in a meadow beside a stream which ran from a beaver pond, through some cultivated land, into a thick stand of balsam and spruce. Six hundred and thirty-four trap nights netted us thirty-nine mammals compared with seventy-five at the last stand.

Condylura cristata. STAR-NOSED MOLE.—Two caught in the same trap on successive nights. The third night this trap caught a *Blarina* and the other night it was empty. Another trap evidently caught a mole as it was dragged along the run for about a foot until it became entangled in roots and weeds, where it was solidly held and the occupant escaped.

Sorex cinereus cinereus. CINEREOUS SHREW.—Two taken on high land under logs.

Sorex palustris albibarbis. WHITE-CHINNED WATER SHREW.—One caught the first night with only thirty-two traps out. Taken beside a small stump, two feet from the stream, in open meadow about one hundred yards from nearest woods. This seems to be an unusual place to find these shrews as they are usually taken in woods. Six hundred traps along the same stream failed to get any more.

Blarina brevicauda brevicauda. LARGE SHORT-TAILED SHREW.—Four.

Tamias striatus lysteri. NORTHEASTERN CHIPMUNK.—Several seen but not collected.

Sciurus hudsonicus gymnicus. EASTERN RED SQUIRREL.—Several seen but not collected.

Castor canadensis canadensis. BEAVER.—The owner of the land on which we camped told us that the beavers had several houses above the dam. We saw fresh work and their tracks on the dam.

Peromyscus maniculatus gracilis. WHITE-FOOTED MOUSE.—Two.

Microtus pennsylvanicus pennsylvanicus. MEADOW MOUSE.—Six.

Zapus hudsonius hudsonius. MEADOW JUMPING MOUSE.—Twelve, mostly taken along the stream in the meadow.

Napæozapus insignis insignis. WOODLAND JUMPING MOUSE.—Ten. Seven taken one night in coniferous woods beside the stream. This looked like a good place for Red-backed Mice but none were seen.

Although we did very little hunting for birds the following species were observed: Loon, 4; American Golden-eye, 6; American Bittern, 1; Great Blue Heron, 4; Ruffed Grouse, 3; Goshawk, 1; Marsh Hawk, 1; Sparrow Hawk, 1; Kingfisher, 2; Hairy Woodpecker, 2; Downy Woodpecker, 1; Flicker, 15; Whip-poor-will, 1; Blue Jay, 25; Crow, 20; Goldfinch, 14; Vesper Sparrow, 3; Savannah Sparrow, 1; White-throated Sparrow, 25; Tree Sparrow, 1; Chipping Sparrow, 15; Slate-coloured Junco, 15; Song Sparrow, 32; Cedar Waxwing, 23; Cape May Warbler, 2; Myrtle Warbler, 2; Chestnut-sided Warbler, 1; Bay-breasted Warbler, 1; Black-throated Green Warbler, 2; Maryland Yellow-throat, 5; Redstart, 1; Catbird, 2; House Wren, 4; Red-breasted Nuthatch, 4; Chickadee, 21; Gray-cheeked Thrush, 50; Olive-backed Thrush, 1; Robin, 23; Bluebird, 3. We were pleased to note the absence of English Sparrows from this area.

Our best thanks are due to Dr. R. M. Anderson, of the National Museum of Canada, for his verification of doubtful species.

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By **BERNHARD HANTZSCH**

“Beiträge zur Kenntnis des nordöstlichsten Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume, 8, 1909, pp. 158-229. Volume 9, 1909, pp. 245-320.

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Original pagination given in the text.

(Continued from page 174)



SYNOPTICAL LIST of such of the higher animals as are of importance to the population may now follow. At present I am not in a position to make any sort of complete list of the lower forms of the

animal kingdom; careful investigations of the fishes of the district are submitted in just as meagre detail.

There are only a few fish of especial importance to the inhabitants. At the head of the list is the [Kabeljau] cod; *Gadus callarias* Merr., Eskimo Ogak, which extends its range as far as this district, but as a rule does not extend much farther north and west, and during the ice-free summer and autumn months occurs more or less abundantly. It is easily caught with the well-known double hook, mostly unbaited as was described before. Not only hundreds of schooners farther south in Labrador pursue the cod, but also the Eskimos have great success [P. 223] in catching and drying the fish. This district is visited only once in a while by a Newfoundland fishing vessel for this purpose, since the fishing grounds farther south are easier to reach and have a greater abundance of fish. Also the Killinek Eskimos as a rule fish for the Ogak only for their own use. They usually cook them when just freshly caught, but cook the heads at times when half rotten; they partly dry the creatures, a thing that is difficult in this cool, moist climate. Therefore the export of dried stock-fish is insignificant, while it was the most important export of the six other Moravian mission stations. In 1905 the amount there was 4035 quintals with a value of \$21,149; in 1904, \$23,157; Governor MacGregor, Report, 1906, pp. 40-41. Also fishes similar to the cod, *Microgadus tomcod* (Walb.) and *Molva molva* Merr. may be caught. Now and then a small fish like the salmon, the [Capelin] *Mallotus villosus* (Müll.), Eskimo, Kolligak, occurs in great hauls, especially eastward from Cape Chidley. The creatures are caught in nets. Farther south in Labrador, however, much more frequently than in this district they are dried and used for dogfood in winter. In certain inlets of Ungava Bay south of Killinek there seem to be good fishing places for Salmonidæ, probably the species *Coregonus quadrilateralis* (Rich.) *Salvelinus fontinalis* (Mitch.) and *Salvelinus alpinus stagnalis* (Fabr.) or *arcturus* (Ghtr.) Eskimo Ekalluk. However, the usual catch which is successful only in July, and salting in casks, as occurs at the other mission stations (in 1904, \$4,788 exported) was not carried into effect in nearby Killinek to any extent. The freshwater lakes and the flowing waters harbour trout belonging perhaps to the same species, Eskimo Anaklek and Idluk, which are said to remain always [Kümmerer] ? poor specimens in our most northern district. It was always impossible to find specimens larger than a finger length of *Salvelinus fontinalis*. To be sure these little fish

were caught with endless patience in nooses, as is peculiar only to Eskimos, which [P. 224] are drawn round the bodies of this little creature. They do not know any other method of fishing for them, though they try to pull them out with their hands from under the stones. I once sent an industrious woman to catch trout, and as the result of the whole day's work received four specimens, a finger in length. In spite of these apparently meagre results I have often seen women and children standing in broad, shallow streams bent down and watching attentively. On travels inland one can at times get nothing else. A family with several children who wished to come on foot in September, 1906, from the middle part of the coast of Eastern Ungava Bay to Killinek that is the mainland lying opposite, and on account of the deep inlets travelled far in the hinterland, supported themselves in this way. For many days they had nothing to eat but the results of this trout fishing. When the people [Eskimos] had at last arrived over and as arranged beforehand, had kindled a fire, they were brought across in a boat. It was a beautiful Sunday afternoon. They did not look to be well fed and felt rather weak, but seemed in good humour. As a rule [Lachse] salmon, *Salmo salar* L., Eskimo Kavisilik, are not caught at Killinek. The nearest good places of their occurrence are in the south of Ungava bay, at the mouths of the George River, Whale River and the Koksoak, where the Eskimos carry on the business of catching them under the direction of an official of the Hudson Bay Company. Other fish than those mentioned for example, a flat fish, perhaps *Liopsetta putnami* (Gill.), Eskimo Nettarek, are caught only occasionally. The sharks [Haifische], Eskimo Ekaluvak, still to be mentioned, which belong particularly to the 8-10 meter-length variety *Cetorhinus maximus* (Gunn.), as well as the weaker *Somniosus microcephalus* (Bloch.). These creatures, which are not dangerous as a rule, do much damage, because they are frequently caught in the large seal nets and they not only eat the drowned seals hanging there, but also tear the valuable nets with their teeth. They are, therefore, hated by the Eskimos; but in general neither the flesh is eaten, nor the liver, for the sake of which in other places, for example, north of Iceland, the creatures are hunted in special ships.

[P. 225]. Batrachians (Amphibia) and reptiles (Reptilia) are entirely lacking apparently in this district. How far one of the frog species observed by me hurriedly but with certainty extends northward on the Ungava coast, must be determined by means of later observations.

The avifauna is better known, and was the object of my own special investigations in this locality. On this point I refer to my detailed reports in the Ornithological Journal [*Journal für Ornithologie*], Leipzig, 1908, pp. 177-202, and 307-392, and confine myself here to a few words. The significance of the avifauna for the Eskimos is very great, even if it is appreciably below that of the mammalian fauna kingdom. The value of a bird is measured according to its size and the palatability of the portions which it yields the cooking pot, as well as the ease with which it is secured, and they pursue the birds accordingly. The small, shy and rare birds are seldom noticed. Above all they place the larger birds occurring at the time of migration in flocks, often most abundantly, such as ptarmigan, ducks, gulls, guillemots and other water birds. Of special importance are the eider ducks, which stay in flocks on the flatter parts of the shore, as long as the sea is not entirely covered with ice. The Eskimos try to collect the down and eggs of these birds, as they do only occasionally with other species, chiefly because the whole district is poor in breeding colonies and does not contain a single so-called bird mountain of any size.

Here follows a list of the bird species observed for the north-eastern part of Labrador:

Colymbus griseigena holboellii (Rhdt.) [Rothals-Taucher]. HOLBOELL'S GREBE.—Apparently occasional migrant.

Podilymbus podiceps (L.) [Gefleckt-schnäbliger Taucher]. PIED-BILLED GREBE.—Exceptional visitor.

Urinator imber (Gunn.) [Eistaucher]. LOON.—Eskimo, Tüllik. Widely distributed but not frequent breeding bird.

Urinator arcticus arcticus (L.) [Polar-Seetaucher]. BLACK-THROATED LOON.—Apparently occasional migrant. [P. 226].

Urinator lumme (Gunn.) [Nord-Seetaucher] RED-THROATED LOON.—Kaksau. Widely distributed and not rare bird.

Fratercula arctica arctica (L. or *Fratercula arctica glacialis* Steph.) [Papagei-Taucher]. PUFFIN.—Siggoluktok. Rare migrant.

Cephus grylle mandtii (Licht.) [Mandt's Gryll-Lumme]. MANDT'S GUILLEMOT. Pitsiulak.—Breeding bird here and there and frequent migrant.

Uria lomvia lomvia (L.) [Dick-schnäblige Lumme]. THICK-BILLED GUILLEMOT; Akpa, Akpavik.—Perhaps breeding bird, common migrant.

Uria troile troile (L.) [Dünn-schnäblige Lumme]. COMMON GUILLEMOT. Akpavik.—Occasional guest.

Alca torda L. [Tord-Alk]. RAZOR-BILLED AUK. Akpa.—Infrequent migrant

Alle alle (L.) (Krabbentaucher). DOVEKIE. Akpaliarsuk.—Common migrant.

Megalestris skua (Brünn) [Grosse Raubmöne]. SKUA.—Rare visitant.

Stercorarius pomarinus (Temm.) [Mittlere Raubmöne]. POMARINE JAEGER, Issungak.—Not rare visitor, and perhaps breeding bird also.

Stercorarius parasiticus (L.) [Schmarotzer Raubmöne]. PARASITIC JAEGER. Issungak.—Frequent visitor and breeding bird here and there.

Stercorarius longicaudus Vieill. [Kleine Raubmöne]. LONG-TAILED JAEGER. Issungak.—Rather rare visitor and probably breeding bird here and there.

Gavia alba (Gunn.) [Ellenbein Möne]. IVORY GULL. Naujaluk.—Rather frequent migrant.

Rissa tridactyla tridactyla (L.) [Dreizehn-Möne] KITTIWAKE. Navtsak.—Common migrant.

Larus glaucus Brünn. [Eis-Möne]. GLAUCOUS GULL. Navja.—Frequent visitor, but rather rare breeding bird.

Larus kumlieni Brewst. [Kumlien's Möne]. KUMLIEN'S GULL.—Apparently migrant.

Larus leucopterus Faber. [Polar Möne]. ICELAND GULL. Navjarsuk.—Not a rare visitant and migrant.

Larus marinus L. [Mantel Möne]. GREAT BLACK-BACKED GULL.—Rather rare visitor.

Larus argentatus smithsonianus Coues. [Amerikanische Silber-Möne]. AMERICAN HERRING GULL. Navja.—Frequent visitor and not rare breeding bird.

Xema sabinii (Sab.) [Schwalben-Möne]. SABINE GULL.—Rare autumn migrant.

Sterna hirundo L. [Fluss See-Schwalbe]. COMMON TERN. Immerkotailak.—Occasional visitor or migrant.

Sterna macrura macrura Naum. [Küsten-See-schwalbe]. ARCTIC TERN. Immerkotailak.—Irregularly occurring migrant.

Fulmarus glacialis glacialis L. [Eis-Sturm-vogel] FULMAR. Kakkordluk.—Very frequent visitor and migrant.

Puffinus gravis (O'Reilly). [Grosse Sturmtaucher]. GREATER SHEARWATER.—Occasional summer visitor.

Puffinus griseus stricklandi Ridgw. [Dunhler Sturmtaucher]. SOOTY SHEARWATER.—Rare visitor.

Procellaria pelagica L. [Kleine Shurmschwalbe]. STORM PETREL. Kukkiliksoak.—Rare visitor.

Oceanodroma leucorhoa (Vieill.) [Gabelschwänzige Sturmschwalbe]. LEACH'S PETREL. Kukkiliksoak.—Occasional visitor.

[P. 227].

Oceanites oceanicus (Kuhl). [Buntfüssige Sturmschwalbe]. WILSON'S PETREL. Kukkiliksoak.—

Perhaps rare visitor.

Sula bassana (L.) [Bass-Tölpel]. GANNET. Kogsuk.—Exceptional visitor.

Phalacrocorax carbo (L.) [Kormoran Scharbe]. CORMORANT. Okaitok.—Not rare migrant and probably breeding bird here and there.

Mergus serrator (L.) [Mittlerer Säger]. RED-BREASTED MERGANSER. Pai.—Not a frequent breeding bird and migrant.

Mergus cucullatus L. [Hauben-Säger]. HOODED MERGANSER. Java.—Not a frequent migrant and possibly breeding bird.

Anas boschas comboschas Brehm. [Stock-Ente] MALLARD. Mitterluk.—Exceptional visitant.

Anas obscura rubripes Brewst. [Düstere Ente]. BLACK DUCK. Mitterluk.—Rather rare breeding bird.

Nettion crecca carolinensis (Gm.) [Amerikanische Krick-Ente]. GREEN-WINGED TEAL.—Exceptional visitant.

Dafila acuta (L.) [Spiess-Ente]. PINTAIL. Ivugak.—Rare visitant.

Aethya affinis affinis (Eyt.) or *Aethya marila nearctica* [Berg-Ente]. LESSER SCAUP DUCK.—Rather rare breeding bird.

Clangula clangula americana (Bp.) [Amerikanische Schell-Ente]. AMERICAN GOLDEN-EYE. Katjitok.—Probably migrant or visitant.

Clangula islandica (Gm.) [Spatel-Ente]. BARROW'S GOLDEN-EYE. Katjitok.—Not a rare breeding bird.

Harelda hyemalis (L.) [Eis-Ente]. OLD SQUAW. Aggek.—Well-known, but infrequent breeding bird.

Histrionicus histrionicus (L.) [Kragen-Ente]. HARLEQUIN DUCK. Ingiuliksiut.—Not rare breeding bird.

Somateria mollissima borealis Brehm [Brehm's nördliche Eider-Ente]. GREENLAND EIDER. Mittek.—Frequent inhabitant of the sea coasts and in some places breeding in colonies.

Somateria spectabilis (L.) [Pracht-Eider-Ente]. KING EIDER. Kingalik.—Frequent visitor, bird breeding in isolation.

Oidemia nigra americana (Sw.) [Amerikanische Trauer-Ente]. AMERICAN SCOTER. Uvingiajok.—Not a rare emigrant and isolated breeding bird.

Oidemia fusca deglandi Bp. [Degland's Samt-Ente]. WHITE-WINGED SCOTER. Pitsiulakpak.—Apparently migrant.

Oidemia perspicillata (L.) [Brillen-Ente]. SURF SCOTER. Sorluktok.—Rare migrant and visitant.

Chen hyperborea (Pall.) [*nivalis* (Forst) ?] [Schnee-Gans]. SNOW GOOSE. Kangu.—Not a rare migrant.

Anser albifrons gamboli (Hart). [Amerikanische

Bläss-Gans]. WHITE-FRONTED GOOSE. Nerdler-nak.—Probably migrant.

Branta canadensis (L.) [*hutchinsii* (Rich) ?] [Hutchins' Canadische Gans]. HUTCHINS' GOOSE. Nerdlek.—Not a rare early spring and autumn migrant.

Branta bernicla glaucogaster (Brehm) [Ringel-Gans]. BRANT. Nerdler-nak.—Not a rare migrant.

Crymophilus fulicarius (L.) [Breitschnäbliger Wassertreter]. RED PHALAROPE. Savgak, Kajok.—Rather infrequent migrant.

[P. 228].

Phalaropus lobatus (L.) [Schmalschnäbliger Wassertreter]. NORTHERN PHALAROPE. Savgak.—Not a very frequent migrant.

Tringa canutus L. [Isländischer Strandläufer]. KNOT. Tüllik.—Rare migrant.

Arquatella maritima maritima (Brünn) [Meeres-Strandläufer]. PURPLE SANDPIPER. Tüllik.—Rather frequent visitor and migrant.

Actodromas maculata (Vieill.) [Gefleckter Strandläufer]. PECTORAL SANDPIPER. Siksariarpak.—Not a rare migrant.

Actodromas fuscicollis (Vieill.) [Bonaparte's Strandläufer]. WHITE-RUMPED SANDPIPER. Siksariak.—Most abundant sandpiper species in the migration.

Limonites minutilla (Vieill.) [Kleiner amerikanischer Zwerg Strandläufer]. LEAST SANDPIPER. Sullaijok.—Not a rare migrant and isolated breeding bird.

Ereunetes pusillus pusillus (L.) EASTERN AMERICAN DWARF SANDPIPER. [Ostlicher amerikanischer zwerg-Strandläufer]. SEMIPALMATED SANDPIPER.—Not rare migrant and a breeding bird now and then.

Calidris arenaria (L.) [Sanderling]. SANDERLING.—Rather rare migrant.

Totanus melanoleucus (Gm.) [Grosser Gelbschenkel]. GREATER YELLOW-LEGS. Nioluk, Kanaige.—Not a frequent migrant.

Tryngites subruficollis (Vieill.) [Kurzschnäbliger Uferläufer]. BUFF-BREASTED SANDPIPER.—Occasional visitor.

Tringoides macularius (L.) [Drossel-Uferläufer]. SPOTTED SANDPIPER. Sullaijok.—Occasional visitor.

Numenius hudsonicus Lath. [Hudsonischer Brachvogel]. HUDSONIAN CURLEW. Akpingek.—Not a frequent migrant.

Numenius borealis (Forst.) [Eskimo-Brachvogel] ESKIMO CURLEW. Akpingek.—Migrant.

Charadrius dominicus dominicus Müll. [Amerikanischer Gold-Regenpfeifer]. AMERICAN GOLDEN PLOVER. Ungilite.—Not a frequent migrant.

Aegialitis hiaticula semipalmata (Bp.) [Amerikanischer Sand-Regenpfeifer]. SEMIPALMATED PLOVER. Kullekulliak.—Rather frequent breeding bird and migrant.

Arenaria interpres (L.) [Steinwalzer]. TURNSTONE. Telligvak?—Rather rare migrant.

Canachites canadensis labradorius Bangs [Labrador Wald-Huhn].—LABRADOR SPRUCE PARTRIDGE. Akkigerlek.—Occasional visitor.

Lagopus lagopus lagopus (L.) [Moor-Schneehuhn]. WILLOW PTARMIGAN. Akkigervek.—Occasional visitor.

Lagopus rupestris rupestris (Gm.) [Felsen-Schneehuhn]. ROCK PTARMIGAN. Niksartok.—Rare breeding bird, but common migrant.

Accipiter atricapillus (Wils) [Schwarzkopfiger Habicht]. AMERICAN GOSHAWK. Kigarik.—Rare visitor.

Archibuteo lagopus sancti-johannis (Gm.) [Amerikanischer Raufuss Bussard]. ROUGH-LEGGED HAWK. Kennuajok.—Not a rare visitor and isolated breeding bird.

Hierofalco gyrfalco obsoletus (Gm.) [Labrador Jagdfalke]. BLACK GYRFALCON. Kigavik.—Very rare breeding bird.

Hierofalco gyrfalco candicans (Gm.) [Weisser Jagdfalke]. WHITE GYRFALCON. Kigavik.—Visitant and migrant.

Falco peregrinus anatum (Bp.) [Amerikanischer Wanderfalke]. DUCK HAWK. Kigavik.—Not a very rare visitor and occasional breeding bird. [P. 229].

Falco columbarius L. [Tauben-Falke]. PIGEON HAWK. Kigaviarsuk.—Not a rare visitor and breeding bird.

Asio accipitrinus accipitrinus (Pall.) [Sumpfohr-Eule]. SHORT-EARED OWL. Imaingertak.—Occasional breeding bird, more frequent at the migration time.

Asio magellanicus heterocnemis Oberh. [Labrador Uhu]. LABRADOR HORNED OWL. Ikketojok.—Rare visitor.

Nyctea nyctea (L.) [Schnee-Eule]. SNOWY OWL. Opik.—Regular visitant and occasion breeding bird.

Tyrannus tyrannus (L.) [Alpen-Lerche]. KINGBIRD. Koppernoakpak.—A single occurrence.

Otocoris alpestris alpestris (L.) [Alpen Lerche].

HORNED LARK. Koppernoakpak.—Not rare breeding bird.

Perisoreus canadensis nigricapillus Ridgw. [Labrador-Haher]. LABRADOR JAY. Koppernoaksoak.—Occasional visitor.

Corvus corax principalis Ridgw. [Nordischer Rabe]. NORTHERN RAVEN. Tullugak.—Not a rare breeding bird.

Carpodacus purpureus purpureus (Gm.) [Purpur-Gimpel]. PURPLE FINCH.—Reported occurrence.

Acanthis linaria rostrata (Coues) [Grosser dunkler Leinfink]. GREATER REDPOLL. Saksariak.—Common migrant.

Acanthis linaria fuscescens (Coues) [Labrador Leinfink]. LABRADOR REDPOLL. Saksariak.—A breeding bird on the border of the district.

Acanthis hornemanni hornemanni (Holb.) [Grosser heller Leinfink]. GREENLAND REDPOLL. Saksariak.—Migrant?

Passerina nivalis nivalis (L.) [Schnee-Ammer]. SNOW BUNTING. Amauligak.—Most widespread and also in places most abundant breeding bird.

Calcarius lapponicus lapponicus (L.) [Lerchensporn-Ammer]. LAPLAND LONGSPUR. Nessauligak.—Not a frequent breeding bird but common migrant.

Passerculus sandwichensis savanna (Wils.) [Steppen-Fink]. SAVANNAH SPARROW. Kutsertagvsek.—Occasional visitant.

Zonotricha leucophrys leucophrys (Forst.) [Weisskroniger Ammer-Fink]. WHITE-CROWNED SPARROW.—Occasional visitor.

Setophaga ruticilla (L.) [Amerikanischer Rot-schuwanz]. AMERICAN REDSTART.—One occurrence.

Anthus spinolettus pensilvanicus (Lath) [Pennsylvanischer Pieper]. PIPIT. Aviortok.—Frequent breeding bird and migrant.

Penthestes hudsonicus hudsonicus (Forst.) [Hudsonische Meise]. HUDSONIAN CHICKADEE. Atsaektatsajok.—Not a rare visitor.

Saxicola oenanthe leucorrhoa (Gm.) [Nordischer Steinschmatzer]. GREENLAND WHEATEAR. Erkogolek.—Rather rare breeding bird and migrant.

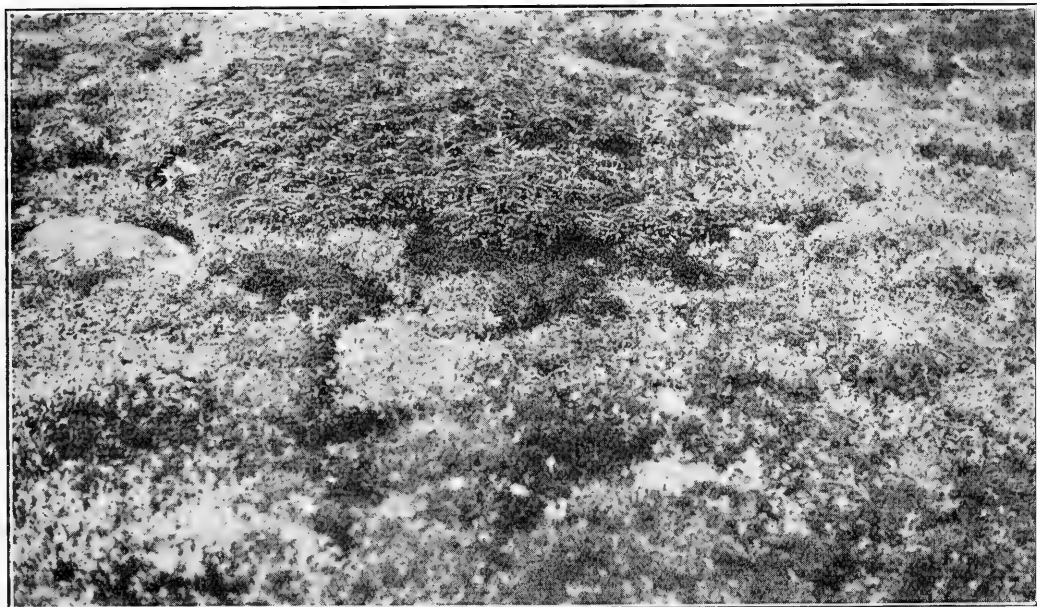
(Conclusion of this article follows in Volume 9)¹

¹ [of original.—ED.]

(To be continued)

**AN ANNOTATED LIST OF VASCULAR PLANTS COLLECTED ON THE
NORTH SHORE OF THE GULF OF ST. LAWRENCE, 1927-1930**

By HARRISON F. LEWIS



Extreme prostrate form of *Picea mariana*, f. *semiprostrata*, on St. Mary Islands. Characteristic Labrador "moss", made up of *Empetrum nigrum*, *Betula* sp., and fruticose lichens, in the foreground.

(Continued from Page 179)

GRAMINEAE

Hierochloë alpina (Sw.) R. & S.

Mutton Bay, July 9, 1927, weathered rocky crest, about 150 feet elevation. Rocky Bay, June 24, 1927. Blanc Sablon, July 10, 1928, gravelly hillside, west side of river.

Hierochloë odorata (L.) Wahlenb., var. *fragrans*. (Willd.) Richter.

