THE OTTAWA NATURALIST

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FOREWORD.

With the appearance of this number of THE OTTAWA NATURALIST a new era in the history of The Ottawa Field-Naturalists' Club is launched.

THE OTTAWA NATURALIST was established in 1887 as the organ of the Ottawa Field-Naturalists' Club. It is now in its thirty-second year and is one of the oldest natural history periodicals in North America. While modest in form and not too prepossessing in appearance, it has published many important papers and the great number of original descriptions that have appeared in its pages makes its files a necessity in libraries of original research in biology.

The time has come, however, when a local periodical of this nature is inadequate and the Dominion requires a more creditable and representative publication for the record and dissemination of the results of scientific research. THE OTTAWA NATURALIST, with its already established position, long and honorable history and scientific standing, seems a logical nucleus from which such a publication should be developed.

Beginning, therefore, with this number, THE OTTAWA NATURALIST will appear in an improved form. The size is enlarged and the number of pages increased. The better paper used throughout will permit of more and finer illustrations; these will improve the appearance and add interest and value to the magazine. To widen its geographical sphere of influence a change of name to one of less local significance is being considered but cannot, by the constitution of the Club, be effected until next year.

In order to reach the highest possible degree of usefulness, the interests of the general, the educational and the technical public will be considered. Teachers in the various schools of Canada, will, it is hoped, find in the pages of THE NATURALIST information which will be of value to them in connection with their teaching of elementary natural science and nature study. It will, therefore, be the editorial policy to publish papers that will appeal to each of these classes of readers.

The further improvement of the publication will rest entirely with the public and the amount of support received will decide whether it succeeds or fails. This fundamental change will naturally involve additional expense, but we have enough faith in the necessity and promising nature of the enterprise to count upon the support of the nature lovers and workers of the Dominion.

We have long felt that there was a field in Canada for such a magazine for the permanent recording of noteworthy biological data and as an assistance and source of pleasure to nature lovers in general.

The proposed increase in size, improvement in appearance and widened geographical appeal involves a heavy financial burden that can be covered only by an enlarged and nation-wide subscription list.

Members of the Club and present subscribers are urgently invited to assist in building up the subscription list. Names of new subscribers with remittances should be sent to the Treasurer of the Club, Mr. J. R. Dymond, Seed Branch, Department of Agriculture, Ottawa.

The subscription price is the same as heretofore, namely $1.00 per year. If personal cheques are remitted, ten cents should be added to cover bank exchange. Nine numbers will constitute a volume, no issues appearing for the months of June, July and August.

Natural history societies throughout Canada are also invited to join with us in making this publication not only indispensable to every working naturalist but one which will be found acceptable to a very large class of people who are always eager to read of the things of nature.

WILD PLANTS AS FOOD.

By F. W. Waugh.

A subject regarding which rather little is known, and which would well repay investigation, is the edibility of the various weeds,plants and other vegetable materials which grow in a wild or uncultivated condition in fields, woods, and waste places generally. The writer's attention was directed to this originally by a study of the food plants used by Indian tribes, though a portion of the information has been obtained from other sources.

The more extended use of our natural food resources could be made to supplement garden production in such a way as to leave a greater acreage for staple products, a special advantage under present conditions.

A knowledge of our native vegetable foods will no doubt also be of interest to campers and those taking extended trips through unsettled parts of the country.

MUSHROOMS.

The mushrooms have attracted more attention, possibly, than other vegetable foods, and an increasing number of people are becoming interested in them scientifically, as well as in their collection for use.

The wide distribution of our edible fungi gives them an important place in the list of cheap and easily-obtained foods. Most of them are easy to identify and the search for new or additional species provides a constant source of interest.

A spore-print should always be taken if any doubt exists as to the identity of a gill-bearing fungus. A piece of white paper is brushed over with a not very strong solution of gum arabic and allowed to dry. The stem of the mushroom is sliced off carefully close to the cap, and the latter is laid on the paper, gills downward, then covered with a bell-jar or drinking-glass and left for a few hours. The spores adhere to the paper in radiating lines and afford a means of deciding their color, which is of importance in identifying them.

Last year the writer collected and made use of over a dozen species of mushrooms, the majority collected within city limits. These were frequently obtained on the way to work; though now and then a bicycle jaunt in the early morning or at the week-end assisted in rounding out the supply.

Damp weather or frequent showers are a practical necessity for mushroom growth. Consequently, if the season is unusually dry, very few of the fungi will be found. In favorable seasons, however, they last right along into frosty weather.

A shady corner in a backyard provided a liberal supply of puffballs (*Lycoperdon pyriforme*) for two or three weeks.

A very common city mushroom is the *Coprinus comatus*, or shaggy mane. This, as well as the closely related species, the Common Inkcap, *Coprinus atramentarius*, was found growing around parks, lawns, roadsides, factory sites, and dumping-grounds for street sweepings. Morels also grow among park shrubbery, as well as in the woods among the ferns and evergreens. The Smooth Lepiota, *Lepiota naucina*, is another which is found quite frequently in shady places. This is of about the same height and general appearance as the common mushroom, although the gills are white in young specimens, becoming slightly pink when older. Care should be taken to differentiate this from the poisonous Amanitas.

Another, but not very common species, at least locally, was the Early Pholiota, *Pholiota praecox*. Enough for half a dozen meals of these was found from time to time under some snowball and lilac shrubs in a neglected dooryard.

Other species found in suburban localities were: Oyster Fungus, *Pleurotus ostreatus;* Fairy-ring Mushroom, *Marasmius oreades*, and Glistening Inkcap, *Coprinus micaceus*. The *Agaricus campestris*, or common mushroom, was also found occasionally, but not so plentifully as some of the others mentioned.

A friend, to whom the writer had mentioned the edibility of the giant puffball, *Lycoperdon giganteum*, one day brought in one of these about seven inches in diameter. The fungus was white and in prime condition for eating and was quite large enough for seven or eight persons. A reliable method of cooking is to slice and fry in butter. Unfortunately, this fungus is rather uncommon.

The fungi mentioned are merely a few of those likely to be found locally, but will afford the beginner an idea of the possibilities.

GREENS.

Another, and even more prolific class than the mushrooms, consists of those vegetables which are prepared like asparagus or spinach. The Indian tribes of America were evidently well-versed in these and are capable of affording us valuable suggestions. A very good list for the Iroquois, an eastern woodland tribe, appeared recently in Memoir 86 of the Geological Survey of Canada. This includes some sixteen or more vegetables used

COMMON EDIBLE FUNGI.

1—*Marasmius oreades;* 2—*Lepiota naucina;* 3—*Morchella conica;* 4—*Coprinus atramentarius;* 5—*Coprinus comatus;* 6—*Pholiota praecox;* 7—*Pleurotus ostreatus.*

From photographs loaned by Mr. J. M. Macoun, Botanist of the Geological Survey, Ottawa.

as greens, though even this does not exhaust the list.

European immigrants from central Europe make extensive use of the young tender dandelion leaves which appear in the beginning of the season. These may be used as a salad, like chicory, with the addition of salad oil and seasoning.

Another method is to parboil, like spinach or similar greens, add a litle salt when nearly cooked, drain, then season with butter, salt and pepper. A hard-boiled egg or two, sliced, may be used to garnish.

A favorite method in use among old country people (before the war?) is to heat some bacon gravy or fat to the boiling-point and pour it over the raw or uncooked leaves. Some fresh green onions, nicely chopped, are added to this, also some vinegar, and some seasoning if necessary.