Watshishu, June 6, 1928, cleft in rock on granitic island. Kegaska River, June 23, 1928, sandy open land above beach near mouth of river. Anse des Dunes, June 28, 1927, sandy side of a dune.

Muhlenbergia racemosa (Michx.) B.S.P.

St. Charles Island, August 27, 1928, fresh marsh beside marl bog.

PHLEUM PRATENSE L.

Natashquan, September 10, 1927, turf near house. Natashquan, September 11, 1927, gravelly roadside and turf near house.

**Agrostis stolonifera* L.

Thunder River, September 2, 1928, grassy, shaded brookside.

Agrostis stolonifera L., var. *compacta* Hartm.

Natashquan, August 17, 1928, upper part of sand beach. Recorded by St. John as *Agrostis alba* L., var. *maritima* (Lam.) G. F. W. Meyer.

Agrostis hyemalis (Walt.) B.S.P., var. *geminata* (Trin.) Hitchc.

Natashquan, August 5, 1927, damp hollow in dunes. Kegaska, September 4, 1927, wet marsh (fresh), beside brook. The Bluff Harbour, August 10, 1928, brackish marsh.

Agrostis borealis Hartm.

Salmon Bay, August 23, 1927, rocky summit of Caribou Island.

Calamagrostis canadensis (Michx.) Nutt., var. *robusta* Vasey.

Mingan, August 31, 1928, damp, sandy road. Salmon Bay, August 23, 1927, sandy areas on Caribou Island. Recorded by St. John as *Calamagrostis canadensis* (Michx.) Beauv.

Calamagrostis canadensis (Michx.) Nutt., var. *Langsdorfi* (Link) Inman.

Kegaska, August 14, 1928, foot of sandy bank at top of beach. The Bluff Harbour, August 1, 1927, fresh marsh on big island. Recorded

- by St. John as *C. Langsdorfii* (Link) Trin.
Calamagrostis neglecta (Ehrh.) Gärtn.
 Ste. Genevieve Island, August 23, 1928, crevices in flat limestone near shore. Watshishu, August 21, 1928, turf on outer island. Natashquan, August 6, 1927, bare, rocky hillside. The Bluff Harbour, August 1, 1927, fresh marsh on big island. Watagheistic Island, July 30, 1928, top of gravel beach. Little Mecatina Island, August 18, 1927, near houses at Cross Harbour.
- Ammophila breviligulata* Fernald.
 Natashquan, August 5, 1927, sand dunes.
- Cinna latifolia* (Trev.) Griseb.
 Betchewun, August 25, 1928, higher part of Gun Island (treeless).
- Trisetum spicatum* (L.) Richter, var. *Maidenii* (Gandoger) Fernald.
 Betchewun, August 26, 1928, foot-path.
- Trisetum spicatum* (L.) Richter, var. *pilosiglume* Fernald.
 Anse des Dunes, August 26, 1927, sandy hollow in dunes.
- Deschampsia flexuosa* (L.) Trin.
 Mingan, August 31, 1928, sandy plain covered with reindeer lichen. St. Mary Islands, July 24, 1927, turfy slope of western island. Salmon Bay, August 23, 1927, mossy area in shade of larches on Caribou Island.
- Danthonia spicata* (L.) Beauv.
 Mingan, August 31, 1928, damp, sandy road. Natashquan, August 5, 1927, sod beside foot-path. Recorded by St. John from Mingan only. Range extension, 99 miles E.
- **Spartina Michauxiana* Hitchc.
 Mingan, August 30, 1928, non-saline sand flat beside Mingan River. This species was recorded by D. N. Saint-Cyr from riviere Pentecote basin: August 28, 1884. St. John found the cover containing the plant marked riviere Pentecote, but a ticket under the plant saying "lac St. Jean, A.13/88", and relegated the record to hypothetical status, apparently considering riviere Pentecote or Pentecost River too far east to fit in with the known range of this plant. The present collection extends the known range of the plant 145 miles east of Pentecost River and thereby greatly increases the probability of the correctness of Saint-Cyr's record.
- Spartina alterniflora* Loisel.
 Betchewun, August 25, 1928, salt marsh.
- Catabrosa aquatica* (L.) Beauv.
 St. Mary Islands, July 24, 1927, damp, mossy foot-path, on western island. St. Augustin Island, July 19, 1928, wet hollow in rock near dwelling. Recorded by St. John "from iles Netagamiou eastward to the strait of Belle Isle". Range extension, 10 miles W.
- Melica striata* (Michx.) Hitchc., f. *albicans* Fernald.
 Betchewun, August 26, 1928, wood road.
- Poa eminens* J. S. Presl.
 Boat Islands, July 27, 1927, wet turf beside pool. Salmon Bay, August 23, 1927, upper part of sandy beach of Caribou Island.
- Poa nemoralis* L.
 Blanc Sablon, July 11, 1928, turf on gneiss plain, east side of river.
- Poa palustris* L.
 Wolf Bay, August 13, 1927, door-yard at head of bay.
- Poa pratensis* L.
 Mingan, August 31, 1928, sandy roadway, and September 4, 1929, sandy wood road. Havre St. Pierre, September 11, 1929, turf in yard. Natashquan, August 5, 1927, crest of bank of sand. St. Mary Islands, July 24, 1927, gravelly foot-path on western island, and July 25, 1927, turf near lighthouse dwelling. Blanc Sablon, July 11, 1928, sand near shore, east side of river.
- Glyceria canadensis* (Michx.) Trin.
 Thunder River, September 2, 1928, rich river bank. Mingan, August 31, 1928, pond border. Kegaska, September 4, 1927, bank of brook.
- Glyceria striata* Hitchc., var. *stricta* (Scribn.) Fernald.
 Thunder River, September 2, 1928, grassy, shaded brookside. Wolf Bay, August 13, 1927, wet, mossy wood-road. Recorded by St. John as *G. nervata* Trin., var. *stricta* Scribn.
- **Glyceria borealis* (Nash) Batchelder.
 Natashquan, August 18, 1928, dried-up pond bed in sandy woods. Romaine, August 11, 1928, sandy shore at mouth of brook.
- Puccinellia paupercula* (Holm) Fernald and Weatherby.
 The Bluff Harbour, August 1, 1927, brackish marsh on big island.
- Festuca rubra* L.
 Natashquan, August 5, 1927, sod beside sandy path. Yankee Harbour, July 28, 1927, shallow crevice in rock near shore.
- Festuca vivipara* (L.) Huds.
 Lourdes de Blanc Sablon, August 26, 1927, gravelly slope. Recorded by St. John as *F. ovina* L., var. *vivipara* L.
- Bromus ciliatus* L.
 Seven Islands, September 12, 1928, border of woods at top of raised boulder beach on Manowin Island. Thunder River, September 2, 1928, open mixed woods on sandy soil.

Kegaska, August 12, 1927, sand dunes near settlement.

**BROMUS INERMIS* Leyss.

Betchewun, August 26, 1928, near dwelling near shore.

AGROPYRON REPENS (L.) Beauv.

Betchewun, August 26, 1928, open clearing. Natashquan, August 5, 1927, sandy churchyard, and sandy riverbank. Kegaska, August 14, 1928, foot of sandy bank at top of beach.

**Agropyron trachycaulum* (Link) Malte, var. *glaucescens* Malte in sched.

St. Genevieve Island, August 23, 1928, limestone shingle at top of beach.

**Agropyron trachycaulum* (Link) Malte, var. *Richardsoni* (Schrad.) Malte in sched.

Mascanin, August 20, 1928, sheltered bank of small stream at tide water.

HORDEUM JUBATUM L.

Natashquan, August 5, 1927, crest of bank of sand.

Elymus arenarius L., var. *villosus* E. Mey.

St. Mary Islands, July 25, 1927, sandy beach beside harbour, on western island.

CYPERACEAE

**Dulichium arundinaceum* (L.) Britton.

Thunder River, September 2, 1928, tidal mud bank (fresh) near mouth of river.

Eleocharis palustris (L.) R. & S., var. *major* Sonder.

Natashquan, August 5, 1927, damp bed of dried-up pond. Recorded by St. John as *Eleocharis palustris* (L.) R.Br.

Eleocharis glaucescens (Link) Schultes.

Wolf Bay, August 13, 1927, saline shore between tide marks at head of bay. Recorded by St. John, as *E. palustris* (L.) R.Br., var. *glaucescens* (Willd.) Gray, from "Etamamiou to strait of Belle Isle". Range extension, 8 miles W.

**Eleocharis uniglumis* (Link) Schultes.

Natashquan, August 7, 1927, brackish marsh near mouth of Little Natashquan River. Bradore Bay, June 30, 1927, saline shore at head of bay.

Eleocharis acicularis (L.) R. & S.

Natashquan, August 18, 1928, border of dried-up pond bed.

Eleocharis tenuis (Willd.) Schultes.

Havre St. Pierre, August 28, 1928, fresh bog beside limestone shore.

**Scirpus pauciflorus* Lightf.

Mingan, August 31, 1928, brackish mud flat.

Scirpus caespitosus L., var. *callosus* Bigel.

Harrington Harbour, June 20, 1927, damp foot-path. Mistanoque Island, June 24, 1927. Bradore Bay, June 28, 1927, damp foot-path.

Recorded by St. John as *Scirpus caespitosus* L. *Scirpus hudsonianus* (Michx.) Fernald.

Natashquan, August 12, 1929. Recorded by St. John only from calcareous regions of Mingan Islands and Labrador side of Strait of Belle Isle.

Scirpus rufus (Huds.) Schrader.

Betchewun, August 26, 1928, rocky limestone shore. Kegaska, August 10, 1929, upper border of mussel-shell beach on Kegaska Island. Reported by St. John from Ile à la Chasse, Mingan Islands only. Range extension, 82 miles E.

**Scirpus campestris* Britton, var. *paludosus* (A. Nelson) Fernald.

St. Charles Island, August 27, 1928, brackish marsh.

Scirpus rubrotinctus Fernald.

Kegaska River (mouth), August 3, 1927, damp, grassy area near shore. Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland. La Tabatière, July 21, 1928, wet hollow in door-yard. Bradore Bay, August 27, 1927, grassy brookside on calcareous sandstone.

Scirpus atrocinctus Fernald.

Natashquan, August 18, 1928, damp, open hollow in sandy woods.

Scirpus atrocinctus Fernald, var. *brachypodus* Fernald.

Harrington Harbour, July 25, 1928, wet hollow on sand and clay bluff beside shore of mainland.

Eriophorum Chamissonis C. A. Meyer.

Natashquan, August 7, 1927, and June 28, 1928, wet fresh marsh beside Little Natashquan River. The Bluff Harbour, June 13, 1927, acid bog on granite island. Lake Island, July 29, 1927, marsh near shore. Yankee Harbour, June 18, 1927, wet bog on granite island. Mutton Bay, July 9, 1927, borders of shallow pond near shore. St. Augustin Island, July 19, 1928, wet moss beside pool. Bradore Bay, June 30, 1927, tundra pool at head of bay.

Eriophorum spissum Fernald.

Natashquan, May 24, 1928, tundra. The Bluff Harbour, June 14, 1927, shallow turf. Harrington Harbour, June 20, 1927, open, wet bog. Blanc Sablon, June 28, 1927, flat, boggy turf at low level. Recorded by St. John as *Eriophorum callitrix* Cham. One of the first plants to bloom in spring, being seen in bloom at Natashquan on May 15, 1928.

**Eriophorum spissum* Fernald, var. *erubescens* Fernald.

Kegaska River (mouth), June 23, 1928, open tundra, rather common, with typical *E. spissum*.

- Harrington Harbour, July 5, 1928, border of small tundra pool on high part of Hospital Island. Rocky Bay, July 17, 1928, granitic crest, uncommon.
- Eriophorum gracile* Roth.
Natashquan, August 5, 1927, dried-up pond bed. Blanc Sablon, July 11, 1928, pool with 3 inches of water on lowland near Blanc Sablon River, east of river. Reported by St. John from Blanc Sablon only. Range extension, 231 miles W.
- Eriophorum tenellum* Nutt.
Thunder River, September 2, 1928, quaking bog. Havre St. Pierre, August 28, 1928, wet bog. Reported by St. John from Blanc Sablon only. Range extension, 363 miles W.
- Eriophorum angustifolium* Roth.
Natashquan, June 28, 1928, border of pond in marsh beside Little Natashquan River. Kegaska River (mouth), June 23, 1928, damp border of small pond. Rocky Bay, July 17, 1928, bog on hillside.
- Eriophorum angustifolium* Roth., var. *majus* Schultz.
The Bluff Harbour, August 1, 1927, border of fresh marsh on big island. Aylmer Sound, August 18, 1927, sphagnum bog on Little Mecatina Island. Bradore Bay, June 30, 1927, wet tundra near head of bay.
- **Eriophorum viridi-carinatum* (Engelm.) Fernald.
Havre St. Pierre, August 28, 1928, wet bog. Lake Island, July 29, 1927, wet marsh of fresh water near shore. Aylmer Sound, August 18, 1927, bog on rocky crest on Little Mecatina Island.
- Rynchospora alba* (L.) Vahl.
St. Charles Island, August 27, 1928, sphagnum on border of marl bog. St. John speaks of it as "Rare, bogs in the Laurentian area as far east as Natashkwan", but this collection is from a limestone island.
- **Carex incurva* Lightf.
St. Augustin, June 22, 1927, and July 19, 1928; both collections from one small island in the group called "St. Augustin Square". Abundant on this island, and seen on two other islands in this group, but not seen elsewhere.
- Carex projecta* Mackenzie.
Mascanin, August 20, 1928, damp spot near shore of granitic island. Harrington Harbour, July 25, 1928, wet hollow on sandy shore of mainland.
- **Carex Crawfordii* Fernald.
Mingan, August 31, 1928, sandy road. Natashquan, August 5, 1927, sod by roadside. St. Mary Islands, July 27, 1928, foot-path.
- Harrington Harbour, July 31, 1928, damp ground beside path.
- Carex aenea* Fernald.
Mingan, August 31, 1928, sandy road.
- Carex gynocrates* Wormskj.
Havre St. Pierre, August 28, 1928, fresh bog beside limestone shore. St. Charles Island, August 27, 1928, boggy woods.
- Carex echinata* Murr., var. *angustata* (Carey) Bailey.
Natashquan, August 5, 1927, damp pond margin, and August 17, 1928, border of brackish marsh beside Little Natashquan River.
- Carex interior* Bailey.
St. Charles Island, August 27, 1928, boggy woods. Recorded by St. John as *C. scirpoides* Schk.
- **Carex canescens* L.
Lake Island, July 18, 1927, turfy border of tundra pool. La Tabatière, July 21, 1928, path through woods. Recorded from St. Paul by W. A. Stearns, but given only hypothetical status by St. John.
- Carex canescens* L., var. *disjuncta* Fernald.
Natashquan, August 18, 1928, damp hollow, in sandy woods. Fog Island, August 9, 1928, shallow, sodded depression.
- Carex brunnescens* (Pers.) Poir.
Bradore Bay, June 30, 1927, foot-path through woods near head of bay.
- **Carex brunnescens* (Pers.) Poir., var. *sphaerostachya* (Tuckerm.) Kükenth.
Mingan, August 31, 1928, sandy woodland road. Bradore Bay, June 28, 1927, damp foot-path on calcareous sandstone.
- Carex tenuiflora* Wahlenb.
Lake Island, July 29, 1927, wet marsh of fresh water near shore. Reported by St. John from Blanc Sablon only. Range extension, 154 miles W.
- Carex trisperma* Dewey.
Wapitagan Island, August 6, 1928, damp, mossy hillocks. La Tabatière, July 21, 1928, moss beside woodland path.
- Carex glareosa* Wahlenb., var. *amphigena* Fernald.
Natashquan, May 24, 1928, in anthesis in roadside turf. Kegaska River (mouth), June 23, 1928, shallow turf on rocks near shore. The Bluff Harbour, June 14, 1927, damp edge of bog on granite island. St. Augustin, June 22, 1927; caespitose clumps in shallow turf on granitic island in group called "St. Augustin Square".
- Carex norvegica* Willd.
The Bluff Harbour, August 1, 1927, fresh marsh on big island. St. Augustin Island, July 19, 1928, wet, turfy pond-border.

Carex disperma Dewey.

Mingan, August 30, 1928, damp bog on Ile du Havre. Blanc Sablon, July 11, 1928, in moss near bank of Blanc Sablon River, west side, near falls. Recorded by St. John as *Carex tenella* Schk.

Carex diandra Schrank.

Betchewun, August 25, 1928, tussock in dried-up bed of small pond on Wood Island. Natashquan, August 5, 1927, damp pond margin. Kegaska, August 14, 1928, wet marsh on Green Island. Blanc Sablon, July 11, 1928, in 3 inches of water in pool on lowland near Blanc Sablon River, east side of river. Reported by St. John from Blanc Sablon only. Range extension, 293 miles W.

Carex stipata Muhl.

Natashquan, August 17, 1928, upper border of brackish marsh beside Little Natashquan River. Harrington Harbour, July 25, 1928, wet hollow on sandy shore of mainland. La Tabatière, July 21, 1928, damp turf near cove. Recorded by St. John from Pointe-aux-Esquimaux (Havre St. Pierre) only. Range extension, 221 miles E.

Carex maritima O. F. Müller.

Kegaska, August 14, 1928, wet meadow. La Tabatière, July 7, 1927, turfy bank beside pool at shore. Lourdes de Blanc Sablon, June 29, 1927, brackish pool on gneiss near shore.

Carex salina Wahlenb., var. *lanceata* (Dewey) Kükenth.

The Bluff Harbour, August 1, 1927, salt marsh on big island. Coacocho, June 19, 1928, sodded shore of head of bay. Whale Head, July 10, 1927, sod on border of pool in saline marsh at Jas. Mauger's harbour. Mainland west of Net Island, Old Fort Archipelago, July 5, 1927, edge of brackish pool at shore.

Carex salina Wahlenb., var. *kattegatensis* (Fries) Almqu.

Natashquan, August 18, 1928, wet marsh beside Little Natashquan River. Wapitagan Island, August 6, 1928, damp swale near shore. St. Augustin Island, July 19, 1928, damp, mossy pond-border. Dukes Island, July 7, 1928, upper part of sandy beach. Bradore Bay, June 30, 1927, saline shore at head of bay. Blanc Sablon, July 10, 1928, sandy hillside, west side river.

Carex subspathacea Wormskj.

Whale Head, July 10, 1927, sod in saline marsh at head of cove at Jas. Mauger's harbour.

Carex aquatilis Wahlenb.

Mingan, August 30, 1928, damp bog on Ile du Havre. Natashquan, August 18, 1928, damp, pastured roadside. Romaine, August

11, 1928, top of sandy shore. Pointe au Maurier, July 13, 1927, vegetation-choked brook. St. Mary Islands, July 24, 1927, damp swale on western island. Salmon Bay, August 23, 1927, in 6 inches of water at pond-border on Caribou Island. Bradore Bay, July 13, 1928, border of pond on tundra. Blanc Sablon, July 11, 1928, damp hollow on gneiss plain, east side of river.

Carex rigida Good.

Thunder River, September 2, 1928, granitic crest. Mutton Bay, July 9, 1927, rocky crest at about 500 feet elevation. Net Island, July 4, 1927, rocky summit of island, at about 300 feet elevation. Bradore Bay, June 28, 1927, damp turf on calcareous sandstone, and July 13, 1928, summit in pre-Cambrian formation, at about 500 feet elevation. Anse des Dunes, June 28, 1927, damp foot-path on calcareous sandstone. Recorded by St. John from Archipel du Petit-Mécatina: Harrington, and Archipel du Vieux-Fort: ile Herbée. Range extension 242 miles W. and 32 miles E.

Carex lenticularis Michx.

Natashquan, August 18, 1928, damp hollow in sandy woods. Anse des Dunes, July 11, 1928, in tufts on bare sand.

**Carex Goodenowii* J. Gay.

Thunder River, September 2, 1928, rich river bank. Mingan, August 30, 1928, sandy bank of Mingan River. Natashquan, June 28, 1928, upper border of marsh beside Little Natashquan River. Given by St. John as hypothetical.

Carex aurea Nutt.

St. Genevieve Island, August 23, 1928, crevices in flat limestone, south shore of island. Observed on Ile du Havre, Mingan, and found to be common along rocky, limestone shore of mainland at Betchewun.

Carex pauciflora Lightf.

Romaine, August 11, 1928, open muskeg. Pointe au Maurier, July 13, 1927, vegetation-choked brook. Dukes Island, July 7, 1928, damp, mossy valley on tundra.

Carex leptalea Wahlenb.

Mingan, August 30, 1928, damp sphagnum on Ile du Havre.

Carex atratiformis Britton.

Betchewun, August 26, 1928, grassy clearing. Blanc Sablon, July 10, 1928, among bushes on mossy hillside, west side of river. Recorded by St. John as *C. atrata* L., var. *ovata* (Rudge) Boott.

**Carex polygama* Schkuhr.

Betchewun, August 26, 1928, open, dried-up bog. Bradore Bay, July 11, 1928, damp, sandy slope.

Carex livida (Wahl.) Willd., var. *Grayana* (Dewey) Fernald.

Blanc Sablon, July 11, 1928, in 3 inches of water in pool on lowland beside Blanc Sablon River, east side of river. Recorded by St. John as *C. livida* (Wahl.) Willd.

Carex vaginata Tausch.

Betchewun, August 26, 1928, in moss in damp coniferous woods. Blanc Sablon, July 11, 1928, mossy bank on west side of Blanc Sablon River, near falls.

Carex paupercula Michx.

Natashquan, August 5, 1927, roadside sod. Romaine, August 11, 1928, edge of muskeg area.

Carex limosa L.

St. Charles Island, August 27, 1928, sphagnum beside marl bog. Natashquan, June 28, 1928, border of pond in marsh beside Little Natashquan River. Romaine, August 11, 1928, open muskeg. Pointe au Maurier, July 13, 1927, vegetation-choked brook. Blanc Sablon, July 11, 1928, in 3 inches of water in pool on lowland near Blanc Sablon River, east side of river.

Carex rariflora Sm.

Mascanin, August 20, 1928, small salt marsh on island. Natashquan, May 24, 1928, in anthesis in roadside turf. Kegaska River (mouth), June 10, 1927, turfy slope of granitic island. Yankee Harbour, July 28, 1927, turfy slope. Harrington Harbour, June 20, 1927, damp foot-path. St. Augustin, June 22, 1927, shallow turf on granitic island in group called "St. Augustin Square". Mistanoque Island, June 24, 1927. Bradore Bay, June 28, 1927, damp foot-path. Blanc Sablon, July 11, 1928, tundra, west side of river.

Carex eburnea Boott.

Betchewun, June 5, 1927, grassy area near shore, and August 26, 1928, wood road.

Carex concinna R. Br.

St. Charles Island, August 27, 1928, top of limestone shingle beach. Betchewun, June 5, 1927, grassy area on limestone near shore. Ste.

Genevieve Island, June 7, 1927, top of limestone shingle beach.

Carex flava L.

Betchewun, August 25, 1928, tuft in dried-up pond.

Carex lepidocarpa Tausch.

St. Charles Island, August 27, 1928, fresh marsh beside marl bog. Recorded by St. John as *C. flava* L., var. *elatior* Schlecht.

**Carex lasiocarpa* Ehrh.

Wolf Bay, August 13, 1927, marshy pond border.

Carex Oederi Retz., var. *pumila* (Coss. & Germ.) Fernald.

Betchewun, August 25, 1928, bare limestone near shore. Natashquan, August 5, 1927, damp sand flat. Recorded by St. John from "Mingan seigniory: Betchouane" only. Range extension, 62 miles E.

Carex capillaris L.

Betchewun, August 26, 1928, damp area in clearing. Ste. Genevieve Island, August 23, 1928, steep mossy bank just above beach. Blanc Sablon, July 10, 1928, among bushes on mossy hillside, west side of river.

Carex oligosperma Michx.

Natashquan, August 17, 1928, wet slough.

Carex miliaris Michx.

Blanc Sablon, July 10, 1928, damp pond margin, west side of river. Recorded by St. John as *C. saxatilis* L., var. *rhomalea* Fernald.

Carex vesicaria L.

Natashquan, August 5, 1927, damp pond margin, and August 18, 1928, damp hollow in sandy woods.

**Carex vesicaria* L., var. *jejuna* Fernald.

Wolf Bay, August 13, 1927, marshy pond border near head of bay.

**Carex vesicaria* L., var. *dichroa* Anderss.

Natashquan, August 18, 1928, border of dried-up pond bed in sandy woods.

**Carex rostrata* Stokes.

Harrington Harbour, August 1, 1928, damp hollow on granitic rock.

(To be continued)

NOTES AND OBSERVATIONS

CHIMNEY SWIFTS.—A few years ago we built a new ell to the house. The chimney was built of bricks from a huge old fire-place which had been torn down. They were smoked on one side but were not encrusted with creosote. As the chimney was not used the first summer, a pair of swifts built a nest in it. I heard the fluttering of the adult birds up and down the chimney and the

shrill twittering of the young ones for a time. Then the fluttering and twittering ceased and I wondered what was wrong. As the chimney ended three feet below the upper ceiling and a stovepipe entered it near the bottom, it was easy to ascertain what was the matter. The nest was in the bottom of the chimney with four tiny dead birds in it. I questioned whether the young ones

had been killed by the fall or died of hunger afterwards, but I think if they had been alive after they dropped the parents could easily have followed and fed them. I was confirmed in this opinion by a later experience.

A second nest was built and again four eggs were laid. Before the eggs hatched a heavy rain-storm came and the second nest dropped. The glue which had fastened it to the chimney adhered to the nest and peeled off from the bricks in flakes. I wondered why both nests fell; it was not necessarily the rain, because nests must often get wet. Was it because the surface of the bricks was not rough enough to hold the glue? or was it because the birds were a young pair and not experienced builders? The fact that the chimney had not been built in before made me think that they might have been young.

I have often found nests in the bottoms of two other chimneys but never with young birds in or near them. They usually come down in winter or after the birds have finished using them. Sometimes I find an unhatched egg and occasionally a dead bird, but it is dead because it cannot get out of the chimney. The opening usually has to be filled with something during the summer to keep the mortar, bits of brick, soot, and dirt that the birds shake down from tumbling out of the fireplace on to the rugs.

One summer, since a chimney was left open with nothing but a wire screen in front of the fire-place, we had a regular succession of swifts young and old, fluttering out into the sitting room. Morning after morning I had to catch an adult bird and put it out of doors. One morning there were two hanging on the curtains. A young one also kept tumbling down and I concluded that it must be the same young bird each time. The first time it fell it was taken up on the roof and placed between two loose bricks on the top of the chimney. In a day or two it was again flopping around the sitting-room floor and making enough noise for two or three birds. That time it was taken upstairs and deposited in a stove-pipe hole and the cover replaced. It set up a twittering for the parent birds immediately. Twice afterwards this had to be repeated, but as I did not find any dead bird in the chimney it must have reached maturity.

In thinking the matter over it seemed to me that the young bird might have had weaker feet than the others. If it kept slipping down the chimney and the parents had to follow to feed it they might get so far down that they could not see the light from the bottom and so get out into the room. In other years when a chimney has been left open

an adult bird would get out into a room perhaps once in a summer.—SUSAN K. SQUIRES.

THE MOCKINGBIRD IN TORONTO.—A Mockingbird was observed in the neighbourhood of my home from November 20, 1927, till December 1, 1927. The only birds with which the Mockingbird might be confused are the shrikes (in colouration), and the Catbird (in actions). The Mockingbird lacks the black ear patches of the shrikes, and has considerable white both on the wings and tail which the Catbird, of course, has not. Consequently there is little chance of mistake. The following observations were made at the time.

It was first seen on November 20th. It flew into a small apple tree about seventy feet away, perched for a moment, and flew away again. I thought it was a shrike at the time but wondered why some sparrows in the tree showed so little concern. I did not have glasses at the time and only had a fleeting glimpse of it as it flew in and out again. On the 21st and 24th I heard it. On the 25th I had my first satisfactory view of it with $\times 5$ field glasses. It was sitting in a lilac bush about 150 feet to the south, preening its feathers. The sun was shining on it from the west (4 p.m.). The white wing and tail patches and lack of black ear patches were noticed. Many English sparrows were interested spectators, some in the same bush. The only note noticed was a sharp click, (referred to in Forbush, *Birds of Massachusetts*, as a loud "smack"). This note was heard several times a day on eight of the nine days that it was noticed. It was accompanied by much flirting of the tail. The bird was very restless; its actions were very similar to those of a Catbird.

In December of the same year a bird which was taken to be a Mockingbird was noticed on several occasions at their feeding board in North Toronto by Mr. Jared McCutcheon and his mother. I did not see this bird.—J. MURRAY SPEIRS.

CAROLINA WREN BREEDING AT TORONTO.—The Carolina Wren (*Thryothorus l. ludovicianus*) may quite appropriately be designed as a comparatively rare bird in Ontario, the few localities at which the species has been found being chiefly in the south-western counties. The only known record of the bird nesting in the province was made at Point Pelee in 1905 when Professor A. B. Klugh and Mr. P. A. Taverner found a brood of four fledglings on September 5 and secured specimens. The young birds were apparently just out of the nest (*Auk*, 1906).

At Toronto, previous to 1930, there were only

two records of this wren, one taken on May 20, 1917, by Mr. J. H. Fleming and one taken on October 17, 1923, by Mr. J. L. Baillie, Jr. Both were males.

On February 23, 1930, Mr. F. H. Emery, of the Brodie Club, and the writer discovered a pair of Carolina Wrens in a sheltered ravine at the extreme north end of High Park, to make the third known record for the Toronto region. The birds, after being disturbed, skilfully concealed themselves in the rank growth of a gray alder thicket, incidentally an ideal spot in winter for tardy summer birds to find food and shelter.

The male very obligingly entertained us with an exhibition of his musical repertoire, surprising us with the remarkable versatility of his stock-in-trade, the astonishing feature of this diminutive wren's vocal ability being the powerful, rich, thrush-like voice it possessed, entirely out of proportion, we thought, to the size of the bird. Probably the commonest phrase delivered might be rendered thus—"tea-kettle, tea-kettle, tea-kettle, tea-kettle, and less frequently—"cherry, cherry, cherry, cherry", the latter sung with a downward inflection. Mr. Emery was especially interested in studying the song variations and has kindly permitted me to quote the following from his diary. "The 'twee, twee, twee, twee' phrase of the Carolina Wren's song was more frequently heard in the early spring. This is probably the 'sweetheart' song referred to by the late Professor E. H. Forbush in his 'Birds of Massachusetts,' Vol. 3. Another rather common phrase suggested 'chittle, chittle, chittle, chittle,' ascending in intensity. A number of other variations were heard, such as—"tweeer or tswur, keer, kweer, krist, kristee, kuaydle, cheverty and teckaware."

After the first day of their discovery the wrens tolerated not a few visitors, chiefly local naturalists and others interested in making the acquaintance of the distinguished bird-guests. Usually the birds were to be found in close proximity to the alder thicket or amid the maze of twigs and branches of a convenient brush-heap. During the weeks that followed no evidence was found of the pair nesting there although their movements received close attention.

On the morning of May 18, 1930, however, the male had shifted his position to the adjoining ravine approximately two hundred yards from its usual and customary haunts, and was singing loudly apparently at home. Cautiously approaching the inimitable songster for a more satisfactory view, I discerned the female as she stealthily flew to an old up-turned stump nearby. A careful scrutiny of the stump's rugged exterior

revealed the wren on the nest inconspicuously concealed at the bottom of a ten-inch depression among the roots and earth and twenty inches above the ground level. The female, quite unabashed, regarded me with cold disfavour from the seclusion of her retreat. I gently placed my hand over the entrance to her domicile. This was obviously an unprecedented gesture of intimacy not to be countenanced, for at this point the inevitable occurred. The indignant bird darted upward into my waiting hand. A cursory inspection of the now thoroughly frightened wren satisfied the human predator, whereupon the bird was given her liberty. Shortly afterward she was seen to return to her charge. An examination of the nest proved it to be composed mainly of fine twigs and grasses and to contain two heavily-incubated eggs and one newly-hatched young. The eggs were white and slightly larger than those of the House Wren, being strongly marked with brownish spots at the larger end.

The stump, oddly enough, was situated only a few feet from the foot of a steep bank facing Bloor Street, a very convenient place for nearby residents to dispose of all manner of rubbish, tin cans, etc. The clatter and noise made by the descending debris one would suppose would prove an intolerable condition to a wren family.

On the morning of May 24 we again visited the wrens to see how things were and found to our dismay that the nest was in a deserted condition. The three unfledged young occupied the nest but were cold and lifeless and the female was nowhere to be seen, although the male in a nearby tree sang rather half-heartedly. The nature of the calamity which had overtaken the wren family could only be conjectured. Cats, we know, abound in the neighbourhood. Perhaps the female met her fate on the nest. The male bird evidently disappeared soon afterward as it was not noted after the end of May.

The nest and young were collected and subsequently presented to the Royal Ontario Museum of Zoology. We believe the nest to be the first ever found in Canada.—ROBERT V. LINDSAY.

LITTLE BLUE HERON IN ONTARIO IN MARCH.—In the *Toronto Globe* of May 20, 1929, there appeared an article stating that a "Lesser White Egret" had been captured in a muskrat trap at Atherley Narrows, at the north end of Lake Simcoe (sixty miles north of Toronto) in the month of March previous and turned over to Mr. Peter Stevenson, District Superintendent of the Department of Game and Fisheries at Orillia. Mr. Stevenson had the bird mounted and sent to

the Department at Toronto where the writer examined it on May 3, 1930, and identified it as an immature (white phase) Little Blue Heron (*Florida caerulea*).

Mr. Stevenson informs me by letter that the bird was trapped by Mr. George Moase on March 28, 1929. The specimen is now in the collection of the Royal Ontario Museum of Zoology.

The bird is practically all white but there is a certain amount of slate-grey in its plumage—the primary tips, edges of primaries, certain feathers of the back, most of the crown and parts of the occipital and long back plumes being of this colour. This first nuptial, mostly white, plumage is evidently worn by immatures of this species until they are almost a year old or less, when slate-coloured feathers begin to appear in their plumage, such as in the specimen under consideration. Mr. A. C. Bent¹ remarks that he has seen this white plumage as late as May 1st. The following measurements were taken from the dried skin on the date of examination—wing, 9¾ inches, bill 2¾ inches, and tarsus 3¼ inches.

This is apparently the third locality at which this bird has been taken in Ontario and in addition to being the most northerly record, the present specimen is the first to be detected in the spring. The other two localities are in the Lake Erie region, viz., at Aylmer, Elgin county² (four birds of the white phase, two of which were

¹ A. C. BENT, *Life Histories of North American Marsh Birds*, 1926, p. 180.

² J. H. AMES, *Auk*, 19: 94, 1902.

³ B. H. SWALES and P. A. TAVERNER, *Auk*, 24: 139-40, 1907.

⁴ P. A. TAVERNER, *Auk*, 26: 83, 1909.

taken on August 15, 1901) and at Point Pelee, Essex county³ (one in white phase taken in September, 1904).

It is of interest to recall that Mr. P. A. Taverner has recorded⁴ the capture of one in the full plumage of the adult at Detroit, Michigan, on May 2, 1882.—JAS. L. BAILLIE, JR.

A GRAY RED SQUIRREL.—On May 8, 1931, I observed a gray individual of the Red Squirrel (*Sciurus hudsonicus*) in a much-frequented section of conifers in High Park, Toronto. The whole of the upper parts including the head and tail were of a beautiful slate-gray colour, the individual hairs being banded with blackish and white giving a pepper-and-salt effect as in the normal pelage. There was a slight suggestion of light brownish-gray on the lower back and upper side of the tail but the general tone of the pelage was decidedly gray.

The only other individual I have ever seen exhibiting this colour phase is a male taken by A. A. Wood at Caradoc, Ontario, on January 8, 1925, and now in the Royal Ontario Museum of Zoology.

The animal was at once noticeable on account of its colour. It seemed to me unlikely that anyone could have passed it without being struck by its different coat, and yet Toronto naturalists have scoured that region regularly for years and no one had reported anything new in the Red Squirrel world. It seems likely that the animal was a comparatively new arrival, possibly a young one of 1930. Is this a distinct colour phase, is it a condition of immaturity or what? Perhaps some mammalogist can enlighten us.—JAS. L. BAILLIE, JR.

BOOK REVIEWS

REPORT ON A GAME SURVEY OF THE NORTH CENTRAL STATES. *Made by Aldo Leopold for the Sporting Arms and Ammunition Manufacturers' Institute under direction of its Committee on Restoration and Protection of Game. Madison, Wisconsin, 1931.**

This publication of some 300 pages is a condensed and unified summary of reports made by the author to the Sporting Arms and Ammunition Manufacturers' Institute, in which he presents the results of a "Game Survey" made by him, during 1928-1930, in the states of Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana and Ohio. The forms of game chiefly dealt with are Bob-white, Rabbits, Pheasants,

Hungarian Partridge, Ruffed Grouse, Sharp-tailed Grouse, Prairie Chicken, Wild Turkeys, White-tailed Deer, and Water-fowl. Although the area covered by the Survey is non-Canadian and presents in large part a condition of intense agricultural activity that is paralleled in only a comparatively small part of Canada, yet it is thought that this work abundantly merits a review in *The Canadian Field-Naturalist* because it is in such large measure a new and profitably stimulating type of publication on game matters.

The author not only studied game conditions at first hand in the states mentioned, but with commendable industry, through correspondence and interviews, amassed, assorted, and made available the views of great numbers of scattered residents of the region, who, as sportsmen,

* Copies obtainable from American Game Association, Investment Bldg., 15th and K Streets, N.W., Washington, D.C., at \$1.00 each postpaid.

conservationists, farmers, game wardens, scientists, or others having to do in some capacity with local game problems, had obtained useful information concerning them. He also made use of the literature on the subject and of various official records, although perhaps somewhat hurriedly.

As a result of his efforts he is able to present an immense amount of valuable information relating to the principal game species of the region with which he is dealing. This information is set forth in a clear and orderly fashion that greatly increases its value, and is frequently presented not only in the text, but by means of maps, charts, and diagrams. The present problems involved in maintaining a huntable supply of game creatures in an area of this kind are clearly delineated and intelligently considered.

The relations of hunting to other principal land uses in these states, such as agriculture and lumbering, are discussed in detail and given the prominence that they merit. The importance of these relationships, as compared with those details of hunting regulations that commonly are given much more of sportsmen's attention is repeatedly emphasized and in this lies one of the principal contributions to game conservation made by this volume. The idea of Game Management, including adequate provision of suitable environment, as the essential background of continued hunting is thoroughly established by the author. The practice of such Game Management involves scientific research, competent, continuous administration, and the co-operation of the land-owner and the sportsman.

The entire book is a mine of useful facts and stimulating ideas and should be read by every conservationist and sportsman, whether concerned directly with similar environmental conditions or not.

It is, of course, unfortunate that the state "surveys" on which the book is based had to be made so hurriedly. Those responsible for the carrying out of this work, while deserving much credit for initiating this new line of endeavour, ought to realize that to allow any man only a month or two in which to dash about over a large

state and "survey" its game supply and game problems is not conducive to desirable thoroughness. As a result of this condition, much of the work, admirable as it is in many respects, rests on an uncertain and untested foundation, because it is necessarily built so largely on the opinions and memories of untrained observers. The marvel is that the author has succeeded in producing a report so well worth while in spite of this handicap.

The incomplete and temporary character of the important records of many state game commissions, as revealed by this report, and the well-known brevity and uncertainty of the tenure of office of many of the commissioners are among the preventable conditions that now hamper conservation.

It is the reviewer's opinion that, of the many charts, maps, and diagrams which illustrate this volume, some are over-burdened with data and made so complicated as to reduce their efficacy to a serious extent. Unless pictorial aids such as these convey a clearer message than the accompanying text and convey it more readily, there is no good reason for presenting them. Some of the graphic presentations of data in this work could be vastly improved by dividing among several diagrams the information now recorded on one.

Important though the relations between game conservation and agriculture admittedly are, particularly in a region where agriculture is intensive, they are scarcely deserving of the term "fundamental", which we find applied to them from time to time in this report. The fundamental questions in conservation lie deeper than that; they are questions of the inter-relations of all species of life on this earth, and especially of the relations between our own species, now the dominant one, and each of the others. While these relations are conditioned in very important ways by all our large-scale activities, including agriculture, they are, after all, fundamentally dependent on the numbers of the human population and its consequent requirements in space, food, and raw materials generally as related to the similar requirements of other species.—H.F.L.

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CONTENTS

	PAGE
Field Notes on the Pallid Meadow Mouse, <i>Lagurus pallidus</i> (Merriam). By J. Dewey Soper	209
List of Original Descriptions Published by the Ottawa Field-Naturalists' Club. By A. LaRocque	214
Contributions to the Knowledge of Extreme North-eastern Labrador. By Bernhard Hantzsch	222
An Annotated List of Vascular Plants Collected on the North Shore of the Gulf of St. Lawrence, 1927-1928. By Harrison F. Lewis	225
INDEX TO VOLUME XLV	229

The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July and August. Its scope is the publication of the results of original research in all departments of Natural History.

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No. 9

FIELD NOTES ON THE PALLID MEADOW MOUSE, *Lagurus pallidus* (Merriam)

By J. DEWEY SOPER

DURING the summer of 1927 the writer made a survey of the mammals of the International Boundary region in Canada from the Rocky Mountains to the Turtle Mountain of Manitoba; this work was carried on for the National Museum of Canada, and continued from early in June until the first week of November, with 16 camps*. In the course of the investigations one of the most interesting discoveries was the presence of the Pallid Meadow Mouse, in fair numbers, at five widely-separated localities in the provinces of Alberta and Saskatchewan.

This species is one of the rarest, as well as the palest of the meadow mice in America; it affords a striking example of "protective colouration" in its grayish pelage, which so nearly harmonizes with the sage-brush and parched, short grass of the semi-arid plains on which it lives. Its upper parts are pale, buffy gray, tinged conspicuously with yellow on the ears and nose; the feet are pale ashy gray, the tail dusky above and whitish below, and the under parts, in general, creamy-white. In build it is stocky, like many familiar members of the genus *Microtus*, to which it is closely related. A notable characteristic is its very short tail, which is little longer than its hind foot. Average measurements of adult specimens are: Length—128 millimetres; tail—20; hind foot—18.

The type locality of the Pallid Meadow Mouse is Fort Buford, Williams County, North Dakota, where Vernon Bailey first took it in September, 1887. Miller* gives its range as "Transition prairies of Western North Dakota, Montana, and as far north as Calgary, Alberta". It is now also known from southern Saskatchewan, where, according to available records, it has its centre of abundance. Accordingly, it is observed to have a restricted range in two provinces and two states, probably because of rather specialized habits, or food preferences. Its distribution is,

moreover, strangely local within the territory which it is known to occupy, as intensive trapping and close observation in many likely localities failed to give any evidence of its presence. The species is largely confined to the high plains of the semi-arid division of the Transition Zone, at elevations of between 2,000 and 3,400 feet above sea-level.

Dr. R. M. Anderson, National Museum of Canada, has kindly furnished me with the following interesting notes on *Lagurus pallidus*, in a letter dated January 16, 1930:—

"There are 42 specimens in our collection, 39 of which were collected by J. D. Soper in southern Alberta and Saskatchewan in 1927. I took two specimens, No.'s 8152 (orig. No. 1382) and 8360 (orig. No. 1590) to Washington and compared them with specimens in the U.S. National Museum. Mr. Vernon Bailey pronounced them typical specimens of *L. pallidus*. The three (3) specimens which we had before Mr. Soper's specimens came in were procured more or less accidentally, as follows:

No. 3182. ♀ Camp 11, Little Sandhill Creek Red Deer River, Alberta, Sept. 20, 1917, collected by C. H. Young. "From talons of Pigeon Hawk".

No. 4469. ♀ Eastend, Sask., June 20, 1921, collected by H. M. Laing. "Taken from nest of Long-eared Owl."

No. 9560. Part of specimen, taken 15 miles southwest of Eastend, Sask., by Lawrence B. Potter. "Found at entrance to burrow of Burrowing Owl."

On April 16, 1923, I examined 14 specimens in the U.S. National Museum, Washington: ALBERTA, Calgary, 3 specimens, Oct. 6, 1894, collected by J. A. Loring. (Vernon Bailey told me that Mr. Loring picked one up on a road near Calgary). MONTANA, Bowdoin, 2; Donovan 2; Lake Basin, 1; Medicine Rocks, 2; Philbrook, 1. NORTH DAKOTA, Glen Ullin, 3. V. Bailey also took 4 specimens at Fort Buford, in 1887."

Although a careful search was made for the Pallid Mouse in the sage-brush plains bordering the Milk River of southern Alberta, it was not

*Anderson, R. M., Division of Biology, Annual Report of National Museum of Canada, Department of Mines, pp. 21-22, 1927.

*Miller, Jr., Gerrit S., List of North American Recent Mammals, U.S. National Museum, Bulletin 128, p. 423, 1924.



Habitat of the Pallid Meadow Mouse (*Lagurus pallidus*), Lodge Creek, Alberta

found until Lodge Creek was reached near the interprovincial line between Alberta and Saskatchewan, 26 miles north of the International Boundary. The approximate altitude of the locality above sea-level is 3,400 feet. Here the species was found inhabiting the sage-brush flats, or benches, well above the valley bottom, but considerably below the general level of the open plains above.

The presence of *pallidus* was first detected by observing well-trodden trails under and between clumps of sage-brush over the dry sun-baked soil of the bench lands. Up to this time I knew nothing of its habits, and this together with the fact that I had never previously worked in the semi-arid regions of the West, rendered the search during the preceding weeks a rather baffling one. I could not, for example, be sure whether the little animal ranged at random over the plain, leaving no outstanding sign, or if, on the other hand, it utilized well-marked trails after the characteristic fashion of many species of *Microtus*, *Lemmus*, etc. Consequently, a great deal of "blind" trapping was done, without result, until the first colony was found between Lodge and North Fork Creeks in the locality referred to above. After this, the species was readily located at many points to the east. The signs left by this mouse are so distinct and characteristic that any careful observer, with a little experience, is certain to detect its presence wherever it occurs.

Traps set before burrows at the base of the

sage-bushes and across the trails (baited with rolled oats) took one adult female and two juveniles in the first habitat located. Subsequently, two more situations were found in the locality where two, and only one mouse, respectively, were captured. Evidently, very few mice are to be found at any one isolated "location", though the number of burrows about the roots of the sage and the condition of the trails leads one to suppose the place frequented by a considerable number. All three occupied areas, as well as old abandoned ones observed, were situated under sage-brush on the slopes of shallow gullies, or "washes", which cut through the benches from the badlands and buttes farther back.

No pale mice could be found in the immediate vicinity of my next camp to the east at Battle Creek, Saskatchewan, (Alt. 3400'), but one was given to me by Mr. Philip Linder, which he killed on a sage-brush flat 4 miles to the southwest. This brings its range into Canada somewhat farther north than the records for Lodge Creek—that is, to a point 30 miles north of the International Boundary. Though the region seems eminently suited to this species, it could not be found in the Eastend country, 46 miles to the east, and only 6 miles in latitude to the north, of the Battle Creek camp.

Only one little group of *pallidus* was located in the valley of the Frenchman River (Camp 10) a few miles west of Val Marie, Saskatchewan, (Alt. 2600'). These animals were occupying an almost

precisely similar situation to those taken at Lodge Creek. The runways here, however, were more intricate and extended over a greater area through sparse grass to include several clumps of sage-brush, the extremes of which were fully 15 yards apart. The runways invariably terminated at holes under the roots of the sage. A female was taken here during the last week of August which contained five small embryos; she and three well-grown immatures were the sole occupants of the one habitat found. This was in longitude $107^{\circ} 47'$ West, 21 miles north of the 49th parallel.

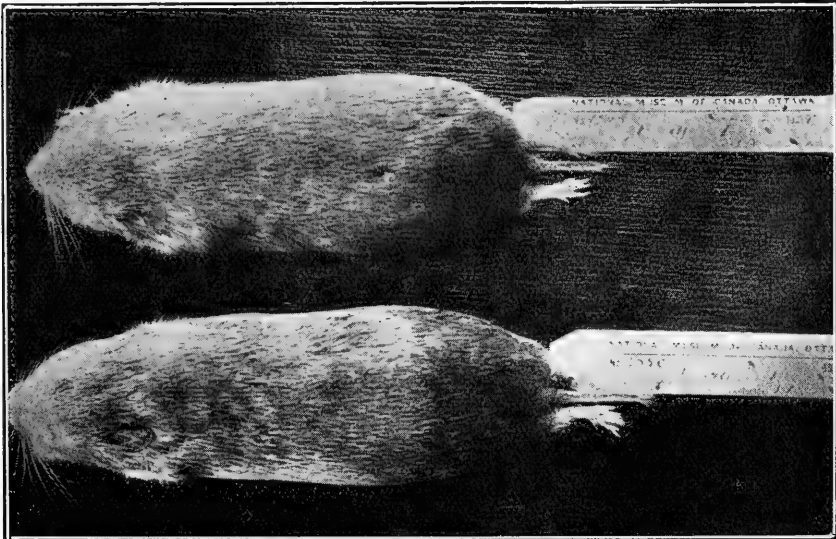
At Rock Creek, Saskatchewan, (Camp 11, Alt. 3000'), south of Wood Mountain, and two miles north of the International Boundary, the species was found at its maximum abundance. Many colonies were found and only time was required to ensure the collection of a large series of specimens.

The first colony found was on a short-grass bench, sparsely scattered over with sage-brush, 100 feet above Rock Creek. The main runway communicated with burrows at nine clumps of sage over a total distance of 80 to 90 feet. Numerous branch trails led out in all directions for purposes of feeding in the surrounding areas of short, shrivelled grass. The total linear length of the trails in this family network amounted to about 250 feet. The number of burrows under and beside the roots of the sage was 25. Again was determined the amazingly small number of animals present in relation to the length of worn trails and the large collection of burrows. Four individuals only were taken here after persistent

trapping—one adult female, two immatures and one juvenile.

A mile to the south of this haunt was another, but this time all the holes—24 in number—were scattered over the face of a grassy slope facing the west. The grass here was exceedingly sparse, and the runways wound about, for the most part quite in the open, sometimes over bare soil, with here and there a brief length under grass just sufficiently heavy to obscure them. The nearest clump of sage-brush was on top of the ridge, six feet distant from the mouth of the nearest burrow. None of the trails entered the sage-brush to secure cover, and this, and the fact that all the burrows were strictly in the open, placed this colony apart in nature from any of the others previously found.

As usual, not nearly so many animals were trapped here as the deeply-worn trails and the abundance of burrows would lead one to expect. This would seem to indicate a great individual activity. The total number of animals taken at this location was one adult female (with five embryos the size of peas), four immatures, and three juveniles. There were thus three generations of mice living in this family group, but, as in the groups previously trapped, an adult male was absent. Three other rather widely-separated habitats were located in this locality in which only one individual in each instance was obtained after persistent trapping; one situation was on an upland bench and the other two on short-grass slopes facing the east; all were associated with clumps of sage-brush.



Adult specimens of *Lagurus pallidus* taken at Big Muddy Lake, Saskatchewan

The species was last taken at Big Muddy Lake, Saskatchewan, (Alt. 2500', 105°W., 18 miles north of the boundary), between September 18 and 27. One colony was found on the high open prairie near the rim of the Waniska Coulee, which is here about 250 feet above the floor of the valley. The runways led through the scanty grass to ramify in various directions, and to connect with burrows that were sunk here and there on the open turf without sign of cover. The nature of the habitat was very similar to that of *Microtus minor*. On September 24, a plant was collected with yellow flowers going to seed, which was found to be the chief food of the pale mouse at this time; this was identified by Dr. M. O. Malte as *Chrysothamnus graveolus* (Nutt.) Greene. Bailey* says of the food habits of this species: "A large part of the food of these mice seemed at that time to consist of the flowers of the little silver sage (*Artemisia frigida*) and the blazing star (*Liatris graminifolia*), and the stems and pieces left from these plants were scattered along the runways and about the entrances of the burrows; heads and seeds of winter fat (*Eurotia lanata*) also were eaten. Many grasses and other plants had been cut, apparently for food. A partly eaten bulb of the blazing star was found near a runway, where it had been dug up."

Two other family colonies were found on the western slope of the Waniska Coulee about midway between valley bottom and rim, which here has a height varying from 200 to 300 feet. Both of these were situated among clumps of sage in the conventional manner, with well-worn trails leading from clump to clump where holes were sunken about the roots of the bushes. Still another group was discovered on the slope of a sage-brush-grown clay butte, with southern exposure. Some of the burrows were about the roots of the sage, as usual, while others were in more or less barren soil fully exposed, as well as in thin clumps of grass.

Following is a list of the specimens taken on the expedition, with measurements in millimetres:

Lodge Creek, Alberta. August 1-August 8.