Another well-known use of dandelion is the employment of the flowers for making home-made wine; a beer is also made from the young plants by adding a little syrup and yeast.

The edibility of bracken shoots, or "fiddleheads", is apparently quite well-known in Europe, though few seem acquainted with it here. There are few weeds or wild plants which are more plentiful than bracken. In fact, it has become a nuisance in many places in hayfields and pastures. The "fiddleheads" are steamed or parboiled, then served on toast, or otherwise, with a butter or cream sauce. These are easily the most delicious of any of the greens given. The scientific name of the plant is *Pteris aquilina*.

The young shoots of the sensitive fern (*Onoclea sensibilis*) may be used in a similar way to bracken.

Somewhat better known as a food, probably, than the ferns is the marsh marigold, *Caltha palustris*. This is a cosmopolitan plant with a very extensive range in North America. It also is gathered when young and tender, and cooked like spinach. If eaten after the flowers have appeared it is said to be rather bitter. It is better parboiled in any case.

A fine material for greens are the young shoots of the common milkweed, *Asclepias syriaca*. This is found very widely as a weed along roadsides and in waste places generally. The plant is gathered just as the first spike, four to six inches in height, appears above the ground. It is parboiled, that is, the water is poured off after boiling once, and a second boiling is given. The greens are then seasoned, some butter being added if desired. This is a favorite vegetable among the Iroquois, who later on use the upper leaves, as well as the clusters of flower-buds when they first come out.

The waterleaf, *Hydrophyllum virginianum*, is another plant of which the young leaves may be used as greens. The following also have the same value: yellow dock, *Rumex crispus*; nettle, *Urtica dioica*; wood betony or lousewort, *Pedicularis canadensis* and *P. lanceolata*; skunk cabbage, *Symplocarpus foetidus*; wild leek, *Allium tricoccum* and garlic, *A. canadensis*. All of these should be gathered when quite young. Gloves are required in gathering nettles.

Among the introduced weeds or plants used in the same way are: lamb's quarters, *Chenopodium album*; red-root pigweed, *Amaranthus retroflexus*; black mustard, *Brassica nigra*; and purslane, *Portulaca oleraca*.

Mustard is said to form an excellent salad green. Sandwiches of bacon, cheese, and other materials are certainly improved by a few young, crisp mustard leaves dipped in a salad dressing.

Other familiar wild plants used as salads are: watercress, sheep sorrel, *Rumex acetosella*, and oxalis. The Ojibwa of the Lake Nipigon region eat the bases of the great bullrush, *Scirpus validus*. These are eaten as a sort of refreshment just as they are.

The most recommendable of the greens and salads referred to would certainly include: bracken, leeks, garlic, pigweed, lamb's quarters, milkweed, dandelion, marsh marigold, purslane, sheep sorrel, mustard and cress. Possibly one or two others should be included, to make allowance for differences in taste.

Sorrel, *Rumex acetosella*, prepared in various ways, is a noted European vegetable. It is made into a sort of soup-like beverage, to which is sometimes added sliced cucumbers, or hard-boiled eggs sliced.

The following is a recipe for "cream of sorrel soup": Cook a cupful of chopped sorrel in a tablespoonful of butter, add a little sugar, half a tablespoonful of vinegar, a tablespoonful of salt and two of rice, then a pint of boiling water. Let simmer until the rice is soft. Add three cupfuls of veal or chicken stock and strain. Beat an egg yolk slightly, add a cupful of light cream and turn into the soup; stir until it becomes hot, then strain and sieve.

Mrs. E. Sapir, of Boston, Mass., has kindly given me the following Lithuanian recipes for the preparation of sorrel: Wash the plant; chop well and add boiling water sufficient to make a soup. Let cook for about ten minutes. After cooling "whiten" with eggs and milk or eggs and cream—these being beaten together and seasoned to taste with salt. The soup is eaten cold or warm.

A second way of preparing is to cook with meat. First, cook the meat until tender, then add the sorrel, previously washed and chopped up well. Let cook for ten minutes; then "whiten" with eggs only (beaten), and eat while hot.

The sorrel, according to our informant, was also frequently "canned", by simply chopping up and filling into bottles for use in the winter.

There are several wild mints which may be made into mint-sauce and used quite acceptably as relishes with meat.

ROOT FOODS.

The bulbs of the leek, *Allium tricoccum*, and the garlic, *Allium canadense*, are found very plentifully in many localities and are quite as good eating as onions and other garden vegetables of the kind.

Other edible roots found in similar situations are pepper-root, *Dentaria diphylla*, and Indian cucumber-root, *Medeola virginiana*. Pepper-root has a pungent, cress-like flavor and is frequently eaten as a salad with a little salt and pepper. Indian cucumber-root may be eaten in the same way and is very much like the cucumber in flavor.

In Western Canada there are a number of food roots which are used more or less extensively by the Indians. Several of these, such as the dog's-tooth violet, *Erythronium grandiflorum*, and the Claytonia, have eastern representatives which may also offer some possibilities. Both have tubers which can be found only by digging down about seven or eight inches into the soil.

The most widely known of the western food materials is probably the root of the camass, *Camassia esculenta*. This plant belongs to the lily family. The roots are dried and afterwards cooked in pits by means of hot stones placed at the bottom, a large fire being also kindled on the top. In filling the pit, the roots are placed alternately with the branches of the fir and other trees. Other roots are prepared in the same way, some requiring a couple of days' cooking.

Various southern British Columbia tribes use the roots of a western form of the bracken, *Pteris aquilina* var. *lanuginosa*. The root of a lily, *Lilium columbianum*, is also cooked and eaten.

BARK AND STEM FOODS.

Many of our Indian tribes still use the bark and other portions of the stems of trees, shrubs and plants.

The Ojibwa Indians peel off the outer bark of the birch and poplar and scrape up the juice mixed with the woody material found beneath. This is quite sweet and is in high favor as a means of refreshment.

The Iroquois use the fresh shoots of the grapevine, *Vitis vulpina*, raw, without peeling; also those of the white pine, *Pinus strobus;* sumac shoots are peeled and eaten, as are those of the red raspberry, *Rubus idaeus aculeatissimus*.

The Indians of southern British Columbia use in the same way the young shoots of the cow parsnip, *Heracleum lanatum*, these being considered a great delicacy; also those of the great willow weed, *Epilobium angustifolium*, the various kinds of raspberry, and the *Balsamorrhiza sagitta*, the latter being peeled.

The Iroquois claim to have pulverized the bark of the soft maples, *Acer saccharinum* and *Acer rubrum*, and made it into a bread. This was no doubt an emergency or famine food.

Slippery elm, *Ulmus fulva*, inner bark is frequently boiled by various Indian tribes and the mucilaginous decoction eaten as a food.

The stems and leaves of plants and the bark and twigs of shrubs and trees were quite commonly, and are, even at present, steeped and drunk as beverages at meal-time. Among these were the twigs of the black birch, *Betula lenta*; the spice bush, *Benzoin aestivale*; the witch hazel and the red raspberry; the roots of the sassafras and the stems of the wintergreen, yarrow, *Monarda fistulosa* and others. Even hemlock leaves were sometimes employed in a similar way. For a more extended reference to Iroquois beverages, see Memoir 86 of the Geological Survey, Department of Mines, Canada, p. 144.

FRUITS.

There are several wild fruits which apparently have received but little attention recently, though they were no doubt more popular a century or so ago.

The elderberry is often allowed to go to waste, although it is excellent for pies and makes a fairly good, but somewhat seedy, preserve. It was formerly in demand for making wine.