No.	Sex	Length	Tail	Hind Foot
1382	♀	130	17	17
1387	♀	98	15	15
1388	—	123	20	18
1389	♂	103	17	17
1396	♂	112	20	18
1397	♂	110	18	17.5

Battle Creek, Saskatchewan. August 9-August 12:

1428	♀	110	20	18
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Frenchman River, Val Marie, Saskatchewan, August 28-September 3:

No.	Sex	Length	Tail	Hind Foot
1486	♀	125	18	17
1487	♂	90	10	16
1494	♂	118	18	17
1495	♂	90	16	16

Rock Creek (Lonesome Butte), Saskatchewan, September 9-September 16:

1519	♀	130	21	18
1520	♂	112	17	16
1528	♂	112	19	18
1529	♂	116	19	16
1541	♀	131	21	18
1542	♂	112	20	18
1543	♂	110	20	18
1551	♂	85	14	15
1552	♂	85	14	14
1567	♀	115	13	17.5
1568	♂	112	19	18.5
1569	♂	87	16	15
1575	♂	130	21	18
1577	♀	116	17	17
1578	♂	121	18	17

Big Muddy Lake, Saskatchewan, September 20-September 26:

1590	♀	135	27	18
1591	♀	130	23	19
1592	♀	112	20	18.5
1593	♂	115	18	18
1595	♀	126	23	18.5
1596	♀	115	22	18.5
1597	♀	94	17	16
1598	♂	95	17	17
1605	♀	127	21	19
1606	♀	110	19	18
1607	♂	111	20	18.5
1608	♀	115	19	18.5
1611	♀	111	20	17.5

Judging from my experience in the Canadian range of these animals, they are never as numerous at any one community of burrows as signs would lead the observer to believe. A few animals appear to employ a large number of burrows and are evidently active over trunk and branch trails, which radiate from the numerous burrows into adjacent areas of sparse grass land. A large quantity of excrement often litters the vicinity of the holes and is invariably scattered along throughout the length of the trails. The species is partially diurnal, as is disclosed by tending traps at various times of the day.

Based on evidence collected in the course of the Boundary work, it is clear that this rather rare, or obscure, animal is strictly confined to the great, dry plains-country within the semi-arid

*Bailey, Vernon: A Biological Survey of North Dakota, U.S. Department of Agriculture, N.A. Fauna No. 49, pp. 101-102, 1926.

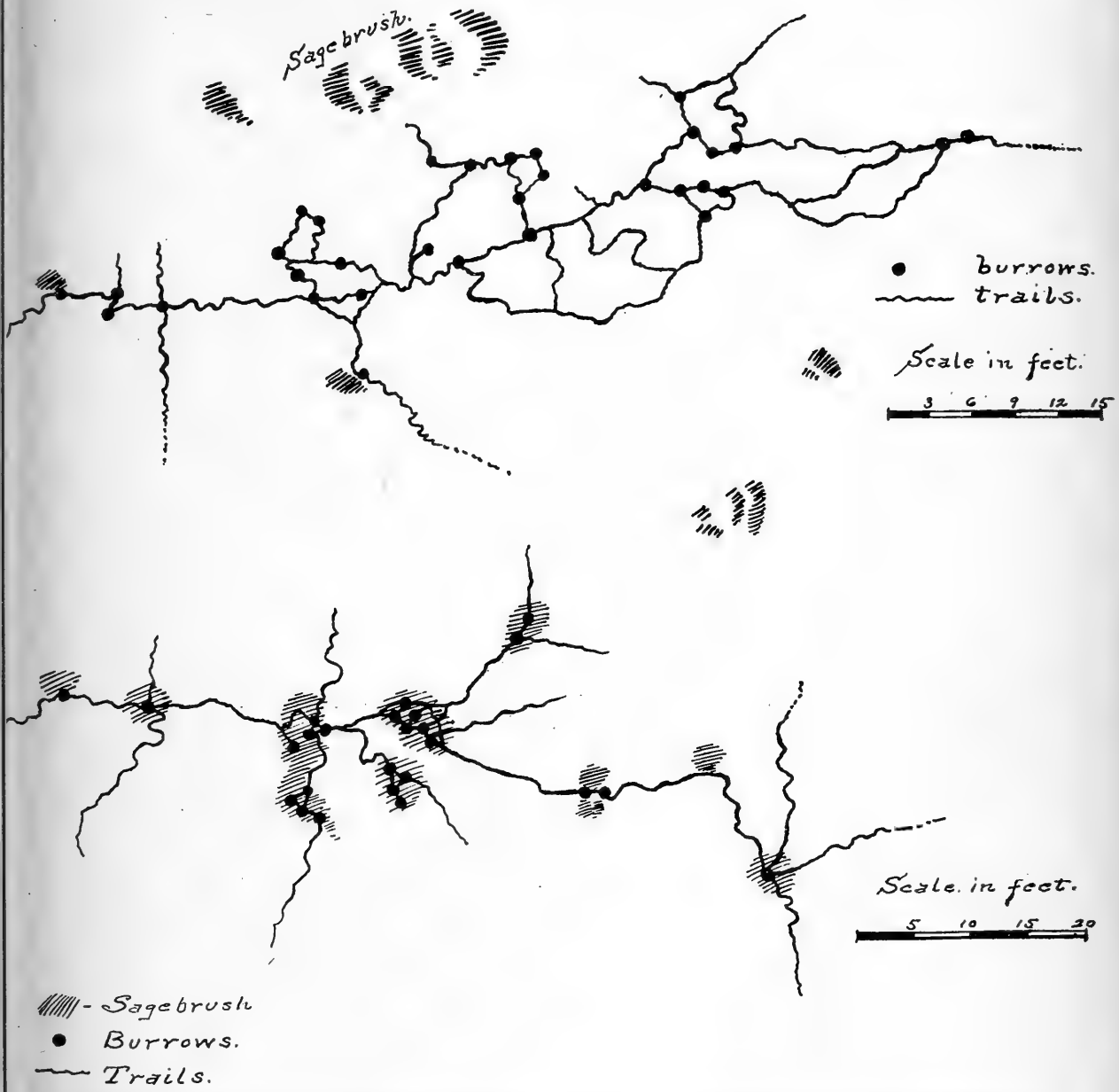


Diagram of runways and burrows of two colonies of Pallid Meadow Mice at Rock Creek Saskatchewan

division of the Transition Zone. The species has a relatively restricted range in southern Alberta and Saskatchewan, where latitudes obtain between 2,000 and 3,400 feet above sea-level. It seems evident, also, that the centre of abundance of the species in Canada lies between the Missouri Coteau region (104°W.) on the east, and Val Marie on the west. East of the 104th meridian the country undergoes a notable change in topography

and vegetation, with a rapid falling off in altitude. West of this point is the high, semi-arid plain with its bad-lands, cactus and sage-brush—a land of ranching; east of it is lower, undulating prairie given over to farming. The Pallid Mouse was not detected east of Big Muddy Lake, which lies near the natural boundary between the western semi-arid, and the eastern humid divisions, of the Transition Zone.

From the foregoing account it will be seen that the ascertained range of *Lagurus pallidus* in Canada lies approximately between 104 and 114 degrees west longitude, and north of the International Boundary for a maximum distance of 140 miles. Apparently it ranges farther north in western Alberta than in the eastern part, or in Saskatchewan. It is probably fortuitous that it was not obtained by me at any point in excess of 30 miles from the International Boundary and was then scarce. The species was found most abundant at Rock Creek and Big Muddy Lake, two and eighteen miles respectively, from the Boundary. As *pallidus* is evidently very local in distribution, as previously mentioned, considerable intensified investigation is still required, in Sas-

katchewan especially, to delimit accurately its northernmost occurrence.

The region which it occupies is treeless except for local small growth in various stream valleys, and on such prominences as Wood Mountain and the Cypress Hills. Wherever it occurs, it will doubtless be found confined, in local habitat, to treeless areas of the semi-arid, short grass plains, scattered over with small cacti and various sagebrush. The average length of the growing season of the region—that is, from the average date of seeding to the average date of the first frosts—is from 120 to 160 days; the average annual rainfall is between 15 and 17 inches, so the country resorted to by the Pallid Meadow Mouse falls, therefore, well within that zonal condition referred to as arid, or semi-arid.

LIST OF ORIGINAL DESCRIPTIONS PUBLISHED BY THE OTTAWA FIELD-NATURALISTS' CLUB

By A. LaROCQUE



THIS LIST was prepared with two objects in mind: first, to facilitate the finding of descriptions of new species in the publications of the Ottawa Field-Naturalists' Club; and second, to put before the members of the Club and the public concrete evidence of its service to Science in publishing original work of the highest value.

The writer hopes that this list will save students some labour by enabling them to find descriptions of new species or genera without having to search through the forty-odd indexes to separate volumes.

The present list covers descriptions of orders, families, genera and species, changes of name and redefinitions. The publications covered are the following:

Transactions of the Ottawa Field-Naturalists' Club: 7 numbers, 2 volumes, 1879-1886.

The Ottawa Naturalist: 32 volumes, 1886-1919.

The Canadian Field-Naturalist: 12 volumes, 1919-1931.

The following abbreviations are used:

Tr:	Transactions of the Ottawa Field-Naturalists' Club
Ott. Nat.:	Ottawa Naturalist
CFN:	Canadian Field-Naturalist
fig.:	figured
nom. nov.:	new name
nom. prov.:	provisional name
desc. emend.:	emended description

subsp. restit.:	subspecies restituta
ord. nov.:	new order
fam. nov.:	new family
gen. nov.:	new genus
sp. nov.:	new species
var. nov.:	new variety
subsp. nov.:	new subspecies
comb. nov.:	new combination
form. nov.:	new form

*Indicates fossil

It was at first intended to give a reference to the type specimen of each new species described, the genotypes of each new genus and where they were to be found. However, some of these new species had been relegated to synonymy, type specimens had been lost or mislaid, sometimes no holotype, and in some cases no genotype, had been designated. It was finally decided to omit this information as it could not be given for even 60% of the species.

The arrangement of this list is biological, though not strictly in accordance with the latest classifications. The convenience of students has been kept in mind more than strict biological order.

INVERTEBRATA

RHIZOPODA

Raphidiophrys magna O'Donoghue, nom. prov., fig., CFN 35: 101, 1921

ANTHOZOA

**Aphylostylus* Whiteaves, gen. nov., Ott. Nat. 18: 113, 1904-05, genotype: *A. gracilis*

**Aphylostylus gracilis* Whiteaves, sp. nov., Ott. Nat. 18: 114, 1904-05

**Cyathophyllum dawsoni* Lambe, sp. nov., Ott. Nat. 12: 239, 1898-99

**Cyathophyllum spenceri* Lambe, sp. nov., Ott. Nat. 12: 238, 1898-99

**Lithostrotion macounii* Lambe, sp. nov., Ott. Nat. 12: 220, 1898-99

HYDROZOA

**Actinostroma infectum* Parks, sp. nov., Ott. Nat. 22: 27, 1908-09

**Stromatopora wilsoni* Parks, sp. nov., Ott. Nat. 22: 28, 1908-09

SPONGIAE

Esperella bellabellensis Lambe, sp. nov., fig., Ott. Nat. 19: 14, 1905-06

Leucandra taylora Lambe, sp. nov., fig., Ott. Nat. 13: 261, 1899-1900

Spongilla johanseni Frank Smith, sp. nov., CFN 44: 184, 1930

GRAPTOLITOIDEA

**Ceramograptus ruedemanni* Hudson, sp. nov., fig., Ott. Nat. 28: 129, 1914-15

ECHINODERMATA

**Amygdalocystites florealis* var. *lævis* W. R. Billings, var. nov., fig., Tr. 4: 52, 1882-83

**Archæocrinus desideratus* W. R. Bill., sp. nov., fig., Tr. 6: 249, 1884-85

**Calceocrinus furcillatus* W. R. Bill., sp. nov., Ott. Nat. 1: 51, 1887-88

**Calceocrinus rugosus* W. R. Bill., sp. nov., Ott. Nat. 1: 53, 1887-88

Cucumaria lissoplaca Clark, sp. nov., CFN 38: 55, 1924

Cucumaria trachyplaca Clark, sp. nov., CFN 38: 56, 1924

**Eostelleroidæ* Hudson, ord. nov., Ott. Nat. 26: 24, 1912-13

**Euspirocrinus obconicus* W. R. Bill., sp. nov. fig., p. 284, Tr. 6: 248, 1884-85

**Glaucocrinus* Parks & Alcock, gen. nov., fig., Ott. Nat. 26: 43, 1912-13 Genotype: *G. falconeri*

**Glaucocrinus falconeri* Parks & Alcock, sp. nov., fig., Ott. Nat. 26: 43, 1912-13

**Glyptocrinus circumcarinatus* Parks & Alcock, sp. nov., fig., Ott. Nat. 26: 45, 1912-13

**Heterocrinus bellewillensis* W. R. Billings, sp. nov., fig., Tr. 4: 49, 1882-83

**Hybocystis eldonensis* Parks, sp. nov., fig., Ott. Nat. 21: 234, 1907-08

**Lebetodiscus chapmani* Raymond, sp. nov., fig., Ott. Nat. 29: 58, 1915-16

**Lebetodiscus inconditus* Raymond, sp. nov., fig., Ott. Nat. 29: 61, 1915-16

**Lebetodiscus loriformis* Raymond, sp. nov., fig., Ott. Nat. 29: 56, 1915-16

**Lebetodiscus multibrachiatus* Raymond, sp. nov., fig. Ott. Nat. 29: 60, 1915-16

**Lebetodiscus platys* Raymond, sp. nov., fig., Ott. Nat. 29: 59, 1915-16

**Lebetodiscus youngi* Raymond, sp. nov., fig., Ott. Nat. 29: 58, 1915-16

**Mariacrinus insuetus* Raymond, sp. nov., fig., Ott. Nat. 26: 79, 1912-13

**Ottawacrinus* W. R. Billings, gen. nov., fig., Ott. Nat. 1: 49, 1887-88, Genotype: *O. typus* Bill.

**Ottawacrinus typus* W. R. Billings, sp. nov., fig., Ott. Nat. 1: 49, 1887-88

**Palæaster? wilsoni* Raymond, sp. nov., fig., Ott. Nat. 26: 77, 1912-13

**Periglyptocrinus priscus* Billings emend. Parks, fig., Ott. Nat. 23: 153, 1909-10

**Porocrinus smithi* Grant, sp. nov., fig., Tr. 2: 42, 1880-81

**Protopalæasteridæ* Hudson, fam. nov., Ott. Nat. 26: 25, 1912-13

**Protopalæaster* Hudson, gen. nov., fig., Ott. Nat. 26: 25, 1912-13, Genotype: *P. narrawayi*

**Protopalæaster narrawayi* Hudson, sp. nov., fig., Ott. Nat. 26: 25, 45, 1912-13

**Schænaster? montanus* Raymond, sp. nov., fig., Ott. Nat. 26: 80, 1912-13

VERMES—HIRUDINEA

Erypobdella punctata subsp. *annulata* Moore, subsp. nov., CFN 36: 38, 1922

BRYOZOA

**Hallopora obliqua* Mather, sp. nov., fig., Ott. Nat. 31: 36, 1917-18

**Hallopora varia* Mather, sp. nov., fig., Ott. Nat. 31: 36, 1917-18

BRACHIOPODA

**Dalmanella jugosa subplicata* Foerste, var. nov., fig., Ott. Nat. 31: 99, 1917-18

**Eoorthis ochus* var. *concentrina* C. H. Kindle, var. nov., fig., CFN 43: 145, 1929.

**Huenella jasperensis* C. H. Kindle, sp. nov., fig., CFN 43: 146, 1929

**Plectambonites punctostriatus* Mather, sp. nov., fig., Ott. Nat. 31: 38, 1917-18

**Rafinesquina alternata varicosa* Foerste, var. nov. Ott. Nat. 31: 102, 1917-18

**Rafinesquina brevisculus* Foerste, sp. nov., fig., Ott. Nat. 31: 101, 1917-18

**Rafinesquina pergibbosa* Foerste, sp. nov., fig., Ott. Nat. 31: 101, 1917-18

**Strophomena parvula* Foerste sp. nov., fig., Ott. Nat. 31: 102, 1917-18

**Syntrophia convexa* C. H. Kindle, sp. nov., fig., CFN 43: 146, 1929

**Trimerella borealis* Whiteaves, sp. nov., fig., Ott. Nat. 16: 142, 1902-03

**Trimerella equanensis* Whtvs, sp. nov., fig., Ott. Nat. 16: 141, 1902-03

**Zygospira recurvirostris turgida* Foerste, var. nov., fig., Ott. Nat. 31: 103, 1917-18

PELECYPODA

**Arca punctifer* Dawson, Ott. Nat. 10: 44, 1896-7 changed to *Arca puncticosata* Dawson

**Calyptogena gibbera* Crickmay, sp. nov., fig., CFN 43: 93, 1929

**Cardinia subangulata* Dawson, Ott. Nat. 10: 44, 1896-97, changed to *C. angulifera*

**Clidophorus noquettensis* Foerste, sp. nov., fig., Ott. Nat. 31: 103, 1917-18

**Clionychia angusta* Foerste, sp. nov., fig., Ott. Nat. 31: 121, 1917-18

**Clionychia gibbosa* Whtvs, sp. nov., fig., Ott. Nat. 22: 109, 1908-09

**Clionychia ottawaensis* Whtvs, sp. nov., fig., Ott. Nat. 22: 108, 1908-09

**Cyrena albertensis* Whtvs, sp. nov., fig., Ott. Nat. 16: 231, 1902-03

**Gervillia stantoni* McLearn, sp. nov., fig., CFN 34: 55, 1920

**Matheria brevis* Whtvs, sp. nov., fig., Ott. Nat. 17: 33, 1903-04

**Orthodesma antiquum* Whtvs, sp. nov., fig., Ott. Nat. 22: 111, 1908-09

**Panenka canadensis* Whtvs, sp. nov., fig., Ott. Nat. 15: 265, 1901-02

Pecten (Pseudamysium) vancouverensis Whiteaves, sp. nov., fig., Ott. Nat. 7: 133, 1893-94

**Rhytimya granulosa* Wilson, sp. nov., Ott. Nat. 29: 85, 1915-16

**Sowteria* Whiteaves, gen. nov., fig., Ott. Nat. 22: 112, 1908-09, genotype: *S. canadensis* (Raymond)

**Tellina dunveganensis* McLearn, sp. nov., fig., CFN 34: 55, 1920

**Tellina (Moera) peacriverensis* McLearn, sp. nov., fig., CFN 34: 55, 1920

Unio borealis Gray, sp. nov., fig., Tr. 3: 53, 1881-82

**Unio nanaimoensis* Whiteaves, sp. nov., fig., Ott. Nat. 14: 177, 1900-01

**Vanuxemia parvula* Whiteaves, sp. nov., fig., Ott. Nat. 22: 111, 1908-09

GASTROPODA

**Archinacella kagawongensis* Foerste, sp. nov., fig., Ott. Nat. 31: 122, 1917-18

Lymnæa laurentiana Latchford, sp. nov., fig., CFN 40: 47, 1926

**Lophospira billingsensis* Ami¹, sp. nov., Ott. Nat. 13: 221, 1899-1900

**Lophospira occidentalis* Wilson, sp. nov., fig., CFN 38: 151, 1924

**Palliseria* Wilson, gen. nov., fig., CFN 38: 150, 1924, genotype: *P. robusta*

**Palliseria robusta* Wilson, sp. nov., fig., CFN 38: 150, 1924

Physa billingsii Heron, sp. nov., fig., Tr. 2: 62, 1880-81

CEPHALOPODA

**Actinoceras imperator* Clark, sp. nov., fig., CFN 42: 188, 1924

**Barrandoceras subcostulatum* Whtvs., nom. prov., Ott. Nat. 12: 121, 1898-99

**Cardioceras canadense* Whiteaves, nom. prov., fig., Ott. Nat. 17: 66, 1903-04

**Cyrtoceras cuneatum* Whiteaves desc. emend., fig., Ott. Nat. 20: 134, 1906-07

**Cyrtoceras quebecense* Whtvs., sp. nov., Ott. Nat. 12: 120, 1898-99

**Lytoceras (Gaudryceras) denmanense* Whtvs., nom. prov., Ott. Nat. 15: 32, 1901-02

**Orthoceras beauportense* Whiteaves, sp. nov., Ott. Nat. 12: 118, 1898-99

**Orthoceras hagersvillense* Whtvs., sp. nov., Ott. Nat. 12: 126, 1898-99

**Orthoceras walpolense* Whtvs., sp. nov., Ott. Nat. 12: 125, 1898-99

**Orthoceras westoni* Whtvs., sp. nov., Ott. Nat. 12: 117, 1898-99

**Peltoceceras occidentale* Whtvs., sp. nov., fig., Ott. Nat. 21: 81, 1907-08

**Stepheoceras nicolense* Whtvs., sp. nov., fig., Ott. Nat. 23: 23, 1909-10

**Tripleuroceras robsoni* Whtvs., sp. nov., Ott. Nat. 12: 123, 1898-99

**Trochoceras insigne* Whtvs., sp. nov., Ott. Nat. 12: 124, 1898-99

TRILOBITA

**Acaste* Goldf. + *Acaste* Goldf. non Leach (as used by Salter) = *Dalmanitina* Ott. Nat. 32: 35, 1918-19

**Agnostus gladiator* Clark, sp. nov., fig., CFN 37: 124, 1923

**Agnostus innocens* Clark, sp. nov., fig., CFN 37: 122, 1923

**Agnostus janei* Clark, sp. nov., fig., CFN 37: 124, 1923

**Bathyurellus flabellus* Bradley, sp. nov., fig., CFN 39: 5, 1925

**Bathyurus superbus* Raymond, sp. nov., fig., Ott. Nat., 24: 129, 1910-11

**Cybele? pervetusta* Bradley, sp. nov., fig., CFN 39: 8, 1925

**Dalmanitina* Reed, redefined by McLearn, Ott. Nat. 32: 31, 1918-19

**Dalmanitina logani* var. *conservatrix* Mc Learn, var. nov., Ott. Nat. 32: 33, 1918-19

Glockeria Wedekind—"found to be untenable" Mc Learn, Ott. Nat. 32: 31, 1918-19

¹ Probably *nomen nudum*. Ami says: "I venture to suggest the name *L. billingsensis* for this species awaiting an opportunity of illustrating it and describing the same in a more complete form."

**Goniodiscus* Raymond, gen. nov., fig., Ott. Nat. 27: 102, 1913-14, genotype: *Microdiscus lobatus* Hall

**Isoteloides convexus* Bradley, sp. nov., fig., CFN 39: 7, 1925

**Isotelus arenicola* Raymond, sp. nov., fig., Ott. Nat. 24: 130, 1910-11

**Leiostegidæ* Bradley, fam. nov., fig., CFN 39: 6, 1925

**Lloydia amplimarginata* Bradley, sp. nov., fig., CFN 39: 7, 1925

**Lloydia obscura* Bradley, sp. nov., fig., CFN 39: 8, 1925

**Lloydia pinguis* Bradley, sp. nov., fig., CFN 39: 8, 1925

**Pædeumias robsonensis* Burling, sp. nov., fig., Ott. Nat. 30: 53, 1916-17

**Peronopsis barrandei* Clark, sp. nov., fig., CFN 37: 121, 1923

**Peronopsis marcoui* Clark, sp. nov., fig., CFN 37: 121, 1923

**Petigurus subrectus* Bradley, sp. nov., fig., CFN 39: 5, 1925

**Phacopidella* Reed, redefined by McLearn, Ott. Nat. 32: 31, 1918-19

**Phacopina* Clark, placed in *Dalmanitinae* by McLearn, Ott. Nat. 32: 33, 1918-19

**Phacops* Emmrich, redefined by McLearn, Ott. Nat. 32: 31, 1918-19

**Phacops (Portlockia) marklandensis* McLearn, sp. nov., Ott. Nat. 32: 35, 1918-19

**Plethagnostus* Clark, gen. nov., fig., CFN 37: 124, 1923, genotype: *P. gyps*,

**Plethagnostus gyps* Clark, sp. nov., fig., CFN 37: 124, 1923

**Portlockia* McCoy, emend, Mc Learn, Ott. Nat. 32: 34, 1918-19

**Strotactinus* Bradley, gen. nov., fig., CFN 39: 8, 1925

**Symphysurina walcotti*, C. H. Kindle, sp. nov., fig., CFN 43: 146, 1929

**Weymouthia* Raymond, gen. nov., fig., Ott. Nat. 27: 102, 1913-14, genotype: *Aagnostus? nobilis* Ford

COPEPODA

Argulus piperatus C. B. Wilson, sp. nov., fig., CFN 34: 149, 1920

OSTRACODA

**Bollia permarginata* Foerste, sp. nov., fig., Ott. Nat. 31: 124, 1917-18

DECAPODA

Spirontocaris macrodonta Hart, sp. nov., fig., CFN 44: 102, 1930

ARACHNIDA

Analges longispinosus Tyrrell, sp. nov., fig., Tr. 3: 45, 1881-82

Analges tyranni Tyrrell, sp. nov., fig., Tr. 3: 45, 1881-82

Dimorphus albidus Tyrrell, sp. nov., fig., Tr. 3: 46, 1881-82

Pteronyssus fuscus Tyrrell, sp. nov., fig., Tr. 3: 48, 1881-82

Pteronyssus speciosus Tyrrell, sp. nov., fig., Tr. 3: 47, 1881-82

INSECTA

Eupithecia fletcherata Taylor, sp. nov., Ott. Nat. 20: 200, 1906-07

Eupithecia youmgata Taylor, sp. nov., Ott. Nat. 19: 226, 1905-06

Rhabdophaga swaini Felt, sp. nov., fig., Ott. Nat. 28: 77, 1914-15

VERTEBRATA

PISCES

Gasterosteus bispinosus subsp. *johanseni* Cox, subsp. nov., CFN 37: 147, 1923

**Kindleia* Jordan, gen. nov., fig., CFN 41: 145, 1927, genotype: *K. fragosa*

**Kindleia fragosa* Jordan, sp. nov., fig., CFN 41: 145, 1927

Leuciscus rubrilateralis Cox, sp. nov., fig., CFN 35: 66, 1921

**Palæospinax ejuncidus* Lambe, nom. prov., fig., Ott. Nat. 32: 28, 1918-19

REPTILIA

**Baëna pulchra* Lambe, sp. nov., fig., Ott. Nat. 19: 189, 1905-06

**Boremys* Lambe, gen. nov., Ott. Nat. 19: 232, 1905-06, genotype: *Baëna pulchra* Lambe

**Chasmosaurus* Lambe, gen. nov., Ott. Nat. 27: 155, 1913-14, genotype: *C. belli* Lambe

**Cheneosaurus* Lambe, gen. nov., fig., Ott. Nat. 30: 117, 1916-17, genotype: *C. tolmanensis* Lambe

**Cheneosaurus tolmanensis* Lambe, sp. nov., fig., Ott. Nat. 30: 118, 1916-17

**Compsemys variolosus* Cope put in *Adocus* by Lambe, Ott. Nat. 15: 63, 1901-02

**Corythosaurus excavatus* Gilmore, sp. nov., fig., CFN 37: 46, 1923

**Edmontosaurus* Lambe, gen. nov., fig., Ott. Nat. 31: 66, 1917-18, genotype: *E. regalis*

**Edmontosaurus regalis* Lambe, sp. nov., fig., Ott. Nat. 31: 66, 1917-18

**Euoplocephalus* Lambe proposed instead of *Sterecephalus* Lambe (preoccupied), Ott. Nat. 24: 151, 1910-11, genotype: *E. tutus*