The wild black cherry, *Prunus serotina*, is very plentiful in many places. This can be made into a most appetizing jam for pies and other purposes. It is also supposed to have medicinal virtues. Black cherry wine is a well-known beverage.

The chokecherry, *Prunus virginiana*, grows throughout a range somewhat similar to that of the black cherry, and is also used for jam.

The wild gooseberry is often found in considerable quantities and makes an excellent preserve and sauce. The prickles are removed by scrubbing the fruit about in a stout bag.

Various species of Juneberry, (*Amelanchier* spp.) are preserved, or eaten raw with cream and sugar.

A very good substitute for cranberries is found in the high-bush cranberry, *Viburnum opulus*. This also has quite a wide distribution.

The ground cherry (*Physalis* spp.) is found growing in many places, and makes a very good sauce or preserve. It is gathered when ripe, a condition indicated by its becoming greenish-yellow, also by the yellowing of the husk.

SEEDS.

A material to which greater attention might in some instances be given, is the wild rice, *Zizania aquatica*. This makes an excellent ingredient in soups, especially meat soups. At present it is obtained mostly from the Indians. It has frequently been sown in marshes to attract wild fowl, also as an article of food.

THE SONG OF THE PORCUPINE.

By P. A. TAVERNER.

Mr. Macnamara's interesting paper on the Porcupine in the January, 1918, number of THE NATURALIST, reminds me of an experience I once had with this species that may be of interest to the readers of the article referred to.

I was paddling close along the shore of Lake Muskoka late one bright moonlight night in early spring, probably May. As I crossed the mouth of a small deep dark bay, I heard a most peculiar succession of cries coming from the shadows at its foot. It was like the continued ya-ya-ya-yaa-a-a-a of a young baby and rose and fell with prolonged querulous quaverings. Wondering at what could originate such sounds in the woods I knew so well, I followed up the sounds, landed and forced my way into the underbrush in their direction. They seemed to proceed from near the top of a large ash tree near the shore. While manœuvring about trying to get the newly leafing branches outlined against the best illuminated parts of the sky, the idea suddenly suggested itself that such cries might well proceed from a cub bear. The thought was disquieting for if the mother found an intruder about she might misunderstand the purely scientific designs of the investigation. I retreated immediately and with haste, and soon had a safe body of water between myself and possible danger. The sounds continued for some time, longer in fact than I cared to stay, and I left without discovering their origin.

A few days later, however, in broad daylight, the same cries were heard just back of the house and immediate investigation showed that they proceeded from a big fat "porkey" in a small maple tree, who was telling the whole world how mournfully happy it was in the warm spring sun. I presume it was of the nature of a love song and for the attraction or delectation of a mate, at least another porcupine, presumably a mate, was found in the vicinity shortly after.

I have never heard this spring song of the Porcupine since, nor have I ever met a northern woodsman who seemed acquainted with it. A superficial search of mammalogical literature has failed to reveal detailed references to it and I think, therefore, it may be worthy of record in these pages.

MAMMAL FOOD OF THE GREAT-HORNED OWL.

Late in the afternoon of December 31st, while following skunk tracks in a small strip of hardwood bush, four miles north of St. Thomas, Ontario, I observed a Horned Owl in a maple overlooking what appeared from external signs to be the winter den of a skunk family. The bird was secured and on picking it up I found the odor of skunk very pronounced.

On opening the carcass three days later for sex determination, was surprised to find the ligaments and fat surrounding the stomach full of porcupine quills. They were quite pliable, slightly bleached and appeared to have been in the bird's body for some time. Two pellets of skunk hair about the size of robin's eggs were the only contents in the stomach. The owl appeared in spite of the quills to be in a healthy condition.

C. E. JOHNSON.

A CROW POLYGAMIST?

In the latter part of May while passing through the Rideau woods near Ottawa, I saw an exceptionally large nest situated about forty feet up in a white pine tree, and a crow circling and cawing above it. As I climbed the tree two more crows flew from the nest which contained eight eggs, without doubt two sets, as four of them had the light ground colour blotched chiefly on the larger end, while the other four had a darker ground colour, and were profusely blotched.

CLYDE L. PATCH.

UNUSUAL FOOD OF THE GARTER SNAKE.

While two friends and I were standing by Kingsmere Lake on May 5th last, a green garter snake left the shore, swam a few yards into the lake, ducked its head under the water and swam back to shore with a trout about three inches long in its mouth. The fish was held by the middle but on reaching the shore it was dropped on a small piece of wood and immediately taken up again by the head and swallowed. Not more than three or four minutes had elapsed between the time the snake left the shore and it was back again with other fish in its stomach.

J. M. MACOUN.

CERUSSITE FROM SALMO, B.C.

BY A. LEDOUX AND T. L. WALKER, ROYAL ONTARIO MUSEUM OF MINERALOGY, TORONTO.

At the H. B. Mine, Salmo, B.C., where the principal ores are oxidised zinc minerals (silicate, carbonate and phosphate) cerussite is found in considerable quantity. The cerussite is not well crystallized as a rule but occasionally exceedingly beautiful crystallized specimens are encountered. The crystals are water clear with very brilliant faces and well suited for exact goniometric measurements. This probably is the finest crystallized cerussite found in Canada.

The crystals are almost invariably twinned forming six rayed structures such as have been frequently observed for this mineral. In these complex growths the twining ordinarily observed occurs on the face of the prism (110) but in the case of the Salmo mineral the structures are often more complex in that several of the individuals are twinned on (110) while one of these is twinned on another individual with (130) as the twinning plane. In many minerals complex twins involving more than one twinning law are common but in the past the stellate interpenetrating twins of cerussite had been regarded as resulting from twinning according to one law only until Hubrecht observed the participation of both twinning laws in the same complex group.* On groups of cerussite from Salmo the same complexity has been observed.

On crystals measured the following forms have been obseved:

(*a*) Pinacoids—
Basal Pinacoid (001) usually rough and when present large.
Brachypinacoid (010) always the largest face so that the crystals are tabular.
Macropinacoid (100) narrow and well defined;

(*b*) Prisms—(110) and (130);

(*c*) Brachydomes — (012), (011), (021), (052), (031), (041), (092), (051), (061), (071), (081), (091), (0.10.1), and (0.12.1).
The domes (012) and (021) are the most prominent. The others are present in certain crystals and give with the goniometer a long series of reflections;

(*d*) Macrodome—(102);

(*e*) Pyramids—(111) and rarely (112).

*Zeitschrift f. Kryst. XL p. 169.

The ordinary form of single crystals is represented in fig. 1; it will be noticed that the faces are generally not very numerous. The more complex type of crystal is represented in fig. 2, where the development of numerous brachydomes is especially characteristic.

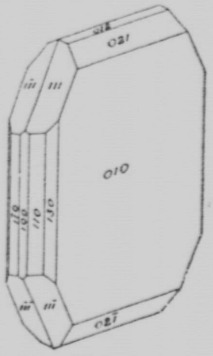

Fig. 1.

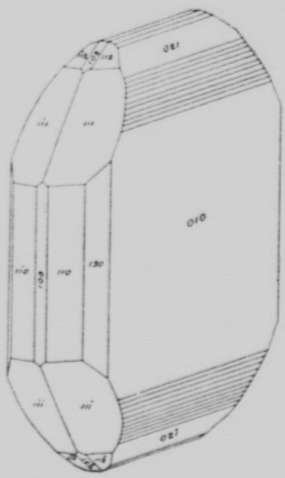

Fig. 2—The brachydomes lying between the faces (001) and (010) are as follows:—(012), (011), (021), (052), (031), (041), (092), (051), (061), (071), (081), (091), (010.1).

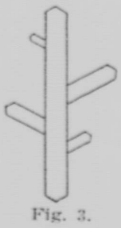

Fig. 3.

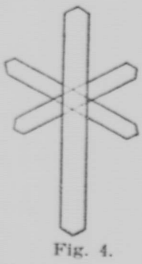

Fig. 4.

Repeated twinning on the unit prism (110) is very common, producing forms such as are represented by fig. 3 or 4. When this twinning law is the only one involved the angle between the *a* axes of successive individuals is 62° 46'. In the crystal represented schematically on fig. 5, the four individuals 1, 2, 3 and 4 are twinned according to this law, but a fifth individual (x) is twinned on No. 2 with (130) as twinning plane. The angle between the *a* axes of those two individuals is 57° 18'. The interpenetration of several individuals

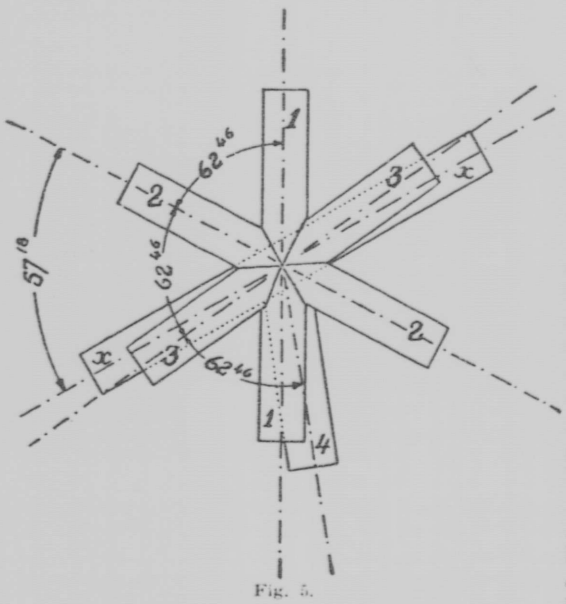

Fig. 5.

twinned according to different twinning laws gives rise to the formation of very complex groups.

The measurements were made by the two-circle goniometer; the measured values of φ and ρ compared with the calculated ones taken from Goldschmidt's Winkeltabellen for the following parameters are given below.

a: b: c=0.6100: 1: 0.7230.

Face.	φ		ρ	
	Measured.	Calculated.	Measured.	Calculated.
001	—	—	0°	0°
010	0°	0°	90°	90°
100	89° 58′	90°	90°	90°
110	58° 39′	58° 37′	90°	90°
130	28° 36′	28° 39′	90°	90°
012	0°	0°	19° 54′	19° 52′
011	0°	0°	35° 53′	35° 52′
021	0°	0°	55° 20′	55° 20′
052	0°	0°	61° 3′	61° 3′
031	0°	0°	65° 16′	65° 15′
041	0°	0°	71°	70° 55′
092	0°	0°	73° 10′	72° 55′
051	0°	0°	74° 32′	74° 32′
061	0°	0°	77°	77° 1′
071	0°	0°	78° 49′	78° 49′
081	0°	0°	79° 45′	80° 11′
091	0°	0°	81° 2′	81° 16′
0.10.1	0°	0°	81° 57′	82° 7′
0.12.1	0°	0°	83° 25′	83° 26′
102	90°	90°	30° 38′	30° 39′
111	58° 39′	58° 37′	54° 16′	54° 14′
112	58° 39′	58° 37′	34° 42′	34° 46′

The brachydomes (092) and (0.12.1) have not been previously observed.

NOTES.

The American Musium of Natural History, we learn from its Journal, has offered to the National War Work Council of the Young Men's Christian Association the choice of any of its thousands of miscellaneous lantern slides which may be found suitable for the entertainment of soldiers in camp, either in this country or abroad. A cable received from France by the War Work Council asked for as many colored slides as possible, with a range of subjects embracing architecture, art, science, war and the scenery of various countries. The museum is preparing also a series of lectures to be circulated among the camps. Four of these now in course of preparation are: "Hunting Elephants and Other Big Game in Africa," by Carl E. Akeley; "Whale Hunting with Gun and Camera," by Roy C. Andrews; "Down the River of Doubt with Colonel Roosevelt," by George K. Cherrie, and "Bird Life on an Antarctic Island," by Robert Cushman Murphy.

The annual report of the Bristol Museum and Art Gallery, lately published, shows great activity, in spite of the war. During the year 261,594 persons visited the museum. An important new development was in connection with wounded soldiers. Some of the collections were temporarily placed in storage and space was made for a recreation center, including frequent lectures and demonstrations, concerts, library facilities and light refreshments.

Of the larvae of *Trogoderma tarsale*, a small beetle well known as a museum pest, experimented on by J. E. Wodsedalek, University of Idaho, Moscow, Idaho, the last of a large number of specimens lived, without a particle to eat, for the surprisingly long period of five years, one month and twenty-nine days or, to be more specific, from October 28, 1911, to December 25, 1916, a period of 1,884 days. Many of the largest larvae which were about 8 mm. in length dwindled down to practically the hatching length of 1 mm. before dying. When the starved specimens almost reach the smallest size possible and are then given plenty of food, they will again begin growing in size. Occasionally these larvae are found in large numbers in insect, seed and drug collections, and naturally destroyed as soon as discovered. Mr. Wodsedalek would appreciate living larvae or adults of other dermestids.

THE BEHAVIOUR OF THE RED SQUIRREL.

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For the past eight months, that is from October to May inclusive, I have had a male Red Squirrel (*Sciurus hudsonicus loquax*), under almost daily observation. The conditions for acquiring information on the normal behaviour of this species have been practically ideal. This squirrel is not tame and I have purposely refrained from any efforts to render it so, since conclusions drawn from the actions of a tame animal are of very doubtful value when applied to the species in the wild state. It has made its headquarters in a large sugar maple tree which grows beside the house, the main limbs of which are on a level with, and close to, my second-story verandah, while the tips of the branches are on a level with a window on the third story.

The reason why the squirrel selected this tree as its headquarters is not far to seek, as last year this maple produced an exceedingly bountiful crop of keys, which were lying thickly on the ground beneath it and on the roof, while all the other trees in the vicinity are soft maples whose keys had long ago germinated.

FOOD.

The main natural source of food supply of the squirrel has been the keys of the sugar maple; the second most important has been the buds of both soft and sugar maple. During April it consumed considerable quantities of buds, first of the soft maple and later, when the buds of the latter species had expanded, turning its attention to those of the sugar maple. After the leaves of the sugar maple were about one-third expanded it cut off a good many of the four-leaved sprays and ate the tender young stem, allowing the leaves to fall to the ground.

At the end of March, when the sap was flowing from broken twigs of the sugar maple and running down the under-side of the branches, the squirrel devoted most of its time to drinking sap. In order to get at this sap it had in most cases to hang upside-down, in the manner shown in Figure 1. When thus hanging from a small branch both fore and hind feet were clasped about the branch so that the toes nearly met on top of the branch. When hanging from a large limb its position looked a good deal more precarious, but it maintained its hold with ease and certainty, and though I saw it thus suspended from large limbs over a hundred times I never saw a single slip. When in this position it relied chiefly on its hind legs, and there was a decided bend outward in these legs at the tarsal joint, this bend evidently enabling the claws to catch the crevices of the bark more effectively.