**Gorgosaurus* Lambe, gen. nov., fig., Ott. Nat., 28: 13, 1914-15, genotype: *G. libratus*

**Gorgosaurus libratus* Lambe, sp. nov., fig., Ott. Nat. 28: 13, 1914-15

**Gryposaurus* Lambe, gen. nov., fig., Ott. Nat. 27: 145, 1913-14, genotype: *G. notabilis*

- **Gryposaurus notabilis* Lambe, sp. nov., fig., Ott. Nat. 27: 145, 1913-14
 **Stephanosaurus* Lambe, gen. nov., fig., Ott. Nat. 28: 17, 1914-15, genotype: *S. marginatus*
 **Styracosaurus* Lambe, gen. nov., fig., Ott. Nat. 27: 110, 1913-14, genotype: *S. albertensis*
 **Styracosaurus albertensis* Lambe, sp. nov., fig., Ott. Nat. 27: 110, 1913-14
 **Testudo exornata* Lambe, sp. nov., fig., Ott. Nat. 19: 187, 1905-06
 **Testudo præxtans* Lambe, sp. nov., fig., Ott. Nat. 27: 61, 1913-14
 **Trachodon marginatus* Lambe, put in *Stephanosaurus*, Ott. Nat. 28: 17, 1914-15

AVES

- Melanerpes erythrocephalus erythrophthalmus* Oberholser, subsp. restit., CFN 33: 48, 1919
Petrochelidon albifrons hypopolia Oberholser, subsp. nov., CFN 33: 95, 1919

MAMMALIA

- **Arctotherium yukonense* Lambe, sp. nov., fig., Ott. Nat. 25: 21, 1911-12
 **Desmostylus sookensis* Cornwall, sp. nov., fig., CFN 36: 122, 1922
Rangifer dawsoni Seton Thompson, sp. nov., fig., Ott. Nat. 13: 257, 1899-1900
Rangifer montanus Seton-Thompson, sp. nov., Ott. Nat. 13: 129, 1899-1900
Sciuropterus sabrinus makkovikensis Sornborger, subsp. nov., Ott. Nat. 14: 48, 1900-01

FOSSIL PLANTS

- **Picea albertensis* Penhallow, sp. nov., fig., Ott. Nat. 22: 82, 1908-09
 **Sequoia albertensis* Penhallow, sp. nov., fig., Ott. Nat. 22: 83, 1908-09
 **Whitlaseya brevifolia* White, sp. nov., fig., Ott. Nat. 15: 104, 1901-02
 **Whitlaseya dawsoniana* White, sp. nov., fig., Ott. Nat. 15: 105, 1901-02
 **Whitlaseya desiderata* White, sp. nov., fig., Ott. Nat. 15: 103, 1901-02

MODERN PLANTS

LICHENES

- Arthonia (Arthothelium) macounii* Merrill, sp. nov., Ott. Nat. 28: 36, 1914-15
Biatora (Biatorina) columbiana Merrill, sp. nov., Ott. Nat. 27: 119, 1913-14
Biatora (Biatorina) griffithi var. *pacifica* (Tuck) Merrill, comb. nov., Ott. Nat. 27: 119, 1913-14
Biatora (Biatorina) lenticularis (Ach.) forma *nigricans* Arn., comb. nov., Ott. Nat. 28: 34, 1914-15
Biatora (Bilimbia) syncomista (Flk) Merrill, comb. nov., Ott. Nat. 27: 120, 1913-14

- Lecanora (Callopisma) atosanguinea* Merrill, sp. nov., Ott. Nat. 27: 117, 1913-14
Lecanora exigua forma *lecideoides* (Crom.) Merrill, comb. nov., Ott. Nat. 27: 118, 1913-14
Lecanora exigua forma *pruinosa* Merrill, form. nov., Ott. Nat. 27: 118, 1913-14
Phlyctis speirea, Merrill, sp. nov., Ott. Nat. 27: 118, 1913-14
Xylographa micrographa Merrill, sp. nov., Ott. Nat. 27: 121, 1913-14

MUSCI

- Amblystegium spirophyllum* Kindberg, sp. nov., Ott. Nat. 4: 64, 1890-91
Amblystegium tenuifolium Kindberg, sp. nov., Ott. Nat. 4: 65, 1890-91
Andreaea sparsifolia Zett. var. *sublaevis* Kindb., var. nov., Ott. Nat. 7: 17, 1893-94
Anæctangium canadense Kindberg, sp. nov., Ott. Nat. 14: 86, 1900-01
Anomodon platyphyllum Kindb., sp. nov., Ott. Nat. 7: 19, 1893-94
Barbula subcuneifolia Kindberg, sp. nov., Ott. Nat. 5: 196, 1891-92
Brachythecium cyrtophyllum Kindb., sp. nov., Ott. Nat. 4: 63, 1890-91
Brachythecium (Rutabula) laxirete Kindb., sp. nov., Ott. Nat. 23: 189, 1909-10
Brachythecium papillipes Kindb., sp. nov., Ott. Nat. 23: 189, 1909-10
Brachythecium rivulare Bruch Ms. × *novæ-brunsviciæ* Kindb., subsp. nov., Ott. Nat. 4: 63, 1890-91
Brachythecium velutinum curvirameum Kindb., subsp. nov., Ott. Nat. 23: 189, 1909-10
Bryum aurimontanum Kindb., sp. nov., Ott. Nat. 23: 186, 1909-10
Bryum brachyneuron Kindb., sp. nov., Ott. Nat. 5: 179, 1891-92
Bryum froudei Kindb., sp. nov., Ott. Nat. 5: 180, 1891-92
Bryum glaciale Kindb., sp. nov., Ott. Nat., 23: 187, 1909-10
Bryum intermedium (Ludw.) Brid. subsp. *ovatifolium* Kindb., subsp. nov., Ott. Nat. 23: 188, 1909-10
Bryum julaceum Kindb., sp. nov., Ott. Nat. 23: 187, 1909-10
Bryum lowii Kindb., sp. nov., Ott. Nat. 23: 187, 1909-10
Bryum macounii Kindb., nom. nov., Ott. Nat. 23: 185, 1909-10
Bryum microstegioides Kindb., sp. nov., Ott. Nat. 14: 88, 1900-01
Bryum nano-cæspiticium Kindb., sp. nov., Ott. Nat. 23: 188, 1909-10
Bryum (Webera vel Pohlia) obtusatum Kindb., sp. nov., Ott. Nat. 23: 185, 1909-10

- Bryum (Rhodobryum) ontariense* Kindb., sp. nov., Ott. Nat. 2: 155, 1888-89
- Bryum pallescens* var. *grande* Kindb., var. nov., Ott. Nat. 23: 187, 1909-10
- Bryum pendulum* Schimp. \times *cylindricum* Kindb., subsp. nov., Ott. Nat., 4: 62, 1890-91
- Bryum pendulum* **longipes* Kindberg, Ott. Nat. 23: 185, 1909-10
- Bryum pendulum* Schimp. **nanum* Kindb., Ott. Nat. 23: 184, 1909-10
- Bryum (Webera) pseudo-carneum* Kindb., sp. nov., Ott. Nat. 14: 88, 1900-01
- Bryum submicans* Kindb., sp. nov., Ott. Nat. 23: 186, 1909-10
- Bryum subneodamense* Kindb., sp. nov., Ott. Nat. 23: 187, 1909-10
- Bryum subpercurrentinerve* Kindb., sp. nov., Ott. Nat. 23: 185, 1909-10
- Calliargon subgiganteum* Kindb., sp. nov., Ott. Nat. 14: 80, 1900-01
- Calliargon trifarium* (Web. et Mohr) subsp. *apiculatum* Kindb., subsp. nov., Ott. Nat. 23: 190, 1909-10
- Camptothecium nitens* var. *leucobasis* Kindb., var. nov., Ott. Nat. 23: 138, 1909-10
- Campthothecium nitens* var. *microtheca* Kindb., var. nov., Ott. Nat. 23: 138, 1909-10
- Ceratodon heterophyllus* Kindb., sp. nov., Ott. Nat. 5: 179, 1891-92
- Desmatodon cernuus* B. & S. var. *xanthopus* Kindb., var. nov., Ott. Nat., 4: 61, 1890-91
- Dicranella cerviculatula* Kindb., sp. nov., Ott. Nat. 5: 195, 1891-92, 7: 18, 1893-94
- Dicranella polaris* Kindb., sp. nov., Ott. Nat. 5: 195, 1891-92, 7: 17, 1893-94
- Dicranoweisia obliqua* Kindb., sp. nov., Ott. Nat. 5: 195, 1891-92, 7: 17, 1893-94
- Dieranum drummondii* Bland var. *trachyneuron* Kindb., Ott. Nat. 4: 61, 1890-91
- Dieranum rugosum* Kindb., sp. nov., Ott. Nat. 4: 61, 1890-91
- Dicranum rugosum rugulosum* Kindb., var. nov., Ott. Nat. 4: 61, 1890-91
- Dicranum scoparifforme* Kindb., sp. nov., Ott. Nat. 2: 154, 1888-89
- Dicranum stenodictyon* Kindb., sp. nov., Ott. Nat. 2: 155, 1888-89
- Didymodon badenpowelli* Kindb., sp. nov., Ott. Nat. 5: 179, 1891-92
- Encalypta rhabdocapra* Schwaeg. var. *leiomitra* Kindb., var. nov., Ott. Nat. 4: 61, 1890-91
- Eurhynchium glaciale* Kindb., var. *angustifolium* Kindb., var. nov., Ott. Nat. 23: 138, 1909-10
- Eurhynchium pseudo-serrulatum* Kindb., sp. nov., Ott. Nat. 7: 22, 1893-94
- Eurhynchium revelstokense* Kindb., sp. nov., Ott. Nat. 7: 22, 1893-94
- Eurhynchium rusciforme* (Weis.) Milde var. *obtusum* Kindb., var. nov., Ott. Nat. 23: 190, 1909-10
- Eurhynchium serrulatum* **ericense* Kindb., Ott. Nat. 7: 22, 1893-94
- Eurhynchium serrulatum hispidifolium* Kindb., Ott. Nat. 7: 22, 1893-94
- Eurhynchium subintegrifolium* Kindb., sp. nov., Ott. Nat., 7: 21, 1893-94
- Eurhynchium subscabridum* Kindb., sp. nov., Ott. Nat. 7: 21, 1893-94
- Grimmia subflaccida* Kindb., sp. nov., Ott. Nat. 14: 85, 1900-01
- Homalothecium corticolum* Kindb., sp. nov., Ott. Nat. 2: 156, 1888-89
- Hypnum (Drepanium) alaskæ* Kindb., sp. nov., Ott. Nat. 7: 23, 1893-94
- Hypnum exannulatum* Guëmbel \times *H. pseudolycopodioides* Kindb., Ott. Nat. 14: 82, 1900-01
- Hypnum imponentiforme* Kindb., sp. nov., Ott. Nat. 14: 83, 1900-01
- Hypnum (Drepanocladus) jamesii-macounii* Kindb. sp. nov., Ott. Nat. 23: 189, 1909-10
- Hypnum (Harpidium) moseri* Kindb., sp. nov., Ott. Nat. 4: 65, 1890-91
- Hypnum pseudo-circinnale* Kindb., sp. nov., Ott. Nat. 14: 83, 1900-01
- Isothecium (?) dawsoni* Kindb., sp. nov., Ott. Nat. 4: 64, 1890-91
- Isothecium myosuroides* **brevinerve* Kindb., Ott. Nat. 7: 20, 1893-94
- Isothecium myosuroides* **hylocomioides* Kindb., Ott. Nat. 7: 20, 1893-94
- Leptotrichum (Ditrichum) tomentosum* Kindb., sp. nov., Ott. Nat. 7: 18, 1893-94
- Leskea moseri* Kindb., sp. nov., Ott. Nat. 7: 19, 1893-94
- Leskea nervosa* Myrin var. *flagellifera* Kindb., sp. nov., Ott. Nat., 4: 63, 1890-91
- Leskea nigrescens* Kindb., sp. nov., Ott. Nat. 2: 155, 1888-89
- Mesoptychia* (Lindb.) Evans, gen. nov., fig., Ott. Nat. 17: 15, 1903-04
- Mnium blythii* var. *microphyllum* Kindb., var. nov., Ott. Nat. 23: 184, 1909-10
- Mnium glabrescens* Kindb., sp. nov., Ott. Nat. 7: 18, 1893-94
- Orthotrichum affine* Schrad. subsp. *subrivale* Kindb., subsp. nov., Ott. Nat. 23: 190, 1909-10
- Philonotis fontana* (L.) Brid. var. *microthammia* Kindb., var. nov., Ott. Nat. 23: 133, 1909-10
- Physcomitrium strangulatum* Kindb., sp. nov., Ott. Nat. 4: 62, 1890-91
- Platygyrium repens* Bruch & Schimp. var. *orthocladus* Kindb., var. nov., Ott. Nat. 2: 156, 1888-89

- Polytrichum (Pogonatum) alpinum* Roehl., var. *microdontium* Kindb., var. nov., Ott. Nat. 5: 180, 1891-92
- Pseudoleskea atricha* Kindb., sp. nov., Ott. Nat. 7: 20, 1893-94
- Pylaisia selwyni* Kindb., sp. nov., Ott. Nat. 2: 156, 1888-89
- Racomitrium fasciculare* Brid. var. *haplocladon* Kindberg, var. nov., Ott. Nat. 7: 18, 1893-94
- Rhaphidostegium pseudo-recurvans* Kindb., sp. nov. Ott. Nat. 7: 23, 1893-94
- Rhynchostegium aneuron* Kindb., sp. nov., Ott. Nat. 4: 64, 1890-91
- Seligeria subcampylopora* Kindb., Ott. Nat. 23: 142, 1909-10
- Tetraplodon urceolatus* (Brid.) B. & S. **T. submnio-*
ides Kindb., Ott. Nat. 23: 141, 1909-10
- Thelia compacta* Kindb., sp. nov., Ott. Nat. 4: 62, 1890-91
- Thuidium abietinum* **pachycladon* Kindb., Ott. Nat. 7: 20, 1893-94
- Thuidium lignicola* Kindb., sp. nov., Ott. Nat. 4: 63, 1890-91
- Thuidium (Elodium) pseudo-abietinum* Kindb. sp. nov., Ott. Nat. 7: 20, 1893-94
- Webera canaliculata* C. M. & Kindb. var. *microcarpa* Kindb., var. nov., Ott. Nat. 5: 179, 1891-92
- Webera fontana* Kindb., sp. nov., Ott. Nat. 4: 62, 1890-91
- MONOCOTYLEDONEÆ
- Allium cernuum* Roth. f. *alba* Henry, form. nov., Ott. Nat. 31: 56, 1917-18
- Allium watsoni* Howell, nom. nov., Ott. Nat. 31: 57, 1917-18
- Arctophila brizoides* Holm., sp. nov., Ott. Nat. 16: 83, 1902-03
- Arctophila chrysantha* Holm., sp. nov., Ott. Nat. 16: 84, 1902-03
- Arctophila gracilis* Holm., sp. nov., Ott. Nat. 16: 83, 1902-03
- Camassia quamash* Green form. *albiflora* Henry, form. nov., Ott. Nat. 31: 57, 1917-18
- Sisyrhynchium idahoense* Bicknell, var. *birameum* (Piper), comb. nov., Ott. Nat. 31: 58, 1917-18
- DICOTYLEDONEÆ
- Actæa asplenifolia* Green, sp. nov., Ott. Nat. 16: 35, 1902-03
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- Amesia rubiginosa* (Crantz) Mousley, comb. nov., fig., CFN 41: 2, 1927
- Anemone cairnesiana* Greene, sp. nov., Ott. Nat. 25: 146, 1911-12
- Anotites picta* Greene, sp. nov., Ott. Nat. 19: 156, 1905-06
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- Antennaria athabascensis* Greene, sp. nov., Ott. Nat. 19: 197, 1905-06
- Antennaria callilepis* Greene, sp. nov., Ott. Nat. 17: 201, 1903-04
- Antennaria chlorantha* Greene, sp. nov., Ott. Nat. 18: 38, 1904-05, 20: 72, 1906-07
- Antennaria erigeroides* Greene, sp. nov., Ott. Nat. 20: 72, 1906-07
- Antennaria eximia* Greene, sp. nov., Ott. Nat. 20: 71, 1906-07
- Antennaria glabra* (J. Vahl) Porsild, sp. nov., Ott. Nat. 28: 89, 1914-15
- Antennaria grænlandica* Porsild, nom. nov., Ott. Nat. 28: 89, 1914-15
- Antennaria intermedia* (Rosenvinge) Porsild, sp. nov., Ott. Nat. 28: 89, 1914-15
- Antennaria isolepis* Greene, sp. nov., Ott. Nat. 25: 41, 1911-12
- Antennaria lanulosa* Greene, sp. nov., Ott. Nat. 18: 38, 1904-05
- Antennaria maculata* Greene, sp. nov., Ott. Nat. 18: 39, 1904-05
- Antennaria modesta* Greene, sp. nov., Ott. Nat. 20: 72, 1906-07
- Antennaria neodioica* Greene, var. *gaspensis* Fernald, var. nov., Ott. Nat. 19: 156, 1905-06
- Antennaria nitens* Greene, sp. nov., Ott. Nat. 25: 42, 1911-12
- Antennaria sansonii* Greene, sp. nov., Ott. Nat. 18: 37, 1904-05
- Antennaria sedoides* Greene, sp. nov., Ott. Nat. 18: 37, 1904-05
- Antennaria stenolepis* Greene, sp. nov., Ott. Nat. 17: 201, 1903-04
- Arnica aprica* Greene, sp. nov., Ott. Nat. 15: 280, 1901-02
- Arnica aspera* Greene, sp. nov., Ott. Nat. 15: 281, 1901-02
- Arnica cana* Greene, proposed for *A. incana* Greene, preoccupied, Ott. Nat. 15: 282, 1901-02
- Arnica confinis* Greene, sp. nov., Ott. Nat., 15: 281
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- Arnica evermannii* Greene, sp. nov., Ott. Nat. 23: 215, 1909-10
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- Arnica lactucina* Greene, sp. nov., Ott. Nat. 23: 214, 1909-10
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- Arnica louiseana* Farr., sp. nov., Ott. Nat. 20: 109, 1906-07
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- Aster linariifolius* L. var. *victorinii* Fernald, var. nov., fig., Ott. Nat. 28: 156, 1914-15
- Aster microlanchus* Greene, sp. nov., Ott. Nat. 15: 278, 1901-02
- Aster puniceus* var. *oligocephalus* Fernald, var. nov., Ott. Nat. 13: 105, 1899-1900
- Berberis brevipes* Greene, sp. nov., Ott. Nat. 15: 42, 1901-02
- Carduus macouni* Greene, sp. nov., Ott. Nat. 16: 38, 1902-03
- Cerastium alsophilum* Greene, sp. nov., Ott. Nat. 16: 37, 1902-03
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- Delphinium chilliwacense* Greene, sp. nov., Ott. Nat. 16: 36, 1902-03
- Dryas tomentosa* Farr., sp. nov., Ott. Nat. 20: 110, 1906-07
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- Erigeron obtusatus* Greene, sp. nov., Ott. Nat. 16: 38, 1902-03
- Erigeron philadelphicus* L. var. *glabra* Henry, var. nov., Ott. Nat. 31: 57, 1917-18
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- Gentiana nesophila* Holm, sp. nov., Ott. Nat. 15: 111, 180, 1901-02
- Gentiana procera* Holm, sp. nov., fig., Ott. Nat. 15: 111, 179, 1901-02
- Gnaphalium macounii* Greene, sp. nov., Ott. Nat. 15: 278, 1901-02
- Gnaphalium proximum* Greene, sp. nov., Ott. Nat. 15: 279, 1901-02
- Hieracium albertinum* Farr, sp. nov., Ott. Nat. 20: 109, 1906-07
- Lappula anoplocarpa* Greene, sp. nov., Ott. Nat. 16: 39, 1902-03
- Malus macounii* Greene, sp. nov., Ott. Nat. 18: 215, 1904-05
- Melanidion* Greene, gen. nov., Ott. Nat. 25: 146, 1911-12
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- Oenothera agari* Gates, sp. nov., fig., CFN 41: 24, 1927
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- Pachystima krautteri* Farr, sp. nov., Ott. Nat. 20: 108, 1906-07
- Pachystima macrophyllum* Farr, sp. nov., Ott. Nat. 20: 107, 1906-07
- Pachystima myrsinites* Farr, sp. nov., Ott. Nat. 20: 107, 1906-07
- Pachystima schæfferi* Farr, sp. nov., Ott. Nat. 20: 108, 1906-07
- Pentastemon gormanii* Greene, sp. nov., Ott. Nat. 16: 39, 1902-03
- Ranunculus apetalus* Farr, sp. nov., Ott. Nat. 20: 110, 1906-07
- Ranunculus cardiopetalus* Greene, sp. nov., Ott. Nat. 16: 32, 1902-03
- Ranunculus hirtipes* Greene, sp. nov., Ott. Nat. 16: 32, 1902-03
- Ranunculus intertextus* Greene, sp. nov., Ott. Nat. 16: 33, 1902-03
- Ranunculus octopetalus* Greene, sp. nov., Ott. Nat. 16: 33, 1902-03
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- Salix interior pedicellata* (Anderson) Ball, comb. nov., CFN 40: 175, 1926
- Senecio balsamitæ* var. *thomsoniensis* Greenman, var. nov., Ott. Nat. 25: 116, 1911-12
- Senecio burkei* Greenman, sp. nov., Ott. Nat. 25: 114, 1911-12
- Senecio canus* Hook, var. *acræus* Greenman, var. nov., Ott. Nat. 25: 118, 1911-12
- Senecio crepidineus* Greene, sp. nov., Ott. Nat. 15: 250, 1901-02
- Senecio dileptiifolius* Greene, sp. nov., Ott. Nat. 15: 251, 1901-02
- Senecio manitobensis* Greenman, sp. nov., Ott. Nat. 25: 117, 1911-12
- Senecio multinomensis* Greenman, sp. nov., Ott. Nat. 25: 115, 1911-12

- Senecio prionophyllus* Greene, sp. nov., Ott. Nat. 15: 250, 1901-02
- Senecio willingii* Greenman, sp. nov., Ott. Nat. 25: 117, 1911-12
- Solidago chrysolepis* Fernald, sp. nov., Ott. Nat. 19: 168, 1905-06
- Stellaria subvestita* Greene, sp. nov., Ott. Nat. 15: 42, 1901-02
- Thalictrum alpinum* var. *gaspense* Greene, var. nov., Ott. Nat. 23: 18, 1909-10
- Thalictrum alpinum* var. *microspermum* Greene, var. nov., Ott. Nat. 23: 18, 1909-10
- Thalictrum alpinum* var. *nesioticum* Greene, var. nov., Ott. Nat. 23: 19, 1909-10
- Thalictrum alpinum* var. *pubicum* Greene, var. nov., Ott. Nat. 23: 19, 1909-10
- Thalictrum dioicum* var. *adiantinum* Greene, var. nov., Ott. Nat. 23: 39, 1909-10
- Thalictrum dioicum* var. *huronense* Greene, var. nov., Ott. Nat. 23: 39, 1909-10
- Thalictrum dioicum* var. *langfordii* Greene, var. nov., Ott. Nat. 23: 40, 1909-10
- Thalictrum glaucodeum* Greene, sp. nov., Ott. Nat. 24: 54, 1910-11
- Thalictrum labradoricum* Greene, sp. nov., Ott. Nat. 24: 53, 1910-11
- Thalictrum leucocrinum* Greene, sp. nov., Ott. Nat. 24: 29, 1910-11
- Thalictrum terræ-novæ* Greene, sp. nov., Ott. Nat. 24: 52, 1910-11
- Thalictrum tortuosum* Greene, sp. nov., Ott. Nat. 24: 54, 1910-11
- Thalictrum zibellinum* Greene, sp. nov., Ott. Nat. 24: 30, 1910-11
- Veronica americana* L. forma *rosea* Henry, f. nov. Ott. Nat. 31: 56, 1917-18
- Viola leucopetala* Greene, sp. nov., Ott. Nat. 15: 191, 1901-02

CONTRIBUTIONS TO THE KNOWLEDGE OF EXTREME NORTH-EASTERN LABRADOR

By **BERNHARD HANTZSCH**

"Beiträge zur Kenntnis des nordöstlichen Labradors, von Bernhard Hantzsch, *Mitteilungen des Vereins für Erdkunde zu Dresden*, Dresden, Volume 8, 1909, pp. 158-229. Volume 9, 1909, pp. 245-320.

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(Continued from Page 198)

THE ROCK material under discussion was collected by Mr. B. Hantzsch, Dresden-Plauen, on his expedition to extreme north-eastern Labrador in 1906², and given to the writer for examination. Since the only previous geological investigation of the northern coastal region of Canada had been in the form of reconnaissance excursions from ships, it seemed that a somewhat more detailed petrographic description of the rocks collected might be of value even if the specimens came from only a restricted area. To Mr. Hantzsch must be credited all the data concerning the manner of occurrence of the different varieties of rock and I also wish to express my sincere thanks to him for his continued co-operation in the assembling of this material.

On the geological map of the north-eastern part

¹ Untersuchung einiger Gesteine aus dem nordöstlichsten Labrador.

² Compare the preceding work: B. Hantzsch, Beiträge zur Kenntnis des nordöstlichen Labradors, No. 8, p. 186.

of Canada³, the extreme north-eastern tip of Labrador situated beyond the 60th degree of latitude has been described as consisting entirely of crystalline schists; the different rocks of this geological complex are certainly, however, very unlike both as regards their age and origin. This view was expressed by A. P. Low⁴ in his description of the geology of the coastal region situated farther west in the southern part of Hudson Strait and in the west and south of Ungava Bay where the rocks belong to the same geological complex as those of the region under discussion. [P. 231.]

According to Low (p. 30) there are among the rocks of this region some very ancient ones which are apparently parts of the old Archæan complex. Intrusive into these is a somewhat younger granite which is, however, far older than the sedimentary rocks from Labrador to be described later and which are placed provisionally in the Cambrian. These in their turn were metamorphosed by still later granites into gneiss-like masses at the contacts with the intrusive, and finally these granites were altered by pressure and mountain-building movements. Since all the gneisses of

³ Compare geological map of the northeastern part of the Dominion of Canada to illustrate the cruise of the D.G.C. *Neptune* to Hudson Bay and the Arctic Islands by A. P. Low, 1: 3168000, 1905.

⁴ A. P. Low, Report on an Exploration of Part of the south shore of Hudson Strait and of Ungava, Geological Survey of Canada, Ottawa, 1899.

different types and origin, and the gneiss-like rocks are very similar to one another in both appearance and composition, no separation of Archæan and Cambrian formations was attempted by A. P. Low, since this would have been possible in only a few places where contacts are exposed.* Analogous relations appear to prevail in this region. The differences in the chemical composition of the rocks from here due to differences in origin are apparent from the fact that in addition to gneisses which are more or less similar to the granites in mineral composition and structure and which were clearly formed by pressure there are pegmatites with decided banding and also amphibolites, graywacke, dolomite and dolomitic limestone. For the sake of completeness it may be observed that quartz veins were observed at many places in the gneisses by Mr. Hantzsch which may eventually be of importance on account of the possible occurrence in them of rare or useful minerals.

In the following account the different types of rock will be discussed according to the places where they are found. These may be located by referring to the works of Hantzsch.

I. NEW PLAUEN ISLAND.

Number 1 rock consists of quartz, orthoclase, plagioclase (oligoclase), biotite, muscovite in less amounts than the biotite, garnet in some rather large grains, magnetite, pyrite, some apatite and zircon.

Under the microscope the rock appears to have suffered pressure. A somewhat vague parallel structure is produced by the alternation of reddish and gray stripes. An original parallel structure is also faintly indicated in the specimen by a similar arrangement of small biotite flakes.

Number 2 shows veins in the gneiss and consists of alternating bands of pale reddish feldspar, quartz and small amounts of biotite. The parallel structure of this coarsely grained rock corresponds in this specimen with that of the bordering medium-grained biotite gneiss.

While the two last mentioned rocks occur in place the third, a schist, is an erratic block which was probably transported by ice to the plateau which lies about 100 metres above sea-level. The plateau appears to be bevelled off where the rock was found. Under the microscope fine-grained feldspathic bands of reddish colours are seen to alternate with grayish coloured bands which have an abundance of mica.

*The rocks described as of probable Cambrian age are now believed to be late Precambrian. They are younger than the granites of the region. They are cut by basic intrusives and are gently folded and faulted but it has not yet been definitely proved that they are cut by any granites or that they are metamorphosed anywhere into gneisses.—F.J.A.

The rock contains the same minerals as does No. 1 and in addition clinozoisite. A division into red or muscovite gneiss and gray or biotite gneiss as is the case in the Saxon mountain region cannot be perceived in this region.

No. 4 and No. 5. Amphibolite (in place) shows under the microscope an irregular banding in one specimen (4) and in the second (5) a platy cleavage. Both varieties are fine-grained but under the microscope a spotted gabbroid structure is to be observed. Hornblende of irregular outline and with a strong pleochroism (X=light yellow, Y=brown, Z=brown-green to blue-green) comprises the chief mass of the rocks, as much as three-quarters in a section. The basic plagioclase (labradorite) forms compact individual crystals, no fine-grained mosaic. In the platy variety, it is partly altered into prismatic clinozoisite and seriated and carbonitized aggregates. Garnet is present only in the platy variety, biotite only in the irregularly grained variety. In addition pyrite, magnetite, apatite and quartz are present in subordinate amounts. The effect of pressure is apparent in the faintly undulatory extinction and the irregularly spotted leaf-like character of the feldspar. [P. 233].

No. 6 is a granulated graywacke which is quite different from the gneisses and amphibolites. Whether this is found in place on the island is not known but it is said to occur in large quantities and at the place where it was collected it is present in such large amounts that it appears to occur there in situ. The small angular grains of quartz, plagioclase, orthoclase, and also some carbonate, magnetite and perhaps even carbon, are cemented together by a small amount of matrix which consists of biotite, muscovite, and chlorite.

II.—OPERNGEVIK

No. 7. Amphibolite with good banded structure formed by the alternation of white bands of about a centimetre thickness with others in which plagioclase and black hornblende predominate. The plagioclase is between oligoclase and andesine; together with the somewhat sparse amounts of hornblende (pleochroism: X=light yellow, Y=brown green, Z=blue green) it composes the chief constituent of the rock. In addition there are present, titanite, clinozoisite with inclined extinction, and some epidote; also accessory biotite, garnet, quartz, pyrite, magnetite and apatite. In the specimen excellent augen structure is shown by the plagioclase and hornblende and also by clinozoisite in combination with a mosaic of these two minerals. In addition the plagioclase shows strong undulatory extinction and other pressure phenomena.

No. 8 is a massive, coarse-grained amphibolite which does not occur in place but lies on the preceding rock in loose blocks together with quartzite. The hornblende which comprises most of the rock is unusually fresh and pure and besides the prismatic cleavage shows another parallel to (101) which appears as fine lines of fracture in the specimen. There are present in small amounts, brown biotite, apatite in rounded anhedrons, some quartz and pyrite. [P. 234].

III.—SNOW BAY

No. 9. Biotite-gneiss (found in place). White quartz-feldspar bands and black biotite ones alternate. The former are irregular, the latter show a pronounced parallel arrangement of the biotite crystals. In addition to the quartz, the small amounts of orthoclase, the different plagioclases (oligoclase, andesine, and labradorite), and brown biotite, there are also present, garnet where the biotite is abundant, magnetite and apatite. With the large feldspar individuals are associated some fine-grained feldspar intergrowths arranged in an irregular fashion without producing any parallel structure.

No. 10. Hornblend-gneiss. Thin bands not much over one millimetre in thickness of flesh-coloured feldspar alternate with dark green hornblende streaks. In places the rock is traversed by zones marked by viridite. This gneiss was found near the sea but in rather large quantities so that it could have hardly been transported from another place. The chief minerals in the specimen are orthoclase, plagioclase, and hornblende the last including a compact green variety without crystal outlines (X=yellow, Y=green, Z=bluish-green), which is in places altered into fibre-like aggregates of a pale green hornblende and also a sporadic compact blue variety (Z=colourless to yellowish, Y=greenish-blue, Z=blue). The rock has evidently been metamorphosed; the feldspars occur in two forms, first as large individuals which look gray and altered and second as clear colourless material which surrounds, replaces, and even interlaces along old fissures, the altered feldspar, and which is optically orientated with it. There is also an abundance of secondary material; chlorite of different varieties formed from hornblende, pale green epidote, carbonate in part in the rock matrix, in part in veinlets, white mica, a doubtful mineral in tabular isotropic sections somewhat like muscovite, and finally rather abundant pyrite, some magnetite and titanite.

IV.—PORT BURWELL

No. 11. Hypersthene-hornblende-gneiss (in place). Feldspathic bands of brownish yellow to

greenish-gray colour alternate with darker bands whose minerals show a somewhat parallel arrangement. The plagioclase is namely andesine, partly acid, partly basic; orthoclase was not found. Quartz appears in relatively large crystals. Hypersthene forms small round grains with pleochroism X=bright red, Y=yellowish, Z=bright green; the hornblende which occurs in somewhat smaller amounts shows X=bright yellow, Y=deep brown-green to green-brown, Z=brownish green. Subordinate amounts of brown biotite in flakes, a black mineral apparently titaniferous magnetite, yellow iron pyrite, apatite, zircon, probably titanite, and secondary carbonate, chlorite, talc and serpentine also occur.

No. 12 is a yellowish-grey dolomite, hardness No. 4 (it is used by the natives as a whetstone). Chemically it is calcium-magnesium carbonate, almost free of iron and with only a small residue insoluble in hydrochloric acid. Under the microscope the rock is seen to consist only of small grains of dolomite less than .1 mm. in diameter aside from some brown-black material which colours it. Distinct rhomboid outlines are in places visible particularly in the cavities which have been weathered out. This dolomite was not found in place but occurs in loose blocks above an outcrop of gneiss.

No. 13. Dolomitic limestone, compact, of light gray colour and not as hard as No. 12. It was found as fragments in a fiord near Killinek. In the specimen some rather large carbonate grains occur in a fine-grained darker carbonate ground mass.

V.—TAKPANGAJAK

No. 14. Coarse-grained pegmatite in veins cutting gneiss in place. The irregularly banded rock is composed of flesh-coloured to brick-red orthoclase, quartz and biotite. The plagioclase consists of oligoclase and andesine. Its distinctive colour is probably due to the presence of a volatile substance. After being heated in a test tube to a red glow, the brown colour disappeared leaving a spotted mixture of smoky black and uncoloured portions, while the orthoclase kept its colour afterwards. Plagioclase and orthoclase are distributed unevenly throughout the rock, the former being lacking in some places, the latter in others. In a specimen free of orthoclase, quartz and plagioclase formed excellent graphic intergrowths, a feature I have not found described in the literature.

(To be continued)

**AN ANNOTATED LIST OF VASCULAR PLANTS COLLECTED ON THE
NORTH SHORE OF THE GULF OF ST. LAWRENCE, 1927-1928**

By HARRISON F. LEWIS

(Continued from Page 204)

ARACEÆ

Calla palustris L.

The Bluff Harbour, August 1, 1927, border of pond on big island. Observed also at Watsishu, Natashquan, and Kegaska. Recorded by St. John from "Natashkwan" only. Range extension, 56 miles E.

LEMNACEÆ

Lemna minor L.

Kegaska, August 14, 1928, surface of small pond on Green Island. Found also on one other of several small ponds on the same island, but not observed elsewhere. Recorded by St. John from ponds on two small islands near Romaine, which is 25 miles east of Kegaska.

ERIOCAULACEÆ

Eriocaulon septangulare With.

Mingan, August 31, 1928, muddy bed of shallow, dried-up pond.

JUNCACEÆ

Juncus bufonius L.

Natashquan, August 5, 1927, damp pond margin. St. John treats this as an introduced species, but near Natashquan it is abundant about ponds and damp hollows among sand dunes two or three miles from settlement and has every appearance of being indigenous.

Juncus trifidus L.

St. Augustin, August 20, 1927, rocky crest on Little Rigolet Island. Blanc Sablon, June 28, 1927, low, wet sand.

Juncus Vaseyi Engelm.

Natashquan, August 5, 1927, damp pond margin and damp track in sand dunes.

Juncus filiformis L.

Wolf Bay, August 13, 1927, dooryard at head of bay. La Tabatière, July 21, 1928, border of shaded path in coniferous woods.

Juncus balticus Willd., var. *littoralis* Engelm.

Natashquan, August 7, 1927, sandy roadway and fresh marsh by Little Natashquan River. The Bluff Harbour, August 1, 1927, fresh marsh on big island. Lake Island, July 29, 1927, marsh near shore. Pointe au Maurier, July 13, 1927, mussel-shell beach near tide mark.

Juncus balticus Willd., var. *melanogenus* Fernald & Wiegand.

Anse des Dunes, June 28, 1927, sandy hollow.

Juncus brevicaudatus (Engelm.) Fernald.

Natashquan, August 5, 1927, damp foot-path. Romaine, August 11, 1928, wet river-bank.

Juncus pelocarpus Meyer.

Natashquan, August 18, 1928, dried-up pond bed.

Juncus albescens (Lange) Fernald.

Lourdes de Blanc Sablon, August 26, 1927, muddy depression. Recorded by St. John as *Juncus triglumis* L.

Luzula parviflora Desv., var. *melanocarpa* (Michx.) Buchenau.

Betchewun, August 26, 1928, damp clearing. Anse des Dunes, June 28, 1927, sandy bank of brook.

Luzula confusa Lindb.

Mt. Cartier, July 22, 1929, slope near summit of mountain, at elevation of about 1250 feet.

Luzula spicata (L.) DC.

Blanc Sablon, July 17, 1929, near foot-path, west side of river.

Luzula campestris (L.) DC., var. *multiflora* (Ehrh.) Celak.

Wolf Bay, July 31, 1927, damp, rich soil on the island called "The Black Land".

Luzula campestris (L.) DC., var. *frigida* Buchenau.

Mingan, August 30, 1928, sand flat beside Mingan River. St. Augustin Island, July 19, 1928, open, mossy bank. Bradore Bay, June 25, 1927, loamy turf on calcareous sandstone, and June 28, 1927, wet lakeside on calcareous sandstone. Anse des Dunes, June 28, 1927, sandy bank of brook.

LILIACEÆ

Tofieldia minima (Hill) Druce.

St. Charles Island, August 27, 1928, top of limestone shingle beach.

Tofieldia glutinosa (Michx.) Pers.

St. Charles Island, August 27, 1928, fresh marsh beside marl bog.

Zigadenus elegans Pursh.

Ste. Genevieve Island, August 23, 1928, shallow turf near shore. Recorded by St. John as *Zigadenus chloranthus* Richardson.

**Allium Schoenoprasum* L., var. *sibiricum* (L.) Hartm.

Betchewun, August 26, 1928, grassy clearing. Possibly introduced.

Clintonia borealis (Ait.) Raf.

Betchewun, August 26, 1928, dense coniferous

woods. Kegaska River (mouth), June 25, 1928, face of turfy, sandy bank facing the sea. Mainland west of Net Island, Old Fort Archipelago, July 5, 1927, clearing among woods in brook valley. In 1928 first seen in bloom near mouth of Kegaska River on June 23.

Smilacina stellata (L.) Desv.

Kegaska River (mouth), June 23, 1928, sandy, open land above beach. Pointe au Maurier July 13, 1927, mussel-shell beach, near tide mark. Bradore Bay, June 29, 1927, grassy crest of sand beach. In 1928 first seen in bloom near mouth of Kegaska River on June 23.

Smilacina trifolia (L.) Desv.

Kegaska River (mouth), August 3, 1927, in 3 inches of water in shallow pool in rock. Washikutu, June 9, 1928, damp hollow. La Tabatière, July 7, 1927, wooded bank near shore. Bradore Bay, June 30, 1927, bushy sphagnum bog.

Maianthemum canadense Desf.

La Tabatière, July 21, 1928, in moss in coniferous woods.

Streptopus amplexifolius (L.) DC.

St. Mary Islands, July 22, 1927, mossy ravine on eastern island.

**Streptopus oreopolus* Fernald (*S. amplexifolius* (L.) DC. x *roseus* Michx.)

Mutton Bay, July 9, 1927, basaltic dyke ravine, near brook. Recorded from "Ile Nue, archipel de Mingan" by Frère Marie-Victorin (1929a).

Streptopus roseus Michx.

Kegaska River (mouth), June 23, 1928, sandy open land above beach. Mutton Bay, July 9, 1927, basaltic dyke ravine. Blanc Sablon, June 28, 1927, river bank, east side of Blanc Sablon River.

IRIDACEÆ

Iris versicolor L.

St. Mary Islands, July 22, 1927, border of rivulet on eastern island. La Tabatière, July 21, 1928, meadow at head of cove. Observed in bloom at Natashquan on June 27, 1928.

Iris setosa Pall., var. *canadensis* Foster.

Wapitagun, July 15, 1927, turfy hilltop on island. St. Mary Islands, July 22, 1927, turfy slope on middle island. Observed in bloom at Natashquan on June 28, 1928.

Sisyrinchium angustifolium Mill.

Natashquan, August 5, 1927, damp pond margin. Kegaska, August 14, 1928, turf near shore on Green Island. Observed also at Thunder River. Recorded by St. John as "Occasional as far east as Natashquan". Range extension 25 miles E.

ORCHIDACEÆ

Cypripedium parviflorum Salisb.

Betchewun, August 25, 1928, dry hillside.

Cypripedium acaule Ait.

Baie Johan Beetz, August 22, 1928, dry, open hillside.

Orchis rotundifolia Pursh.

St. Charles Island, August 2, 1930, talus below limestone cliff.

Habenaria hyperborea (L.) R.Br.

Blanc Sablon, July 11, 1928, wet slope of steep bank, east side of river. The only certain records given by St. John are for "Mingan Islands: Ile du Havre", and "Pointe-aux-Esquimaux". Range extension, 310 miles E.

Habenaria dilatata (Pursh.) Gray.

Kegaska, August 14, 1928, turf near beach on Green Island. Harrington Harbour, July 25, 1928, wet gully on sand and clay bluff on mainland. Blanc Sablon, August 26, 1927, sphagnum bog on gneiss plain, west side of river, and July 11, 1928, sandy bank, east side of river. Seen also near outer beach on Kegaska Island, August 15, 1928.

Habenaria obtusata (Pursh) Richards.

Natashquan, August 9, 1927, shady, open, fir woods. Wolf Bay, August 13, 1927, dense coniferous woods. La Tabatière, July 21, 1928, coniferous woods.

**Habenaria obtusata* (Pursh) Richards., var. *collectanea* Fernald.

St. Mary Islands, July 22, 1927, turfy hillside on middle island. Lobster Bay, July 17, 1928, boggy hillside.

Spiranthes Romanzoffiana Cham.

Mascanin, August 20, 1928, shallow turf near shore of outer granitic island containing mussel-shell deposits. Natashquan, August 5, 1927, damp pond margin, and August 9, 1927, damp border of slough in sand dunes. Fog Island, August 9, 1928, turfy slopes. Observed also on small, outer, granitic islands at Watshishu, near shore of mainland on west side of harbour at Baie Johan Beetz, and at Seven Islands.

Epipactis repens (L.) Crantz, var. *ophioides* (Fernald) A. A. Eaton.

Ste. Genevieve Island, August 23, 1928, damp, mossy floor of dense virgin coniferous forest. Wolf Bay, August 13, 1927, dense coniferous woods. Observed also at Seven Islands.

Listera cordata (L.) R.Br.

Mingan, August 30, 1928, deep coniferous woods on Ile du Havre. Ste. Genevieve Island, August 23, 1928, damp, mossy floor of dense virgin coniferous forest. Cove near Rapide Lessard, Little Rigolet, July 20, 1928, mossy forest floor in coniferous woods.

Corallorhiza trifida Chatelain.

Mingan, August 30, 1928, just within border of coniferous woods on Ile du Havre.

Microstylis monophyllos (L.) Lindl.

Havre St. Pierre, September 6, 1929, rocky limestone shore of bay between Havre St. Pierre and Pointe aux Morts. Not reported by St. John west of Bonne Esperance. Range extension, 291 miles W.

Calypso bulbosa (L.) Oakes.

Betchewun, June 5, 1927, spruce woods on limestone near shore. St. Genevieve Island, June 7, 1927, top of limestone shingle beach.

SALICACEÆ

Salix lucida Muhl.

Romaine, August 10, 1928, foot of sandy bank, top of beach. Observed on Eskimo Island, Mingan Islands, and at Thunder River.

Salix lucida Muhl., var. *intonsa* Fernald.

Mingan, August 30, 1928, sandy border of Mingan River. Bradore Bay, July 13, 1928, mouth of small river at head of bay. Observed also at Thunder River. Recorded by St. John from Natashquan River and Lagorgendière: Romaine. Range extension, 179 miles E.

**Salix discolor* Muhl., var. *overi* Ball.

Betchewun, August 26, 1928, large bush in clearing.

**Salix Bebbiana* Sarg., var. *capreifolia* Fernald.

Kegaska River (mouth), June 23, 1928, sandy hillside near shore.

**Salix Bebbiana* Sarg., var. *perrostrata* (Rydb.) Schneid.

Ste. Genevieve Island, August 23, 1928, open limestone shingle above beach. Mascanin, August 20, 1928, small tree, 12 feet high, beside small stream at tide water. Mainland west of Net Island, Old Fort Archipelago, July 5, 1927, sheltered hollow on hillside.

**Salix simulans* Fernald.

Betchewun, August 26, 1928, open, dried-up bog, and September 3, 1929, open, swampy area. (Fernald, 1930).

Salix humilis Marsh.

Ste. Genevieve Island, August 23, 1928, limestone shingle above beach. Mascanin, August 20, 1928, bush near shore. Harrington Harbour, July 25, 1928, face of sand and clay bluff beside shore of mainland.

**Salix humilis* Marsh., var. *keveenawensis* Farwell.

Seven Islands, September 11, 1928, sandy ridges.

**Salix paraleuca* Fernald.

Lake Island, July 29, 1927, turfy bank. Also collected from same plant, August 8, 1929. Determined by Prof. M. L. Fernald and compared with type. Heretofore known only from

Gaspé and Bonaventure Counties, in the Gaspé peninsula, Province of Quebec.

Salix planifolia Pursh.

Betchewun, August 26, 1928, open, dried-up bog. Natashquan, June 27, 1928, ponds and pond-borders in sandy woods, and August 18, 1928, dried-up pond bed in sandy woods. Bradore Bay, June 28, 1927, wet lakeside on calcareous sandstone. Blanc Sablon, June 28, 1927, sandy bank on calcareous sandstone, west side of river, and July 10, 1928, damp pond margin, west side of river. Recorded by St. John as *S. phlycifolia* L.

**Salix glaucophylloides* Fernald.

Mingan, August 30, 1928, sand flat beside Mingan River.

Salix pyrifolia Anderss.

Natashquan, August 5, 1927, damp hollow in sandy woods, and June 27, 1928, border of pond in sandy woods. La Tabatière, July 21, 1928, thicket near shore. Recorded by St. John from Natashquan only. Range extension, 142 miles E.

Salix candida Flügge.

Baie Johan Beetz, August 22, 1928, smooth, low, granitic rock near shore. Bradore Bay, June 29, 1927, damp brookside on calcareous sandstone; June 30, 1927, bushy river-bank on gneiss at head of bay; and August 28, 1927, among granitic boulders at head of cove on Basin Island. Shows a distinct tendency to overflow from calcareous regions to nearby regions of granitic rocks.

**Salix candida* Flügge, var. *denudata* Anderss.

Betchewun, August 26, 1928, open, dried-up bog.

Salix pellita Anderss.

Natashquan, August 5, 1927, damp hollow in sandy woods, and August 18, 1928, crown of low sand hill. Romaine, August 11, 1928, foot of sandy bank at top of beach.

Salix cordifolia Pursh., var. *callicarpæa* (Trautv.) Fernald.

Ste. Genevieve Island, August 23, 1928, top of limestone beach. Wapitagun, August 6, 1928, semi-erect at top of sea-cliff and also prostrate in moss on hillside. St. Mary Islands, July 22, 1927, turfy hillside, and August 6, 1929, turfy slope near shore, and August 7, 1929, turfy slope near shore. St. Augustin, June 22, 1927, shallow turf on outer granitic island in the group of islands called "St. Augustin Square". Bradore Bay, June 28, 1927, wet lakeside on calcareous sandstone. Greenly Island, July 12, 1928, sheltered slope. Blanc Sablon, June 28, 1927, prostrate in turf on calcareous sand-

stone, west side of river. Recorded by St. John as *S. cordifolia* Pursh.

**Salix cordifolia* Pursh, var. *intonsa* Fernald.

Wolf Bay, July 31, 1927, turfy slope on the island called "The Black Land". Wapitagun, August 4, 1928, shallow turf on granitic slope.

**Salix cordifolia* Pursh, var. *Macounii* (Rydb.) Schneid.

Wolf Bay, June 16, 1928, turfy hillside, and June 17, 1928, low, rich soil at foot of turfy bank. Lake Island, June 17, 1927, scanty turf bordering bare granite just back of cliffs, and August 6, 1928, prostrate in moss on hill.

**Salix arctophila* Cockerell.

Yankee Harbour, July 28, 1927, damp swale. Mistanoque Island, June 24, 1927. Blanc Sablon, June 28, 1927, prostrate in turf on calcareous sandstone, west side of river.

Salix urva-ursi Pursh.

Net Island, July 4, 1927, prostrate on rocky, granitic summit of island, at about 300 feet elevation. Bradore Bay, July 13, 1928, granitic summit, at about 500 feet elevation.

Salix vestita Pursh.

Blanc Sablon, July 10, 1928, bushy hillside, west side of river.

Populus tremuloides Michx.

Thunder River, September 2, 1928, open, scattered, mixed woods on sandy soil. Magpie, September 1, 1928, open woods on sandy plain. Ste. Genevieve Island, August 23, 1928, open limestone shingle area above beach. Mascanin, August 20, 1928, beside small stream at tide water. St. John states, "R. Bell indicates this

on his map (B⁴) as growing over the greater part of Labrador peninsula. It does not, however, grow in the coastal region east of Mingan." That this unfortunate statement is incorrect is shown by the above collections from Ste. Genevieve Island and Mascanin, both of which stations are east of Mingan and at both of which *P. tremuloides* grows within a few feet of tide water. At Mascanin, the easternmost station recorded, were a number of trees of this species about 40 feet high, and from 5 to 11 inches in diameter, as well as smaller individuals. This record extends the known range of this plant 70 miles eastward from Mingan along this coast. I have also observed the species at Betchewun and at Little Watshishu, both east of Mingan, so that its range in this region is, apparently, fairly continuous. It may be noted here that the St. Lawrence Pilot, vol. 1, Eighth Edition, 1916, page 168, published by the British Admiralty, records "poplar" as growing on Little Mecatina Island, probably on the authority of Dr. Wm. Kelly, who accompanied Capt. Bayfield when he made a hydrographic survey of this coast. The species intended is not known.

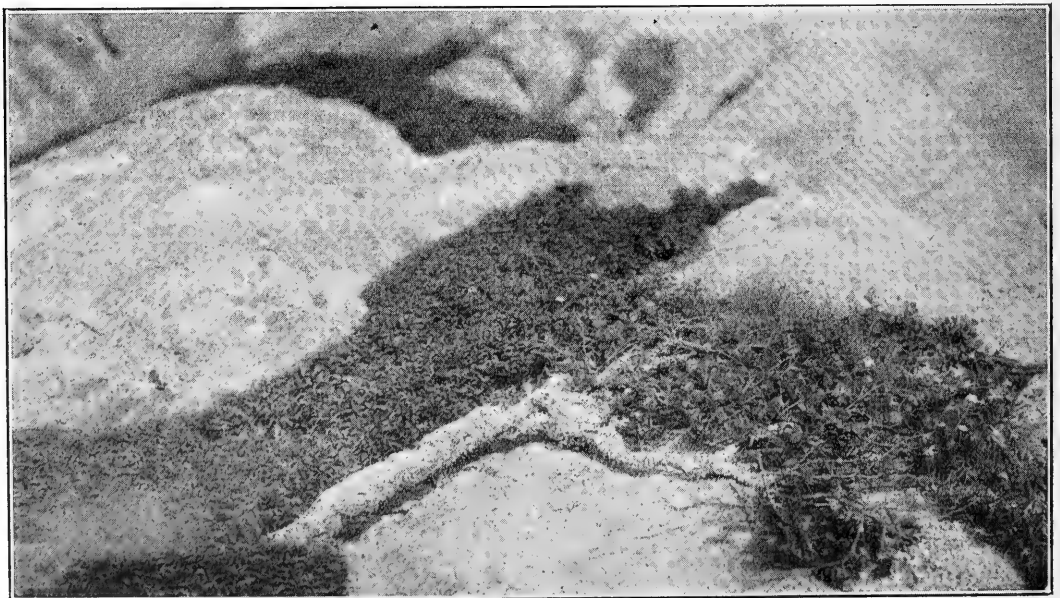
**Populus tremuloides* Michx., var. *rhomboidea* Vict.

Magpie, September 1, 1928, tree about 40 feet high and 10 inches in diameter.

Populus tacamahacca Mill.

Betchewun, August 26, 1928, boggy places in clearings and woods. Recorded by St. John as *P. balsamifera* L.

(To be continued)



Unusually old individual of *Betula pumila*, prostrate at top of sea-cliff on Lake island.