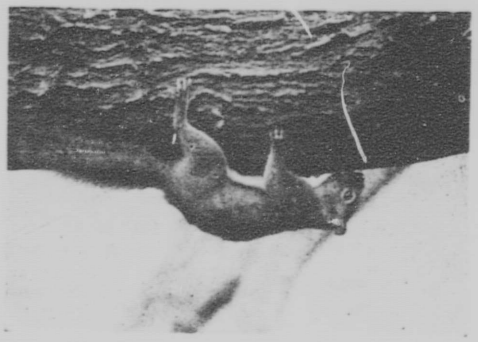

Fig. 1—Squirrel in position assumed when drinking sap.

When drinking sap it laps it up, its tongue going at a tremendous rate.

I have tried the squirrel with many different articles of food, such as meat, vegetables and nuts. For green vegetables, such as cabbage and celery, it has no great fondness. It likes meat, but its favorite food is undoubtedly nuts—hazels, walnuts, beechnuts and hickories. It also relishes sweet substances, as candy and jam.

MANNER OF EATING.

When eating anything which can be picked up it invariably takes it between its fore-paws, and sits up in the position shown in Figure 2. The position

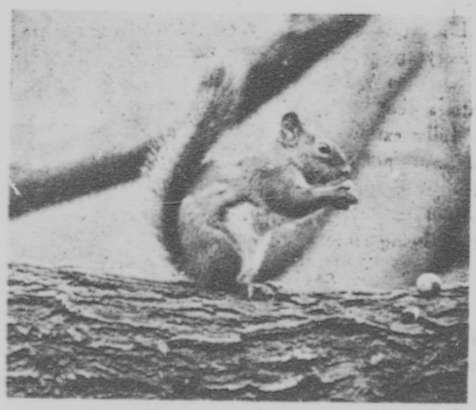

Fig. 2—Squirrel in characteristic eating attitude

of the tail when in this attitude varies a good deal, as it may be straight out along the limb, raised slightly from the limb and with a downward curve, or the basal portion resting on the limb and the apical half curved upward. But when it settles itself to consume something which will take some time to eat, it almost invariably elevates the tail straight in the air or applies it even more closely to the back. In eating a nut it first gnaws through the shell at a point just to one side of the apex, then breaks away the shell until it has consumed all the meat. In eating a beechnut it pulls one of the sides off with its teeth and then gets the kernel out whole.

STORAGE.

The squirrel practices three methods of storage—carrying things off to one of its main hoards, burying each object separately, and arranging them in a fork or on a limb. It classifies the things that it stores into two classes—hard objects and soft. Hard things such as nuts and seeds it either carries to one of its hoards or buries; soft things, such as meat, apples, etc., it arranges about the tree. It thus buries nothing which will mould or decay readily. It has several main hoards, though I only know the exact location of two, and when it is carrying off a number of things consecutively it takes them to two or more of these hoards alternately. When it buries a nut in the soil it scratches out a hollow with its fore-paws, places the nut in it, shoves it in as far as possible with its nose, and then covers it with a few swift strokes from right and left with the fore-paws. It performs this operation with much rapidity, but does it so well that when it has buried a nut in a location where there is moss and dead leaves there is no trace of any disturbance. In fact upon three occasions I noted the location of the spot at which I had seen it bury a nut as accurately as possible, but upon going to the place I was unable to find the nut.

During the winter its chief method of storage is burying in the snow. In doing this it shoves the object into the snow with its nose, then covers it with a few quick sweeps from right and left with its fully extended fore-paws. It will thus bury in the snow not only nuts and other hard objects, but also pieces of meat and small apples. That is, it treated them as hard objects, as indeed they soon were, being frozen solid in a short time.

CARRYING CAPACITY.

It is able to carry off objects of considerable weight, as the following instance shows. On the morning of May 11th, it entered the pantry through the open window. There it discovered a bowl of boiled potatoes, some of which it hid behind cans in the pantry, while it carried others up the maple tree and arranged them in the forks. Some of the potatoes which it carried up the tree weighed a quarter of a pound.

TUNNELLING UNDER THE SNOW.

When the snow became deep the squirrel made tunnels beneath it, first driving the tunnel which touches the tree, and later constructing the system of tunnels shown in Figure 3. During the winter

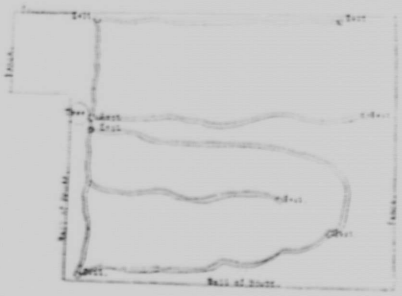

Fig. 3—Plan of tunnels of red squirrel under the snow.

I was able to judge somewhat of the extent of the tunnels from the positions of the exits, and when the snow thawed I was able to map them.

The purpose of these tunnels was to gain access to the keys of the sugar maple which were so thickly scattered about the yard. The squirrel usually brought them to one of the exits to eat.

ACTIVITY IN WINTER.

It was out every day during the winter except in very stormy or in extremely cold weather. At such times it would not appear for two or three days at a time.

LEAPING ABILITY.

None of the leaps which I have seen it make seemed to tax its leaping power at all. A jump which it made often dozens of times a day in the winter was from the roof to the main crotch of the maple tree—a distance of eight feet with a drop of two feet. I noticed that it never tried the return leap, that is a leap which would land it two feet higher than its starting point, but always ran out on a limb and then to the roof.

In leaping it extends its legs and flattens its body, while the tail is straight and stiff behind it.

MANUAL DEXTERITY.

Though it lacks a "thumb" its dexterity with its fore-paws is much greater than in the case of most animals. By taking them between its paws it handles both large and small objects with the utmost precision and certainty. It can turn a smooth and slippery nut round and round in its paws and I have never seen it let anything slip. I have seen

it reach out and pull off a bud with a single paw, folding the toes against the palm in doing so, and also place a piece of a leaf in its mouth with one paw.

BALANCING OF OBJECTS.

The squirrel is most expert in balancing objects on branches. Usually it selects either a crotch or the somewhat flat surface at the point at which a horizontal branch comes off from the limb as the place of deposition. When placing anything in position it shifts it a trifle to one side or the other with its paws or muzzle and does not leave it until it is as securely lodged as possible. It succeeds in balancing nuts in situations in which I should not like to undertake to balance them. I noticed that when it hung a long strip of ham-rind, an article of diet with which it can hardly have had previous experience, on a branch it shifted it until the two ends hung equally on each side of the branch. Out of the scores of times that I have seen it balancing objects I have only once seen it let anything fall, and upon this occasion it made a most strenuous effort to catch it but failed.

RESTING.

The squirrel does not often rest. It is almost ceaselessly active from early morning till dark, and during this time it is eating almost continuously. However it does rest, and even sleep, occasionally. Its favorite resting-position is spread out along a limb, with its legs out straight in front and behind and with its chin resting on its fore-paws. When it composes itself for a nap it hunches itself up, rests its chin on the limb, and flattens its tail down along its back. I have only once seen it go right off to sleep—as a rule its eyes are closed completely only for a moment at a time.

It has certain favorite places for resting, the most favored situation being on a rather small, nearly horizontal, branch at the point where it comes off from a larger branch. Here it sits with its posterior end against the larger branch in such a way that it gives one the impression that it "fits in" there.

I have seen it stretch—first one paw and then the other—and yawn. It often rubs its jaw and throat along a limb, in this respect reminding one very much of the actions of a cat.

WASHING.

After it has eaten anything sticky or greasy it licks its forepaws very thoroughly and then rubs them over its nose. It sometimes spends five minutes thus cleaning up.