INDEX TO VOLUME XLV

- A., R. M. Review by 72
Abies balsamea 99
Acanthis hornemannii hornemannii 198
linaria 12, 17
linaria fuscescens 198
linaria rostrata 198
Accipiter atricapillus 198
Achillea lanulosa 106
multiflora 106
Actæa rubra 102
Actitis macularia 77, 160
Actodromas fuscicollis 197
maculata 197
Adoxa Moschatellina 106
Aegialitis hiaticula sempalmata 198
semipalmata 12
Aethya affinis affinis 197
marila nearctica 197
Agabus tristis 34
Agrotiphila quieta 34
Air sponsa 182
Alca torda 76, 196
Alces americana 111, 159
Alder, Green 101
River 101
Alectoria ochroleuca cincinnatiata 173
Algelaius phæniceus 161
Alle alle 196
Alligator mississippiensis 40
Allium sibiricum 100
Alnus crispa 101
tenuifolia 101
Alsine verna propinqua 173
Amara alpina 87
Ambystoma jeffersonianum maculatum 109, 112
Amelanchier alnifolia 103
American Egret at Guelph, Ont. 148
American Waterfowl, Review 42
Ami, Henry Marc, Obituary 25
Amodramus savannarum bimaculatus 186
Amphibia, Reptilia and Mammalia of the Temagami district, Ont. 109
Amphibians 68, 89, 109
Amphibians and Reptiles of the Athabaska and Great Slave Lakes region 68
Amphiodon alosoides 33
Amphipoda 81, 83
Anarta richardsoni 86
Anas boschas rubripes 197
obscura rubripes 197
platyrhyncos 160, 182
rubripes 77, 182
Anderson, R. M., Review by 92
Andromeda Polifolia 35, 105
Androsace septentrionalis 105
Anemone 35
Anemone canadensis 102
multifida 102
Anemone patens Wolfgangiana 102
Richardsonii 35
Animal Life of Yellowstone National Park, Review of 92
Annotated list of vascular plants collected on the north shore of the Gulf of St. Lawrence, 1927-1930. 129, 174, 199, 225
Annual Meeting, Report of Annual Report. 19
McIlwraith Ornithological Club 120
Anser albifrons 11, 14, 182
albifrons gamboli 197
Antennaria alpina 35, 174
Anthus rubescens 12, 18
spinolettus pensilvanicus 198
Aplexa sp. 83
Apocynum androsæmifolium 105
Arabis alpina 173
brachycarpa 102
Aralia nudicaulis 104
Archibuteo lagopus 12, 16
lagopus sancti-ohannis 198
Arctica queuseli 86
Arctostaphylos alpina 35, 105, 174
Uva-ursi 105
Arenaria interpres 198
verna propinqua 102
Armeria vulgaris Labradorica 174
Arnica alpina 35
Arquatella maritima maritima 197
Artemia bungei 81
"Artemia gracilis" 81
Artemiopsis Stefanssonii 80
Artemisia canadensis 106
frigida 106, 212
vulgaris Tilesii 106
Arum, Water 100
Asio accipitrinus accipitrinus 198
flammeus 161
magellanicus heterocnemis 198
Aspidium Goldianum 193
Aster Lindleyanus 106
Richardsonii 106
salicifolius 106
Astragaulus adsurgens 104
alpinus 35, 174
tenellus 104
Asyndesmus lewisi 71, 184
Athabaska, Botany 97
Auk, Razor-billed 74, 76, 196
Avocet, American 183
Azalea, Trailing 35
Baillie, J. L., Gray Red Squirrel 207
Little Blue Heron 206
Mourning Dove 180
Baker, A. W., Insect Parasites 189
Ball, J. N., Grouse Cycles 162
Baneberry, Red 102
Barbarea stricta 102
Bastin, C. H., Black-capped Chickadee 179
Glaucous-winged Gulls 180
Bat, Hoary 147
Least Brown 118
Little Brown 110
Batrachians, Labrador 195
Bay, Lapland Rose 35
Bear, Black 110, 160
Bearberry 105, 174
Alpine 35, 105
Beaver 111, 160, 194
Beaver, Unnatural History of 1
Bedstraw, Northern 106
Sweet-scented 106
Beetles, Camboid 87
Beetles, Labrador 87
Betula glandulosa 101
papyrifera 101
Bilberry, Bog 35, 105
Billfish 41
Birch, Canoe 101
Dwarf 101
Bird banding 167
Bird-banding return, Unusual 40
Bird-banding returns 44, 150
Bird-banding, Value of 70
Bird Census, Christmas 35
Bird Picture Cards, Review 22
Bird sanctuaries 73
Birds, Great Slave Lake 158
Labrador 113
Manitoba 181
New Checklist of 180
Sub-arctic areas 11
Bistort 35
Bittern, American 194
Least 71
Blackbird, Red-winged 65, 161
Rusty 161
Blackfish (Globocephalus) stranded on the south coast of Prince Edward Island 157
Blarina brevicauda 110, 193, 194
Blueberry 105
Bluebird 194
Mountain 184
Bob-white Quail liberated in Alberta 91
Bonasa umbellus 161
Botany, Athabaska 97
Great Slave Lake 97
Labrador 173
St. Lawrence Gulf 129, 174, 199, 225
Sub-arctic 35
Botrychium angustisegmentum 78

- Bramble, Arctic..... 35
Branchinecta paludosa... 80, 83
 Brant..... 197
Branta bernicla glaucogaster 197
 canadensis... 12, 14, 160
 canadensis hutchinsii.. 197
Bremus arcticus..... 34
Brenthis aphirape triclaris. 34
 freija tarquinius..... 34
 improba..... 34
 polaris..... 86
 polaris americana... 34
 British and American
 grouse cycles..... 162
 Brown, Florence A., Eco-
 nomics of Wild Life.. 63
Bryanthus Taxifolius..... 174
 Buffalo-berry..... 104
Bufo americanus..... 109, 112
 cognatus..... 90
 hemiphrys..... 68
 lentiginosus woodhousei 68
Bufo cognatus cognatus
 from Alberta..... 90
 Bullfrog..... 109
 Bullhead..... 34
 Bunch-berry..... 104
 Bunting, Snow... 17, 148, 198
Buteo swainsoni..... 91
 Butterflies, Southern Sul-
 phur..... 41
 Butterflies, Sub-arctic... 34
 Butterfly, Owl..... 86
 Butterwort..... 35

Calcarius lapponicus 12, 18, 198
Calidris arenaria..... 197
Calla palustris..... 100
Callitriche palustris..... 104
Caltha palustris..... 102
Calypso bulbosa..... 100
Campanula rotundifolia... 106
 uniflora..... 174
 Campion, Moss..... 35
Canachites canadensis... 161
 canadensis labradorius 198
 Canada, New map of.... 71
 Sub-arctic..... 11, 31
 Canada's heritage of wild
 life—Some economic
 aspects..... 63
Cancer magister..... 188
 oregonensis..... 188
 productus..... 188
Cantis..... 193
 lycaon..... 110
 Capelin..... 195
 Carcasses of the Mammoth
 and Rhinoceros found
 in the frozen ground of
 Siberia, Review..... 93
Cardamine pratensis..... 173
Carex concolor..... 35
 hyperborea..... 173
 rigida..... 173
 Caribou..... 32, 112
 Carolina Wren breeding at
 Toronto..... 205

Carpodacus purpureus pur-
 pureus..... 198
 Cartwright, B. W., Mani-
 toban Birds..... 181
Castilleja pallida..... 35, 106
Castor canadensis..... 111, 194
 Catbird..... 138, 194
Catopsilia agarithe..... 42
Catostomus catostomus... 33
 commersonii..... 8
 Cat-tail..... 99
 Census, Christmas Bird... 35
Cephus grylle grylle..... 76
 grylle mandii..... 11, 196
Cerastium alpinum..... 35, 173
Cerchneis sparverius..... 161
Cervus canadensis..... 40
Ceryle alcyon..... 161
Cetorhinus maximus..... 195
Cetraria nivalis..... 173
Charadrius dominicus dom-
 inicus..... 197
 meloda..... 21
 semipalmata..... 15, 77
Chelydra serpentina..... 110
Chen caerulescens..... 181
 hyperborea..... 14, 197
Chenopodium album..... 102
 capitatum..... 102
 Cherry, Wild Red..... 103
 Chickadee..... 18, 194
 Black-capped... 30, 179
 Hudsonian... 30, 162, 198
 Chickweed..... 35, 173
 Mouse-ear..... 35, 173
Chilostigma præterita..... 34
 Chimney Swifts..... 204
Chionoectes bairdi..... 187
 Chipmunk, Eastern..... 110
 Northeastern... 193, 194
 Western..... 110
Chondestes grammacus 21, 186
 Christmas Bird Census,
 1930..... 35
Chrysemys marginata 110, 112
Chrysothamnus graveolus.. 212
Chydorus sphaericus..... 80
Cicuta maculata..... 104
Cimoliosaurus magnus... 136
 Cinquefoil..... 35
 Shrubby..... 103
 Three-toothed... 103
Circus hudsonicus..... 161
 Cisco (fish)..... 8
 Cladocera..... 80, 83
Cladonia sp..... 97
 bellidiflora..... 173
 sylvatica..... 173
 Clam, Fresh-water..... 87
Clangula clangula ameri-
 cana..... 197
 hyemalis..... 160
 islandica..... 197
 Clay-coloured Sparrow at
 Hawkstone, Simcoe
 Co., Ont..... 91
Clethrionomys gapperi 111, 194
Clorinda lowi..... 81
 Cloud-berry..... 35, 103
Cochlearia grænlandica... 173
 Cod..... 195
Colaptes auratus borealis.. 161

Colias nastes..... 86
Collomia linearis..... 105
Colymbus auritus..... 12
 griseigena holboellii... 196
Comsothlypis americana pu-
 silla..... 185
Conchidium ducussatum... 86
 Conchostraca..... 80
Condylura cristata... 110, 194
 Conservation of game... 31
 Conservation of wild life... 9
 Contributions to the know-
 ledge of extreme
 north-eastern Labra-
 dor.. 49, 85, 115, 143, 169,
 194, 222
 Coot..... 90
 Copepoda..... 80, 83
 Coral, Fossil..... 86
 Coregonidae..... 83
Coregonus..... 34
 clupeiformis..... 8
 quadrilateralis..... 195
 Cormorant, Common... 113, 196
 Double-crested 74, 77, 181
Cornus canadensis..... 104
 stolonifera riparia... 104
Corvus corax principalis.. 12, 17, 113, 161, 184, 198
Corydalis aurea..... 102
 sempervirens..... 102
Cottus cognatus..... 34
 Coventry, A. F., Fauna
 of Temagami, Ont... 109
 Cowbane, Spotted..... 104
 Cowbird..... 185
 Crabs, Brachyuran... 187
 British Columbia... 187
 Cranberry, Mountain... 105
 Rock..... 35
 Small..... 35
 Crane, Little Brown... 14, 160
 Sandhill..... 160
 Whooping..... 183
 Cress, Hoary..... 149
 Marsh..... 35
 Criddle, N., Obituary by 90
Cristivomer namaycush... 34
 Critchell-Bullock, J. C.,
 Expedition to Sub-
 arctic Canada..... 11, 31
Crocethia leucophæa..... 160
 Crosby, Maunsell Schief-
 felin, Obituary..... 146
 Crossbill, White-winged... 17
 Crow..... 138, 194
 Crowberry..... 104
 Crow-flower..... 173
 Crowfoot..... 173
 Crustacea, Fresh-water... 80
Crymophilus fulcarius... 197
Cryobius arcticola..... 87
Cryptoglaux funerea... 16
Cryptogramma acrosticho-
 des..... 98
 Cuckoo, Black-billed... 78
 Yellow-billed..... 79
Culex nigripes..... 87
 Curlew, Eskimo..... 197
 Hudsonian..... 197
 Currant, Northern Black.. 103
 Skunk..... 103

- Currant, Swamp Red.... 103
 Cycles, Periodic..... 162
 Cygnus..... 14
 columbarius..... 160
Cypripedium passerinum... 100
Cyprinotus incongruens... 80
Cystopteris fragilis..... 173
- Dactylina arctica*..... 173
Dafila acuta..... 14, 197
 Dale, E. M. S., Lark Sparrow..... 21
 Dandelion..... 35, 106, 174
Daphnia pulex..... 80, 83
 Davis, E., Least Brown Bat..... 118
 Kazabazua district... 193
 Deer, White-tailed..... 111
Delphinium Brownii..... 102
Dendroica aestiva..... 162
 atricapilla..... 162
 coronata..... 162
Deschampsia caespitosa... 35
Diadophis punctatus..... 109
Diapensia Lapponica..... 174
Diaptomus sp?..... 80, 83
 bacillifer..... 80
 Eiseni..... 80
Dicrostonyx hudsonius... 86
Disporum trachycarpum... 100
 Dogbane, Spreading..... 105
 Dogwood, Red-osier..... 104
 Dove, Mourning..... 180
 Dovekie..... 196
Draba..... 35
 Bellii..... 173
 Dryade..... 35
Dryas integrifolia..... 35
 octopetala integrifolia.. 173
Dryocalis corymbosa... 103
 Duck, Black.. 74, 77, 182, 197
 Eider..... 117, 144
 Harlequin..... 197
 Lesser Scaup..... 197
 Old-squaw.. 14, 160, 197
 Pintail..... 14, 197
 Scaup..... 14
 Wood..... 182
 Duck-banding..... 167
 Dymond, J. R., Saury.... 41
- Eagle, Golden..... 35
 Northern Bald..... 161
 Eel-grass..... 57-62
 Egret, American..... 148
 Eider, American.. 74, 77, 113
 Greenland..... 197
 King..... 197
Elæagnus argentea..... 104
Elaphe obsoleta obsoleta.. 83
Elephas primigenius..... 94
 Elk..... 40
 Elk remains in Norfolk county..... 40
Elymus arenarius villosus.. 35, 173
 Emerton, James H., Obituary..... 90
Empetrum nigrum..... 104, 174
- Empidonax minimus*..... 161
 trailli alnorum..... 161
 Entomostraca..... 80, 83
Epilobium angustifolium.. 104
 glandulosum adenocaulon.. 104
 latifolium..... 35, 174
 spicatum..... 174
Equisetum arvense..... 98
 arvense campestre..... 173
 fluviatile..... 98
 pratense..... 98
 sylvaticum..... 98
Erebica rossii..... 34
Ereunetes pusillus.. 12, 15, 197
Erigeron purpureus..... 106
 uniflorus..... 35, 174
Eriophorum angustifolium.. 173
 Scheuchzeri..... 173
 vaginatum..... 173
Erihizon dorsatum..... 111
Erysimum cheiranthoides.. 102
 Esker at Tweed, Hastings County, Ontario..... 114
 Eskimo fishing method... 117
Esox lucius..... 8
Eubranchipus gelidus..... 80, 82, 83
Euphagus carolinus..... 161
Eurotia lanata..... 212
Eurycercus glacialis..... 81
 lamellatus..... 80, 83
Eurymus boothi..... 34
 eurytheme..... 42
 hecla glacialis..... 34
 palæno chippewa..... 34
Eutamias minimus borealis 110
 Everlasting, Alpine..... 35
 Excursions, O.F.-N.C..... 119
 Expedition to sub-arctic Canada, 1924-25... 11, 31
- Fairbairn, H. W., Great Slave Lake fauna... 158
 Fairy-shrimp..... 80, 82
Falco columbarius columbarius..... 161, 198
 islandus..... 16
 mexicanus..... 182
 peregrinus..... 12, 16
 peregrinus anatum..... 198
 rusticolus gyrfalco.. 16, 182
 Falcon, Prairie..... 182
 Farley, F. L., Bonaparte's Gull..... 138
 Lewis's Woodpecker.. 71
 Piping Plover..... 21
 Fern, Braun's Holly..... 193
 Goldie's Shield..... 193
 Lance-leaved Grape.. 78
 Scented Shield..... 35
 Fescue, Creeping..... 35
Festuca borealis..... 173
 ovina alpina..... 173
 rubra arenaria..... 35
 Field notes on the Pallid Meadow Mouse..... 209
 Financial Statement..... 19
 Finch, Purple..... 198
 Fir, Balsam..... 99
 Fireweed..... 104
- First Canadian record of Least Brown Bat.... 118
 Fish, Movements of..... 8
 Sub-arctic..... 33
 Fisher..... 110, 160
 Fishing, Eskimo method.. 117
 Five years' progress in the bird sanctuaries of the north shore of the Gulf of St. Lawrence 73
 Fleabane, One-flowered... 35
 Flicker..... 194
 Boreal..... 161
Florida cærulea..... 40, 207
 Flycatcher, Acadian..... 41
 Alder..... 161
 Least..... 161
 Olive-sided..... 161
 Forestry vs. Game cover.. 28
 Fox..... 160
 Red..... 110
Fragaria cuneifolia..... 103
Fratercula arctica arctica 76, 196
 arctica glacialis..... 196
 Fresh-water Mollusca of Wisconsin, Review... 149
 Fresh-water Mussel and Coot kill each other.. 90
 Fresh-water Plesiosaurs... 135
 Frog..... 89
 Green..... 109
 Leopard..... 69, 109
 Mink..... 109
 Northern Swamp Cricket..... 68
 Northern Wood... 69, 109
 Frogs, in Labrador..... 195
 Fulmar..... 196
Fulmarus glacialis glacialis 196
 Fungi..... 139
- G. A. Grasshopper control 149
Gadus callarias..... 195
 Gale, Swart..... 101
Galium boreale..... 106
 triflorum..... 106
Gallinula chloropus cackinans..... 183
Gallinula Florida..... 183
 Game conservation..... 31
 Game cover..... 28
Gammarus limnæus..... 81, 83
 Gannet..... 196
Gasterosteus aculeatus.. 82, 83
Gavia adamsi..... 11
 alba..... 196
 arctica..... 12
 immer..... 12
 immer pacifica..... 160
 stellata..... 12, 76, 113
Geocaulon lividum..... 101
 Geology, Glacial..... 114
Geranium Bicknellii..... 104
 Glacial action..... 114
Glaucomys sabrinus.. 111, 112
 sabrinus macrotis... 112
Glauz maritima..... 105
Globiocephalus melæna.. 157
 Goldeneye, American, 194, Barrow's..... 197
 Goldeye (fish)..... 33

Goldfinch..... 194
 Goose, American White-fronted..... 14
 Blue..... 181
 Canada..... 14, 160
 Hutchins..... 197
 Lesser Snow..... 14
 Snow..... 197
 White-fronted..... 182, 197
 Gooseberry, Northern..... 102
 Goshawk..... 194
 American..... 198
 Gould, V. E., Woodcock.. 91
 Grackle, Bronzed..... 161
 Grass, Cotton..... 173
 Fescue..... 173
 Holy..... 173
 Lyme..... 35
 Meadow..... 173
 Tufted Hair..... 35
 Grasshopper control in eastern Canada..... 149
 Gray Red Squirrel..... 207
 Grayling..... 83
 Arctic..... 34
 Great Slave Lake..... 68
 Botany..... 97
 Fauna..... 158
 Grebe, Holboell's..... 196
 Horned..... 12
 Pied-billed..... 160, 196
 Griscorn, L., Obituary by 146
 Groh, H., Hoary Cress... 149
 Grosbeak, Pine..... 161
 Rose-breasted..... 65
 Grouse, Ruffed..... 161, 194
 Spruce..... 161
 Grouse cycles..... 162
Grus canadensis..... 183
 canadensis..... 14, 160
 mexicana..... 160
 Guide to the study of freshwater biology, Review 72
 Guillemot, Black..... 74, 76
 Common..... 196
 Mandt's..... 196
 Thick-billed..... 196
 Gull, Bonaparte..... 138
 California..... 160
 Glaucous-winged, 180, 196
 Great Black-backed.. 74, 76, 113, 196
 Herring, 13, 74, 76, 160, 196
 Iceland..... 196
 Ivory..... 196
 Kittiwake... 74, 76, 196
 Kumlien's..... 196
 Ring-billed..... 74, 77
 Sabine..... 196
 Short-billed..... 13, 160
Gynaephora rossii..... 34
 Gyrfalcon..... 16, 182
 Black..... 198
 White..... 16, 198
Gyrophora sp..... 97

 H., A. Obituary by..... 25
Habenaria hyperborea.... 100
 obtusata..... 35
Halizætes leucocephalus atascanus..... 161

Hantzsch, B., Labrador.. 49, 85, 115, 143, 169, 194, 222
 Hare, European..... 179, 192
 Varying..... 111, 160
 Harebell..... 106
Harelda hyemalis.. 11, 14, 197
 Harper, Francis, Amphibians and Reptiles... 68
 Athabaska plants... 97
 Hart, J. L., Movements of fish..... 8
 Hawk, American Sparrow 161
 Duck..... 16, 198
 Eastern Pigeon..... 161
 Marsh..... 161, 194
 Pigeon..... 198
 Rough-legged..... 16, 198
 Sparrow..... 194
 Swainson's..... 91
 Hawk found in South America was apparently banded in Canada..... 91
Hedysarum boreale... 35, 104
 Mackenzii..... 35
 Mackenzii albiflora... 35
Hemigrapsus nudus..... 189
 oregonensis..... 189
 Henry Marc Ami, Obituary 25
 Heron, Great Blue..... 194
 Little Blue.. 40, 71, 206
 Louisiana..... 40
Heuchera Richardsonii... 102
Hieracium umbellatum... 106
Hierochloa alpina..... 173
Hierofalco gyrfalco canadensis..... 198
 gyrfalco obsoletus... 198
 Higgs, A., Mussel and coot 90
Hirundo erythrogastra... 161
Histrionicus histrionicus.. 197
 Hoary Bat at Toronto in summer..... 147
 Hoary Cress at Ottawa.. 149
 Hope, C. E., Hoary Bat.. 147
 Howitt, H., American Egret..... 148
 Hungarian Partridges liberated in Prince Edward Island..... 180
 Hurlburt, W. E., Sulphur butterflies..... 42
Hyalella knickerbockeri... 83
Hyas tyratus..... 187
Hydranassa tricolor ruficollis..... 40
Hydroporus lapponum... 87
Hyla crucifer..... 109
Hylocichla guttata pallasi... 162
Icterus spurius..... 185
 Illustrations:
 Adult Pallid Meadow Mouse..... 211
 Betula pumila..... 228
 Diagram of Mouse burrows..... 213
 Elasmosaurus, restoration..... 137
 Godwit, Marbled opp. p. 1
 Great Slave Lake.... 101

Illustrations:
 Habitat of Pallid Meadow Mouse..... 210
 Hands quarry..... 26
 Hoary Bat..... 147
 Marl bed at McKay Lake..... 56
 Muskeg near McKay, Alta..... 105
 Ripple marks in rock 27
 Roadside marker.... 57
 Stranded Blackfish... 157
 Sun cracks in rock.. 27
 Tazin and Taltson rivers..... 99
 Tweed Esker..... 115
 Typical North Shore vegetation..... 199
 Vertebral centrum of *Leurospodyxus*? 137
 Insect Parasites of Vertebrates and Host Phylogeny..... 189
 Insects, Sub-arctic... 34, 86
 Is Gambel's Sparrow an Ontario bird?..... 141
 Isopoda..... 83
 Ivory, Fossil..... 93
Izobrychus exilis..... 71

 Jaeger, Long-tailed..... 196
 Parasitic, 12, 160, 183, 196
 Pomarine... 12, 142, 196
 Japanese Starling at Alert Bay, B.C..... 22
 Jay, Blue..... 194
 Canada..... 17, 161
 Labrador..... 198
 Johansen, F., Fresh-water Crustacea..... 80
 Junco..... 138, 161
 Slate-coloured..... 194
Junco hyemalis..... 161
Junco balticus..... 100
 Juniper, Creeping..... 99
 Low..... 99
Juniperus communis depressa..... 99
 horizontalis..... 99

Kalmia polifolia..... 35
 Kindle, E. M., Reviews by 93
 Roadside markers... 55
 Kingbird..... 138, 198
 Kingfisher..... 194
 Kingfisher, Belted... 161
 Kinglet, Ruby-crowned.. 138
 Knot (bird)..... 197
 Knot-grass..... 173

 L., F. R., Review by.... 149
 L., H. F., Reviews by.. 42, 207
 Labrador... 49, 85, 115, 143, 169, 194, 222
 Birds of..... 113
 Botany..... 173
 Rock specimens from. 222

- Labrador Tea 104
 Narrow-leaved 104
 La Brie, W., Acadian Sharp-tailed Sparrow 40
Labyrinthites chlidensis 86
Lagopus lagopus 12, 15, 198
 rupestris 11, 15, 198
Lagurus pallidus 209
 Lake Athabasca 68
 Landon, M., Elk remains 40
Lanius ludo icianus excubitorides 185
 ludovicianus migrans 185
Laniviro fla ifrons 185
 Lapland Longspurs singing from trees 21
Larix laricina 98
 LaRocque, A., List of new species 214
 Lark, Horned 16, 161, 198
 Larkspur 102
Larus argentatus 12, 13, 76, 160
 argentatus smithsonianus 196
 brachyrhynchus 13, 160
 californicus 160
 delawarensis 77
 glaucus 196
 kumlieni 196
 leucopterus 196
 marinus 76, 113, 196
 philadelphia 138
Lathyrus ochroleucus 104
 Laurel, American 35
 Least Bittern on the Island of Orleans, Que. 71
Ledum granlandicum 104
 palustre 104
 Leechman, D., Reviews by 72, 92, 93
 Lemming 86
 Leopold, A., Grouse cycles 162
Lepidium Draba 149
 Lepidoptera, Sub-arctic 34
Lepidurus arcticus 80
Leptocleidus superstes 136
Lepus americanus 111, 160
Lepyryus sp. near *palustris* 34
Leucichthys 8, 34
Leurospondylus ultimus 135
 Lewis, H. F., Bird banding 70
 Bird sanctuaries 73
 Birds of Labrador 113
 Eel-grass 57-62
 Plants of the North Shore 129, 174, 199, 225
 Unsuspecting Chickadees 30
 Lewis's Woodpecker in Alberta 71
Liatrix graminifolia 212
 Lichen, Reindeer 173
 Target 173
Limax sp. 83
Limnetis gouldii 80, 82, 83
Limnites minutilla 197
 Lindsay, R. V., Carolina Wren 205
 Pilot Black-snake 83
 Ling 83
Linnæa borealis americana 106
Liopeltis vernalis 110
Liopsetta putnami 195
 List of original descriptions published by the Ottawa Field-Naturalists' Club 214
 Little Blue Heron on Ontario in March 206
 Lloyd, H., Wolf at the door 70
 Lobelia, Brook 35
Lobelia Kalmii 35
 Loche 34
 Logier, E. B. S., *Bufo cognatus* 90
Loiseleuria procumbens 35
 Loments, Northern 35
 Purple 35
 Purple (albino) 35
 Longspur, Lapland 18, 21, 198
Lonicera glaucescens 106
 Loon, Arctic 12
 Black-throated 196
 Common 12, 160, 194, 196
 Pacific 160
 Red-throated 12, 74, 76, 113, 196
 Yellow-billed 12
Lota maculosa 34
Loxia leucoptera 17
Lumbriculus variegatus 81
Lumbricus sp. 83
 Lupine 35
Lupinus nootkatensis Kjellmanii 35
Lutra canadensis 110
Lychnis apetala 173
Lycopodium annotinum 98
 complanatum 98
 Selago 173
Lymnæa sp. 82, 83
 Lynx 160
Lynx canadensis 110
 McIlwraith Ornithological Club, Annual Report 120
 MacKay, D. C. G., Brachyuran Crabs 187
 McKay Lake 55
 Macnamara, C., Beaver .. 1
Maianthemum canadense 100
 Mallard 160, 182, 197
Mallotus villosus 195
 Mammals, Gt. Slave Lake 158
 Temagami 109
 Mammoth, Fossil 93
Mancasellus tenax 83
 Maps: Gt. Slave Lake area 159
 Location of Tweed Esker 114
 Marigold, Marsh 102
Marila marila 14
 Markers, Roadside 55
 Marl bed at McKay Lake 56
Marmota monax canadensis 110
 Marten 110, 160
Martes americana 110
 pennanti 110
 Mating and oviposition in *Pandalus danæ* 107
 Maunsell Schieffelin Crosby, Obituary 146
Megalestris skua 196
 Members, O. F.-N. C. 120
Mentha glabrior 106
Mephitis mephitis 110
 Meredith, R., Least Bittern 71
 Merganser, Hooded 197
 Red-breasted 13, 74, 77, 160, 197
Mergus cucullatus 197
 serrator 13, 77, 160, 197
Mertensia paniculata 106
Microgadus tomcod 195
 Microscope and pond life 20
Microsorex hovi invecutus .. 193
Microtus chrotorrhinus 111, 112
 drummondii 159
 minor 212
 pennsylvanicus fontigenus 111, 112
 pennsylvanicus pennsylvanicus 194
 Mink 110, 160
 Mockingbird in Toronto .. 205
 Mole, Brewer 118, 193
 Star-nosed 110, 194
Molva molva 195
 Moorwort 35
 Moose 111
 Eastern 159
 Mosquitoes 87
 Moss, Bear 173
 Branch 173
 Mourning Dove in Kenora district, Ont. 180
 Mouse, Arctic White-footed 159
 Cooper Lemming 193
 Deer 86
 Forest Meadow 111
 Gapper Red-backed .. 194
 LeConte White-footed 111
 Meadow Jumping 111, 194
 Pallid Meadow 209
 White-footed 193, 194
 Woodland Jumping 111, 194
 Mousley, H., Black-billed Cuckoo 78
 Virginia Rail 65
 Munro, J. A., Bob-white Quail 91
 Wild life conservation 9
 Murre, Common 74, 76, 113
 Musk-ox 32, 147
 Muskrat 111
 Northwest 160
 Muskrat vs. Weasel 179
 Mussel, Fresh-water 90
Mustela cicognani 110
 cicognanii richardsonii vison 160
 vison 110
Myotis keenii septentrionalis 119
 lucifugus 118
 sodalis 119
 subulatus leibii 115, 119
Myriophyllum exalbescens .. 104
Myrica Gale 101
Mysis relicta 83

- Najas flexilis*..... 100
Nannus borealis..... 161
Napæozapus insignis 111,
112, 194
insignis abietorum.... 112
Nature Narratives, Review 93
Needler, A. B., Mating of
Pandalus..... 107
Needler, A. W. H., Strand-
ed Blackfish..... 157
Nephroma arcticum..... 173
Nesting of Bonaparte's
Gull in Central Al-
berta..... 138
Nesting of the Piping
Plover..... 21
Nettion crecca carolinensis. 197
carolinense..... 77
New Check-list of Birds.. 180
New map of Canada..... 71
New records of mushrooms
and other fleshy fungi
of the Ottawa district 139
Newt..... 109
Notes and observations on
some Manitoban birds 181
Notes on Birds of the Lab-
rador Peninsula in
1930..... 113
Notes on Mammals and
Birds from Great Slave
Lake..... 158
Notes on the Brachyuran
Crabs of Northern
British Columbia.... 187
Notes on the home life of
the Virginia Rail.... 65
Numensis borealis..... 197
hudsonicus..... 197
Nuthatch, Carolina..... 23
Red-breasted..... 37, 194
Nyctea nyctea..... 16, 198
Nycterus cinerea..... 147
Nymphozanthus advena... 102
Obituaries:
Ami, H. M..... 25
Crosby, M. S..... 146
Emerton, J. H..... 90
Observations on Canadian
fresh-water Crustacea
made in 1927-29.... 80
Occurrence of the Pomar-
ine Jaeger in the Mon-
treal district..... 142
Occanites oceanicus..... 196
Oceanodroma leucorhoa.. 196
Odell, W. S., Ottawa mush-
rooms..... 139
Odocoileus virginianus bor-
ealis..... 111
O'Donoghue, C. H., Seiches 67
Oenis semidea..... 86
semidea arctica..... 34
taygete..... 34
Official Canadian record of
bird-banding returns.. 44, 150
Oidemia deglandi..... 14, 160
fusca deglandi..... 197
nigra americana..... 197
Oidemia perspicillata.... 197
Oligochaeta..... 81, 83
On the daily movements of
the coregonine fishes.. 8
Ondatra zibethica..... 111
zibethica spatulata.... 160
Oporornis agilis..... 185
Orchis, Small Northern
Bog..... 35
Oregonia gracilis..... 187
Oriole, Baltimore..... 138
Ostracoda..... 80, 83
Otocoris alpestris 12, 16, 161, 198
Ottawa, Fungi..... 139
Ottawa Field-Naturalists'
Club, Excursions.... 119
List of Members..... 120
Otter..... 110
Otus asio..... 183
Our great outdoors: Mam-
mals, Review..... 72
Ovibos moschatus..... 32
Ovisposition in Shrimps.. 107
Owl, American Hawk.... 184
Arctic Saw-whet.... 16
Barred..... 183, 194
Burrowing..... 184
Labrador Horned... 198
Screech..... 183
Short-eared..... 161, 198
Snowy..... 16, 198
Oxyria digyna..... 173
Oxytropis Lamberti..... 104
Pachydicta sp..... 86
Paintbrush, Indian.... 35
Palmer, C. W., Duck-
banding..... 167
Pandalus danæ, Mating of 107
Papaver nudicaule..... 173
Parascalops breweri... 118, 193
Parasites..... 189
Parnassia palustris... 35, 102
Parnassus, Marsh Grass of 35
Parsnip, Water..... 104
Partridge, Hungarian... 180
Labrador Spruce.... 198
Passer domesticus..... 161
Passerculus sandwichensis
12, 18, 161
sandwichensis savanna 198
Passerherbulus lecontei... 186
nelsoni subvirgatus... 40
Passerina nivalis nivalis.. 198
Paulson, C. W. G., Snow
bunting..... 148
Pedicularis flammea.... 174
lapponica..... 35
sudetica..... 35
Peeper, Spring..... 109
Pelecanus erythrorhynchos. 160
Pelican, American White.. 160
Penthestes..... 18
atricapillus atricapillus
hudsonicus hudsonicus
30, 162, 198
Perca flavescens..... 8
Perch, Yellow..... 8
Perisoreus canadensis 12,
17, 161
canadensis nigricapillus 198
Peromyscus maniculatus... 86
maniculatus borealis.. 159
maniculatus gracilis.. 111, 112, 193, 194
maniculatus manica-
tus..... 112
Petrasites palmatus..... 106
sagittatus..... 106
Petrel, Leach's..... 196
Storm..... 196
Wilson's..... 196
Petrochelidon lunifrons... 161
Phacelia Franklinii..... 106
Phalacrocorax auritus au-
ritus..... 77, 181
carbo..... 113, 196
Phalarope, Northern... 197
Red..... 197
Phalaropus lobatus..... 197
Phoebe..... 161
Phragmites communis.... 100
Phylogeny..... 189
Physa sp..... 82, 83
Lordi..... 149
Picea canadensis..... 98
mariana..... 99
Pickerel..... 83
Picoides americanus.... 161
arcticus..... 161
Pike..... 8, 83
Pilot Black-snake in On-
tario..... 83
Pine, Jack..... 98
Pinguicula vulgaris.... 35
Pinicola enucleator..... 161
Pink, Sea..... 35
Pinus Banksiana..... 98
Pipit..... 18, 198
Pisidium sp..... 81
Pisobia bairdi..... 15
maculata..... 12, 15
Places of special geological
interest in Ontario
and Quebec..... 25
Planesticus migratorius 18, 162
Plantago eriopoda..... 106
Plants, North Shore of the
St. Lawrence..... 129
Sub-arctic..... 35
Plecoptera..... 34
Plectrophenax nivalis 12, 17, 148
Plesiosaurs, Fresh-water.. 135
Plethodon cinereus..... 109
Plover, American Black-
bellied..... 161
American Golden... 197
Black-bellied..... 15
Piping..... 21
Semi-palmated 15, 74, 77,
198
Poa alpina..... 173
arctica..... 173
Podilymbus podiceps 160, 196
Polygonum amphibium... 102
aviculare..... 102
Muhlenbergii..... 102
viviparum..... 35, 173
Polypodium virginianum.. 98
Polystichum Braunii.... 193
Pond life and the micros-
cope..... 20
Pontoporeia..... 83

- Poplar, Aspen 100
 Balsam 100
 Poppy 173
Populus balsamifera 100
 tremuloides 100
 Porcupine 111
Potamogeton Richardsonii 100
Potentilla 35
 alpestris 173
 anserina 103
 emarginata 173
 fruticosa 103
 glabrella 103
 monspeliensis 103
 nivea macrophylla 173
 palustris 103
 quinquefolia 103
 tridentata 103
Primula mistassinica 105
Procellaria pelagica 196
Prosopium quadrilaterale 8
Prunus pennsylvanicus 103
Pseudacris septentrionalis 68
 triseriatus 112
 Ptarmigan, Rock 15, 198
 Willow 15, 198
 Puffin 74, 76, 196
Puffinus gravis 196
 griseus stricklandi 196
Pugettia gracilis 187
Pygosteus pungitius 82, 83
Pyrola grandiflora 35, 104
 rotundifolia grandiflora 174
 secunda 104

 Quail 91
 Quebec, Mammals, Birds,
 Ferns 193
Quiscalus quiscula æneus 161

 Rabbit cycles 162
Racomitrium lanuginosum 173
 Rail, Virginia 65, 183
Rallus virginianus 183
Rana cantabrigensis 69, 109
 catesbiana 109
 clamitans 109, 112
 pipiens 69, 109, 112
 septentrionalis 109, 112
Rangifer arcticus 32
 caribou 112
Ranunculus lapponicus 102
 nivalis 173
 Purshii 102
 pygmaeus 173
 replans 102
 sceleratus 102
 Raspberry, Dwarf 103
 Red 103
 Raven 113
 Northern 17, 161, 184, 198
Recurvirostra americana 183
 Redpoll, Greater 17, 198
 Greenland 198
 Labrador 198
 Redstart 194

 Redstart, American 198
 Reed 100
 Reindeer Moss 97
 Relation of Canada Geese
 and Brant to commer-
 cial gathering of eel-
 grass in the St. Law-
 rence estuary 57-62
 Reminiscences of the home
 life of the Black-
 billed Cuckoo 78
 Report on a game survey
 of the north central
 States, Review 207
 Reptiles, Amphibians and
 Fishes, Review of 92
 Reptiles, Great Slave Lake
 Labrador 195
 Lake Athabasca 68
 Temagami 109
 Reviews:
 American Waterfowl 42
 Animal Life of Yel-
 lowstone National
 Park 92
 Bird picture cards 22
 Carcasses of the Mam-
 moth and Rhino-
 ceros found in the
 frozen ground of
 Siberia 93
 Freshwater Mollusca
 of Wisconsin 149
 Guide to the study of
 Freshwater Bio-
 logy 72
 Nature Narratives 93
 Our great outdoors:
 Mammals 72
 Report on a game sur-
 vey of the north cen-
 tral States 207
 Reptiles, Amphibians
 and Fishes 92
 Reserve Fund Statement 19
 Rhinanthus oblongifolius 106
 Rhinoceros, Fossil 93
 Rhododendron lapponicum 35
 Ribes hudsonianum 103
 prostratum 103
 triste 103
 Riparia riparia 18, 161
 Ripple marks 25
 Rissa tridactyla tridactyla 76, 196
 Roadside markers 55
 Robin 18, 162, 194
 Rorippa palustris 35
 Rosa acicularis 103
 Rose, Wild 103
 Rosemary, Wild 35
 Rubus acaulis 35, 103
 Chamæmorus 35, 103
 melanolasius 103
 pubescens 103
 Russell, L. S., Fresh-water
 Plesiosaurs 135
 Rutter, R. J., Lapland
 Longspurs 21

 S., W. E., Review by 22
 Sage 212
Sagina nodosa 102
Sagittaria cuneata 100
 St. Lawrence, North Shore
 plants 129, 174, 198, 225
 Salamander, Jefferson's 109
 Red-backed 109
 Spotted 109
Salix 35
 anglorum 173
 Cutteri 173
 herbacea 173
 interior 100
 Labradorica 173
 reticulata 173
 Uva-ursi 173
Salmo salar 195
 Salmon 195
Salvelinus alpinus 82, 83
 alpinus arcturus 195
 alpinus stagnalis 195
 fontinalis 86, 195
 Sanctuaries, Bird 73
 Sanderling 160, 197
 Sandpiper, Baird 15
 Buff-breasted 183, 197
 Eastern American
 Dwarf 197
 Least 197
 Pectoral 15, 197
 Purple 197
 Semipalmated 15
 Solitary 138
 Spotted 74, 77, 160, 197
 White-rumped 197
 Sarsaparilla, Wild 104
 Sauger (fish) 8
 Saunders, W. E.:
 Acadian Flycatcher 41
 Japanese Starling 22
 Prothonotary Warbler 41
 Saury 41
Saussurea angustifolia 35
 Saw-wort 35
Saxicola ænanthe leucorrhœa 198
Saxifraga austromontana 102
 cæspitosa granlandica 173
 cernua 173
 Hirculus 35
 triscupidata 35, 102
 Saxifrage, Three-toothed 35
 Yellow Marsh 35
Sayornis phæbe 161
 Schierbeck, O., Forestry vs.
 Game cover 28
Sciurus hudsonicus 159, 207
 hudsonicus gymnicus 111, 193, 194
Scombrexox saurus 41
 Scoter, American 197
 Surf 197
 White-winged 14, 160, 197
 Seal 144
 Bearded 144
 Sedge 35, 173
 Seiches 67
 Serviceberry, Northwest-
 ern 103
Setophaga ruticilla 198
 Shark 195
 Shearwater, Greater 196

- Shearwater, Sooty 196
Shepherdia canadensis 104
 Shrew, Cinereous 110, 193, 194
 Large Short-tailed 110, 193
 Northern Pigmy 193
 Smoky 193
 Water 110
 White-chinned Water 193, 194
 Shirke, Migrant 185
 Shrimp, Clam 80, 82
 Fairy 80, 82
 Tadpole 80
 Shrimp, Mating of 107
Sialia currucoides 184
Sieberella galeata Chidleyensis 86
Silene acaulis 35, 173
Silpha lapponica 34
 Silverberry 104
Siphula ceratitidis 173
Sisymbrium brachycarpon 102
Sisyrinchium mucronatum 100
Sium suave 104
 Skua 196
 Skunk 110
Smilacina trifolia 100
 Snake, Garter 110
 Green 110
 Red-bellied 110
 Ring-necked 109
 Pilot Black 83
 Western Garter 69
 Snipe, Wilson 65
 Snow bunting in Nova Scotia 148
 Snowberry 106
 Snyder, L. L.:
 Clay-coloured Sapprow 91
 Gambel's Sparrow 141
 Solomon's Seal, Two-leaved 100
Somateria mollissima borealis 197
 mollissima dresseri 77, 113
 spectabilis 197
 Some notes on mammals, birds and ferns of Kazakazua district, Quebec 193
 Some notes on the European Hare 192
 Some plants of the Athabaska and Great Slave Lake region 97
Somniosus microcephalus 195
 Soper, J. D., Pallid Meadow Mouse 209
Sorex cinereus 110, 193, 194
 fumeus fumeus 193
 palustris albibarbis 110, 112, 193, 194
 Sorrel 173
 Sparrow, Acadian Sharp-tailed 40
 Chipping 161, 194
 Clay-coloured 91
 Gambel's 141, 161
 Harris 186
 House 161
 Lark 21, 186
 LeConte's 186
 Lincoln 138
 Savanna 161, 194, 198
 Sparrow, Song 194
 Tree 18, 161, 194
 Vesper 194
 Western Grasshopper 186
 Western Savannah 18
 White-crowned 198
 White-throated 91, 138, 194
 Species, New 214
 Speedwell, Marsh 106
 Speirs, J. M., Mockingbird 205
 White-throated Sparrow 91
Speotyto cunicularia hypugæa 184
Sphærium sp. 82
Sphagnum sp. 98
 Sphagnum Moss 98
Spizella monticola 12, 18, 161
 passerina 161
 Sponge, Fresh-water 82, 83
Spongilla sp. 83
 Spoon-wort 173
 Spruce, Black 99
 White 98
Squatarola squatarola 15
 squatarola cynosuræ 161
 Squires, S. K., Chimney Swifts 204
 Squirrel, Eastern Red 193, 194
 Hudson Bay Red 159
 Northern Flying 111
 Red 111, 207
Stachys palustris 106
 Star, Blazing 212
 Starling 65
 Japanese 22
 Statement of financial standing 19
Statices labradorica 35
Stellaria cerastioides 173
 humifosa 173
 longifolia 102
 longipes 102, 173
 longipes Edwardsii 35
Stercorarius longicaudus 12, 196
 parasiticus 12, 160, 183, 196
 pomarinus 12, 142, 196
 similis 34
Sterna caspia 160
 caspia imperator 77
 hirundo 77, 160, 196
 macrura macrura 196
 paradisæa 12, 13, 77
 Stickleback, Ten-spined 82
 Three-spined 82
Stizostedion canadense 8
Storeria accipito-maculata 110
 Strawberry, Wild 103
Strix varia 183
 Sucker 83
 Common 8
 Northern 33
Sula bassana 197
 Sulphur, Large Orange 42
 Orange 42
 Red-barred 42
Surnia ulula caparoch 184
 Swallow, Bank 18, 161
 Barn 161
 Cliff 161
 Swan 14
 Swan, Whistling 160
Symphoricarpos albus pauciflorus 106
 occidentalis 106
Sympistes yetterstedti 86
Synaptomys cooperi cooperi 193
 Tadpole 89
 Tamarack 98
Tamias striatus lysteri 110, 112, 193, 194
Taraxacum 35
 ceratophorum 106
 officinale ceratophorum 174
Taxus canadensis 29
 Teal, Green-winged 74, 77, 197
Telmessus cheiragonus 188
 Tern, Arctic 13, 77, 196
 Caspian 74, 77, 160
 Common 74, 77, 160, 196
 Terrill, L. McI., Pomarine Jaeger 142
Thamnophis sirtalis 110, 112
 sirtalis parietalis 69
Thelypteris fragrans 35
 spinulosa 98
 Thompson, S. L., European Hare 192
 Thrasher, Brown 38
 Thrush 18
 Eastern Hermit 162
 Gray-cheeked 194
 Olive-backed 138, 194
Thryothorus ludovicianus 205
Thymallus signifer 34
 Tinker 76
Tipula arctica 34
 Toad 89
 Common 109
 Dakota 68
Tofieldia borealis 173
Totanus flavipes 160
 melanoleucus 197
 Towhee 37, 71
 Tragacanth 174
Trematospora sp. 86
Triglochin maritima 100
Tringa canutus 197
Tringoides macularius 197
Trisetum subspicatum 173
Triturus viridescens 109, 112
 Tripe de Roche 97
 Trout 82, 86
 Lake 34
Tryngites subruficollis 183, 197
 Tufts, R. W., Hungarian Partridges 180
 Tullibee 34
 Turbellaria 82, 83
 Turnstone 198
 Turtle, Painted 110
 Snapping 110
 Twinflower 106
Typha latifolia 99
Tyrannus tyrannus 198
 Unnatural history of the Beaver 1
 Unsuspecting Chickadees 30

Unusual behaviour of	Vole, Yellow-cheeked	111	Winter records of Towhee
Woodcock in autumn.	<i>Vulpes fulva</i>	110	in Toronto
<i>Uria lomvia</i>			Wintergreen
<i>troille troille</i> . 76, 113, 196			Wolf
<i>Urinator arcticus arcticus</i> . 196			Timber
<i>imber</i>	Waller, S., Muskrat vs.		"Wolf at the door"
<i>lumme</i>	Weasel	179	Wolfberry
<i>Ursus americanus</i>	Warbler, Bay-breasted	194	Woodchuck
<i>Usnea</i> sp.	Black-poll	162	Woodcock
Ussher, R. D., Towhees	Black-throated Green	194	Woodpecker, American
<i>Utricularia intermedia</i>	Cape May	194	Three-toed
	Chestnut-sided	194	Arctic Three-toed
	Connecticut	185	Downy
	Golden-winged	71	Hairy
<i>Vaccinium canadense</i>	Myrtle	162, 194	Lewis's
<i>Oxycoccus</i>	Nashville	185	Pileated
<i>uliginosum</i> . 35, 105, 174	Northern Parula	185	<i>Woodsia ilvensis</i>
<i>uliginosum microphyllum</i>	Prothonotary	41	Wren, Carolina
<i>Vitis-Idæa minus</i> . 35, 105	Tennessee	138, 161	House
Value of detailed bird-	Yellow	65, 162	
banding records	Waxwing, Cedar	194	<i>Xema sabinii</i>
<i>Vermivora peregrina</i>	Weasel	179	
<i>ruficapilla</i>	Bonaparte	110	Yack, H. L., European
<i>Veronica alpina</i>	Richardson	160	Hare
<i>scutellata</i>	What is meant by the term		Yellowlegs, Greater
Vertebrates, Parasites of	"Wild Life Conserva-	9	Lesser
Vetch, Alpine Milk	tion"?		Yellowthroat, Maryland
<i>Viburnum pauciflorum</i>	Wheatear, Greenland	198	Northern
<i>Vicia americana</i>	Whip-poor-will	194	Young of European Hare
<i>americana truncata</i>	White-throated Sparrow in		born in winter
<i>Viola adunca</i>	Winter	91	
Vireo, Red-eyed	Whitefish	34, 83	<i>Zapus hudsonius</i>
Warbling	Common	8	<i>Zenaidura macroura carol-</i>
Yellow-throated	Round	8	<i>insensis</i>
<i>Vireosylva gilva</i>	Wild-life, Economics of	63	<i>Zonotrichia leucophrys gam-</i>
<i>olivacea</i>	Willow	35, 173	<i>beli</i>
<i>Viviparus raynoldsanus</i>	Sand-bar	100	<i>leucophrys leucophrys</i> .
Vole, Drummond	Willowherb, Broadleaved	35	141, 198
Meadow	Wilson, M. E., Esker	114	<i>Zostera marina</i>
Red-backed	Ripple marks	25	57-62

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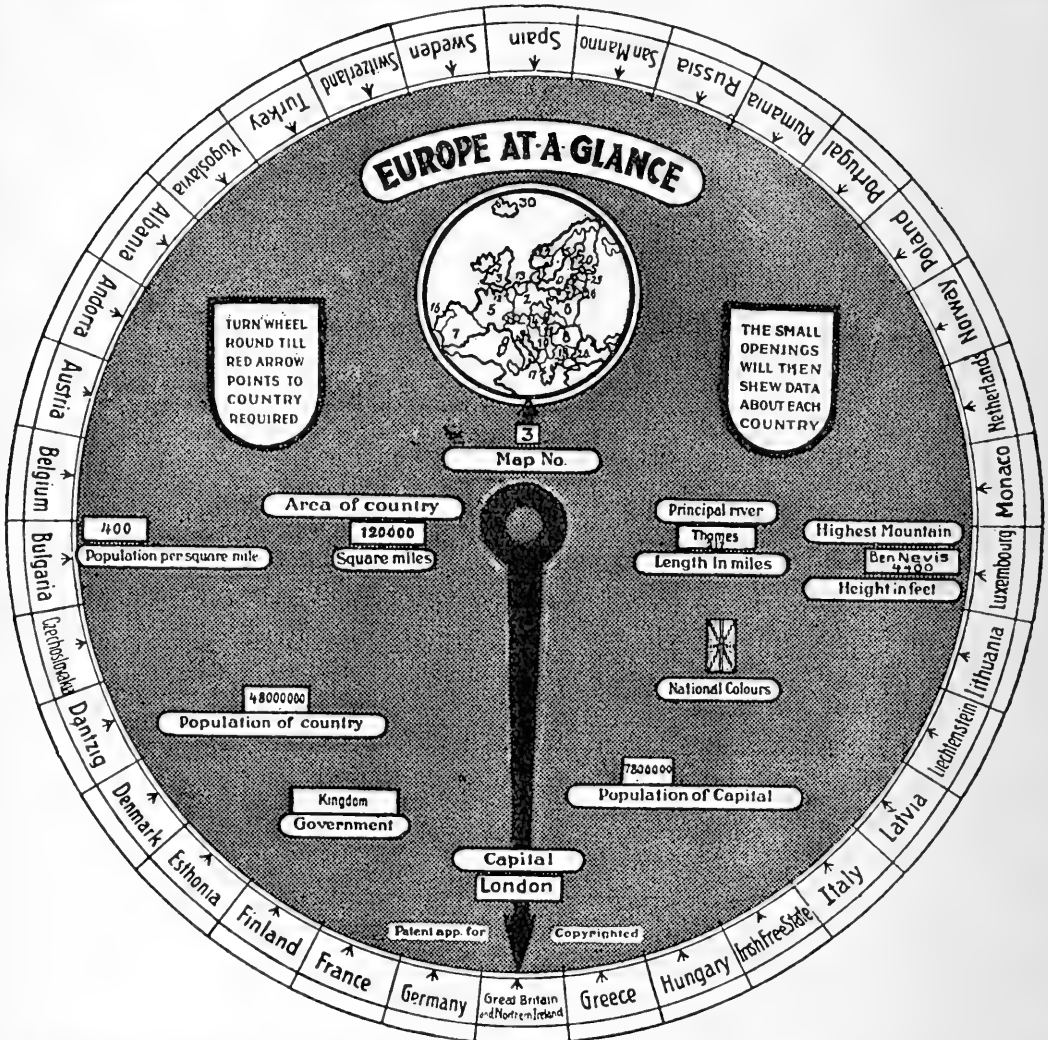
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