SCRATCHING.

During the winter it did not seem to be troubled with insects, but in the early spring they apparently gave it a busy time. It scratched and bit itself very frequently and often for some time at a stretch, causing the shedding hairs of its winter coat to fly in all directions.

"FREEZING."

Upon two occasions when a hawk flew over, and upon another when it caught a sound like the scream of a hawk, the squirrel "froze", remaining absolutely motionless for three minutes or more. As soon as it moved it exploded into a loud and long-continued chatter.

PSYCHOLOGY.

In the study of any animal the most interesting thing, and at the same time the phase of the subject in which we have to proceed most cautiously in drawing conclusions, is its mentality. My close observation of the squirrel during the past eight months has given me some glimpses of the psychology of this animal.

The sense of ownership is a mental attribute which seems to be well developed. This squirrel appears to regard the sugar maple as its own private preserve. All through the winter it drove away any house sparrows which perched in it. Toward spring another squirrel sometimes came into this tree, and this always resulted in a great deal of barking and chattering, and ended in the retreat of the intruder, hotly pursued. This squirrel was also a male and was as large and apparently as strong as the "owner" of the tree, but it fled without putting up a fight. Once this second squirrel came into the tree when the "owner" was away, and finding some pieces of meat it proceeded to eat them in such a hurry that it choked.

The squirrel watches the things it has stored in the tree most jealously. Upon several occasions a white-breasted nuthatch has come and pecked at some of this food, and whenever this has been observed by the squirrel it has come on the jump and driven it away. Once the nuthatch came and pecked at a piece of meat, the squirrel drove it away, and then as the nuthatch flew the squirrel bounded over to another piece of meat as if it anticipated an attempt upon that piece also.

Does the squirrel know where it has placed things? This question has frequently been discussed and I can answer it most decidedly in the affirmative, as time after time I have seen it go by the nearest route to something it had stored and proceed to eat it. I am not prepared to say that it never forgets anything, indeed if it did not it would imply a far better memory than that of a human being.

Curiosity is an attribute which the squirrel exhibits to a marked degree. Any new object is at once seen, carefully approached and investigated. It seems as if the squirrel's method of investigation entails not only smelling a thing but trying it with

its teeth. This certainly was the case with my camera. When it first saw it set up it was afraid of it, then it watched it as it passed it, then went up and smelled it and finally climbed on top of it and took a nip of the bellows, which was carrying it a bit too far from my point of view.

A couple of incidents which throw some light on the psychology of the squirrel I shall describe and let the reader draw his own conclusions.

One day the squirrel took a big piece of meat from which the fat had ben rendered, carried it to the edge of the roof from which it usually made its eight-foot leap, gathered itself as if about to jump, then checked itself, hesitated a moment, and then carried the meat up onto the roof of the verandah and thus to the tree. With small objects it always made this leap without any hesitation.

On May 15th, I placed a pile of apple-peelings and two small apples on a board which projected out over the roof. The squirrel was pulling at a long peeling when one of the apples rolled towards it and was about to fall off the board. It dropped the peeling and seized the apple just in the nick of time.

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 19, 1918.

The activities of THE OTTAWA FIELD-NATURALISTS' CLUB during the 39th year of its existence, in popularizing and diffusing knowledge of the natural sciences, have been carried on chiefly in three ways: a course of seven lectures, twelve field excursions and the publication of THE OTTAWA NATURALIST which has now completed its 30th volume.

Thirty-two members were elected during the year making a total membership of 367. Twenty-one members serving overseas are carried gratis.

The lectures were planned to create a more intelligent interest in Canadian natural history and to give a better understanding of the value of scientific work. Through the co-operation of the Librarian of the Carnegie Library a programme for next season, covering the meetings of the various literary and scientific societies, will it is hoped be arranged, thus reducing to a minimum the conflict of dates.

The field excursions were announced in the daily papers in order that the general public as well as the club members might take advantage of them. Scientific men, both members of the Club and others at the request of the Club, attended the excursions to direct interest and answer questions.

The following are the officers and committees for the club year 1918-1919:

President, C. Gordon Hewitt; *Vice-Presidents*, M. Y. Williams, L. D. Burling; *Secretatry*, Clyde L. Patch; *Treasurer*, J. R. Dymond; *Editor*, Arthur Gibson.

Additional Members of Council: P. A. Taverner, F. W. Waugh, C. M. Sternberg, W. T. Macoun, G. A. Millar, Miss M. E. Cowan, Dr. R. M. Anderson, H. McGillivray, C. B. Hutchings.

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Excursions—F. W. Waugh, H. B. Sifton, C. M. Sternberg, G. A. Millar, Miss M. E. Cowan, C. L. Patch, H. McGillivray, C. B. Hutchings.

Lectures—M. Y. Williams, P. A. Taverner, L. D. Burling, W. T. Macoun, G. A. Millar, R. M. Anderson.

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Trust Funds—W. T. Macoun, C. Gordon Hewitt, H. M. Ami.

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Archaeology: Harlan I. Smith, F. W. Waugh, W. J. Wintemberg, Dr. C. M. Barbeau, Dr. E. Sapir.

Botany: G. A. Miller, W. T. Macount, J. M. Macoun, Mrs. A. F. Brown, Dr. M. O. Malte, J. R. Dymond, E. C. Wight, H. B. Sifton, Miss M. E. Cowan.

Entomology: Arthur Gibson, Dr. C. G. Hewitt, J. M. Swaine, F. W. L. Sladen, C. B. Hutchings.

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Ornithology: C. L. Patch, P. A. Taverner, Dr. M. Y. Williams, A. G. Kingston.

Zoology: Dr. R. M. Anderson, A. Halkett, E. E. Lemieux, E. A. LeSueur, C. H. Young, C. E. Johnson.

Photography: W. S. Hutton.

COLLECTING NOTES FOR NORTHERN SPIDERS.

BY J. H. EMERTON.

The most conspicuous northern spiders are the *Lycosidae*, which run on the ground and catch insects for food, without the use of cobwebs, taking shelter, especially in breeding time, in holes in the ground, or among plants, which they line more or less with silk. Some species, known to live as far north as Ontario and Manitoba, dig holes in sandy soil, and these may live farther north and should be looked for wherever there is sand only partly covered with plants. The hole usually has a perfectly round opening thickly lined with silk, to which sometimes sand and bits of straw are attached.

All spiders eat insects, but, as far as known, any spider may eat any insect which it can catch. All observations on choice of food by spiders would be useful, for instance, whether *Lycosidae* would catch Lepidoptera if the latter came their way.

The *Lycosidae* carry their eggs in a round silk bag attached behind to the spinnerets, and the young, after leaving the bag, hold for some time to the mother's back. The young hatch in midsummer and become half grown before winter, when they take what shelter they can find near the ground and remain torpid until the next spring, when they grow rapidly, maturing in June, the males before the females. The pairing takes place as soon as the females are adult, and this is the best time to collect them to be certain which males and females belong together. Many of these species are very variable and there is much doubt about their classification.

The distribution of many *Lycosidae* is extensive; for instance, *Pardosa glacialis* extends all over North America as far south as New York and Ohioward. *Lycosa pictilis*, under various names, extends along the Arctic coast from Siberia to Greenland, and south to Labrador, the White Mountains, Norway and the Alps. Specimens are desirable from as many places as possible.

Next to the *Lycosidae*, the most conspicuous spiders of the north are the very small species of *Erigone* and its allies, which live in enormous numbers close to the ground in small flat cobwebs which become visible only when covered with dew. These spiders are most readily found under stones and sticks lying on the ground. They also live in dead grass and litter of all kinds along the seashore and banks of ponds and rivers, and in the moss and decaying leaves that collect under trees and bushes. This loose material should be shaken and sifted on a large cloth, blanket or tarpaulin, the coarser parts thrown off and the dust carefully examined. I use a waterproof cloth three feet by six, and on this place an armful of litter, taking care to get the portion nearest the ground. This is beaten and shaken for a few minutes and the larger part taken away. The rest is shaken to the middle of the cloth and sifted in a sieve of three wires to an inch, which removes most of the straw, leaves and moss, and lets through the dust, insects, spiders, etc. Everything alive soon shows itself by movements as the various species recover from the shaking and become warm in the sun.

Epeira carbonaria, which makes round webs between bare stones in the Rocky Mountains, Labrador and the Alps, has not been reported from the Arctic coast, but should be looked for there on rock-covered hillsides above the shore. The spider is gray, like dark granite. It hangs in the middle of the web and drops at the slightest jar, but soon returns. Any cobweb should be watched in the evening, when the spider is more likely to expose itself. At other times the spider may be found in a nest at one side of, or above, the web.

A large number of spiders inhabit the spruce forest and extend across the continent. Many of these are found as far north as Hudson Bay and Alaska, but their northern limits are unknown. The most northern trees should be examined by beating them over a cloth laid on the ground well under the branches, and the falling animals picked from the cloth. Some of the tree spiders make large and conspicuous cobwebs and these should be examined in the morning when covered with dew, and, if possible, photographed then within an hour of sunrise.

Sphagnum does not usually shelter many spiders, but the moss which grows under trees and on decaying wood often contains many.

The leaves under birch and willow trees should be sifted, even if in small quantities.

It is expected that the new Field Museum, Chicago, for which ground was broken in the summer of 1915, will be ready for the transfer of the contents of the old museum in Jackson Park by August, 1919. The new building is situated south of Twelfth Street and east of the Illinois Central Station. It is of Georgia marble, and, exclusive of the porticoes, will measure 756 feet long and 350 feet wide. It will cost $5,000,000.

THE RELATIONSHIP OF THE FOSSIL MARL FAUNA OF MACKAY LAKE, OTTAWA, TO THE PRESENT MOLLUSCAN FAUNA OF THE LAKE.*

By E. J. Whittaker.

Physical Features of the Lake.

MacKay or Hemlock Lake is a small body of water in Rockcliffe, just east of the city of Ottawa. It is irregular in shape, about 500 yards in length and 215 yards in greatest breadth. The long axis of the lake runs approximately north and south. One eighth of the total water area is occupied by a deep bay indenting the eastern shore to a depth of 150 yards. The surface of the lake is 15 feet above the Ottawa River and its greatest depth is only thirty feet. The history of this basin dates back to the end of the Pleistocene, when the land was emerging from the Champlain sea. The shore on the west side consists in part of bedrock of Chazy age, while on all other sides are marine sands and clays and some small areas of recent deposits. The topography about the lake reflects these two contrasting types. In the part of the lake enclosed by bedrock the shores are high, small ramparts of sandstone outcrop, and there is a complete absence of peaty or mucky deposits. Elsewhere the shores are low and owing to their boggy nature the water cannot be approached on foot. A small area at the extreme southern end where the muck deposits are absent, is the only exception.

At the south end there are two small rills which form the only visible inlets to the lake. A considerable volume of water is brought down by them in time of spring flood, but in summer they are nearly dry, and the only supply comes from seepage and springs from the surrounding land areas. As this is inconsiderable in amount, the water becomes quite stagnant. The waters of MacKay Lake find an outlet through a small stream, half a mile in length, which flows into the Ottawa. This creek has cut a valley from 25 to 40 ft. deep and from 80 to 100 feet wide at the top through the Pleistocene clays. Originally, on the emergence of the land from the Champlain Sea, the erosion must have been very rapid through this soft unconsolidated material. At the present time, however, owing to the insignificant volume of water carried the bed of the stream is being lowered very slowly. Its erosive power is further diminished by the abundance of water plants over much of its course.

Though of small extent, the marl deposits of MacKay lake have been known for a long period.** They are very accessible, and new parts of the beds have been constantly brought to view as further advances were made into the sand beds which they overlie. The elevation of the marl beds above the present level of the lake is 18-20 feet, and is without doubt due to the lowering of the lake since their deposition by the cutting down of the outlet. This erosion must have occupied a considerable period of time. Formerly the lake must have been somewhat larger than now, although, at present, the deposits of marl are found only at the south end of the lake, at a distance of about 100 yards from the water. Elsewhere, presumably, the beds have been removed by erosion. The marl is from three to five feet in thickness and is overlain by a small amount of superficial soil and peaty matter on which grows a luxuriant forest of both large trees and undergrowth, whose roots have filled the beds with a network of interlacing fibres. The underlying material is for the most part sand, which frequently shows cross-bedding, and is occasionally replaced by heavy gravel or boulder—suggesting that these lower beds are of fluviatile origin.

The marl was formerly used in making brick and cement but is not being worked at the present time. In appearance it is yellowish-white to pure white, but is occasionally rust-stained from overlying deposits. It is very slightly coherent, crumbling readily between the fingers, and a block placed in water will break down like loaf sugar. It consists of a large proportion of fresh water shells well preserved in a matrix of almost impalpable powder which is not made up of shell fragments as in the case of many marls. Its origin will be discussed later.

A chemical analysis made in 1894* shows over 93% of calcium carbonate, and nearly 5% of organic matter such as root fibres and humus, indicating a very pure marl.

The Faunas.

The fresh water shell remains in the marl of MacKay Lake are the most modern fossils in the area and belong to a late Pleistocene or early

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**Geol. Survey of Canada Report 1845-46, p. 96.
Report of Progress, 1863, p. 765.
Annual Report 1882, vol. VI, p. 70AA.
Annual Report 1894, vol. VII, pp. 23, 24R. (Chemical analysis).
Annual Report 1892, vol. XII, p. 47.
*Annual Report, Geol. Survey of Canada, 1894, vol. VII, pp. 23-24R.

Recent fauna. The fauna is somewhat younger than the Pleistocene fauna on Cayuga Lake described by C. J. Maury.† They occur very uniformly distributed throughout the beds. They can be picked up where the marl has weathered out, or can be procured by thousands if a block of unweathered material is soaked in a pail of water. Many of the shells contain quantities of air and, as the block disintegrates, they rise to the top and can be poured off into a sieve. In this way several thousands of specimens were procured for study. The original coloration of the shells has disappeared and they are white and opaque except in two species—*Valvata tricarinata*, which still retains in many cases a tinge of green, and *Physa heterostropha*, which retains a red band inside the callus at the aperture of the shell. The specimens are perfectly preserved for study, as the finest striae remain unabraded.

Along with the fresh water shells were found, rarely, several species of terrestrial gastropods that had evidently been carried into the lake by small rills or in the case of minute delicate shells, by the wind, and deposited with the fresh water forms. As terrestrial shells are rare in the marl and no very definite relationships to living forms can be established in their case, they are not further discussed here.

MacKay Lake with its somewhat stagnant water is not an especially good habitat for the Mollusca and yet we find a considerable assemblage of forms thriving it in. Many of these forms also occur fossil and the following table shows the species common to both. These two lists show a very marked contrast in the composition of the living and fossil faunas of the lake. It may be added that the list of the present fauna is not complete; to make it so would necessitate a larger series of dredgings than it was possible to make at the time.

MARL FAUNA.	PRESENT FAUNA.
GASTROPODA.	
*Limnaea galbana**	*Limnaea stagnalis appressa*
Planorbis companulatus.	*Planorbis companulatus.*
Planorbis bicarinatus.	*Planorbis bicarinatus.*
Planorbis parvus.	*Planorbis parvus?*
	Planorbis trivolvis.
	Planorbis deflectus.
	Planorbis exacutus.
	Planorbis hirsutus.
Physa heterostropha.	*Physa heterostropha.*
Amnicola porata.	*Amnicola porata.*
	Pomatiopsis lustrica.
Valvata tricarinata.	*Valvata tricarinata.*
	Campeloma decisum.
PELECYPODA.	
Pisidium abditum.	*Pisidium abditum.*
	Lampsilis radiatus.
	Lampsilis luteolis.
OSTRACODA**	*Sphaerium simile.*
Cypris sp.	
Several other species.	

It will be seen that seven species only can be used for comparison between the living and fossil forms. Each of these will be taken up in detail to note what differences, if any, have arisen since the deposition of the marl beds. In the case of gastropods, four sets of measurements were made in the following order: (1) Height of shell, (2) Width of shell, (3) Height of aperture, (4) Width of aperture. In the case of the pelecypods, length, height and width were noted. Measurements were made of a series of average individuals and the means of these taken as the measurements of the species. As conditions in MacKay Lake may not be favourable to the growth of a completely normal fauna, the measurements are added of the species recorded by Mr. Frank Collins Baker*** from the region about Chicago, where the conditions are very favourable to molluscan life and individuals may be expected to reach a normal size.

The method employed in determining the measurements was as follows: The specimens of one species were placed on a smooth surface. A straight edge was then pushed through the shells and a dozen or more were separated from the rest and arranged in a row along the rule. This process was repeated until all the specimens were arranged in rows. The individuals at each end and the one in the middle of each line were measured. For instance, if one line contained seventeen shells, numbers 1, 9, and 17 were selected for measurements. Means were calculated for each species. In this way it was thought a fair average would be obtained in lieu of measuring hundreds of specimens.

A second method secured some additional data, and also acted as a check on the first. The shells were spread out and eight of the largest normal individuals both of the living and fossil forms selected and measured. It was found that the measurements taken in this way were slightly greater than those obtained by the first method, but that the ratios of living to fossil forms agreed very closely. In the tables given in this paper the results obtained by the first method are used except where otherwise noted.

†Interglacial fauna in Cayuga Valley. Jour. of Geol. 1908, vol. XVI, pp. 565-567.

*H. M. Ami lists Limnaea stagnalis and L. dedidiosa from the marl beds, Vol. XII, p. 56G, Ann. Rept. Geol. Surv. of Canada.

**None previously recorded from these beds; all are probably new.

***The Mollusca of the Chicago Area, Chicago Acad. Sciences, Bull. No. 3, Nat. Hist. Survey.

1. *Planorbis companulatus* Say

	H.	W.	A.H.	A.W.*
a. Marl from MacKay Lake	5.18	9.2	4.56	3.69
b. Living form, MacKay Lake	6.27	11.4	5.5	4.56
c. Form in Chicago area	6.63	12.75	5.19	4.69
Ratio b:a	1.211	1.245	1.226	1.238

or an average ratio of 1.23.

In the case of *Planorbis companulatus* we have thus conclusive evidence that the present form is considerably larger (23%) and that the environment of the fossil species was not very suitable to it. But apart from the size the species has not changed at all. The ratios of the four standard measurements are nearly equal showing that the proportions of the shell have remained practically the same. The shell ornamentation remains unchanged also.

2. *Planorbis bicarinatus* Say

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	4.94	8.75	4.15	3.5
b. Living form, MacKay Lake	4.75	7.83	4.17	2.917
c. Chicago form	5.75	10.63	5.13	3.88
d. Form from Presqu'ile Bay, L. Ontario	6.08	11.33	5.25	4.16
Ratio c:a	1.164	1.215	1.231	1.09

Analysis of the above figures shows that in this case the fossil specimens are slightly larger than the living forms, a conclusion not in harmony with the previous result and, as we shall see, also differing from that reached for the majority of the species. Apparently the quiet water of Mackay lake is not well suited to *Planorbis bicarinatus*. The two broadly funnel-shaped depressions in both sides of the shell expose a very large area to erosion by carbon dioxide, which the water contains in considerable amount. Such erosion is a constant drain on the vitality of the animal, as the lime of the shell must be constantly renewed. We have also abundant evidence that the marl forms themselves were not well adapted to their environment. They show an extreme variation in the shell:—the aperture varies from sub-trigonal to sub-ovate; many specimens show traces of former apertures, as evinced by transverse thickening of the shell at one or more places in the body whorl accompanied by a change in direction in the latter; fully fifty per cent. of the specimens examined show distinct minute revolving lines occurring irregularly over the shell; the shell is also thickened unevenly about the aperture. Specimens from Presqu'ile bay, Lake Ontario, do not show any such irregularities. That the slight diminution in size of the specimens found in the lake as compared with those from the marl is local and is not a constant feature, is indicated by the measurements from the Lake Ontario and Chicago specimens. That the marly bottom of the ancient lake was not very suitable to this form, is evident from the presence of so many abnormalities in the individuals, but it was a little more suitable than the present lake.

3. *Plenorbis parvus* Say. The fossil form is variable in size. It is impossible to give an exact series of measurements but the average is lower than those of the living forms to-day. This species is found in considerable numbers in the marl bed but is not nearly so abundant as *Valvata tricarinata* and *Amnicola porata*.

4. *Physa heterostropha* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	11.38	7.38	8.69	4.08
b. Living form, MacKay Lake	12.88	8.13	9.75	4.61
c. Chicago form	13.50	8.67	10.17	4.33
Ratio b:a	1.132	1.102	1.122	1.111

In the case of this species the living form is somewhat larger than the fossils. The ratio agree closely. *Physa heterostropha* shows with the other species the adverse influence of the marly bottom. The fossil form retains some of the original coloring matter in a red band inside the callus at the aperture.

5. *Valvata tricarinata* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	2.7	3.9	1.8	1.65
b. Living form, MacKay Lake	4.41	5.47	2.67	2.28
c. Chicago form One specimen only.	4.00	4.00	2.00	2.00
Ratio b:a	1.65	1.40	1.48	1.39

Of all the species discussed in this paper *Valvata tricarinata* shows the greatest difference in size between the present and fossil specimens. The linear measurements show that the bulk of the living animal is more than twice the size of the fossil form. This species occurs in great abundance in the marl beds and is uniformly small. The marl specimens might be considered a dwarf variety of the species which adapted itself to an unsuitable bottom environment. Many of the shells are slightly green in colour.

*H.—height of shell in millimeters.
W.—width.
A.H.—aperture height.
A.W.—aperture width.

6. *Amnicola porata* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	4.2	3.5	2.23	1.75
b. Living form, MacKay Lake	4.2	3.62	2.1	1.73
c. Chicago form	5.00	4.25	2.8	2.08

These figures show that a. and b. are practically identical in measurements.

This species has not changed at all in the area under discussion but neither its marl environment nor its present one in MacKay Lake have allowed it to attain its maximum growth. This is seen by comparing them with normal forms from the Chicago area which are much larger as shown by the figures above.

7. *Limnaea galbana* Say was first described as a fossil and has since been found living. It was not found living in MacKay Lake. The specimens from the marl beds average a little larger than Say's type. This species is such a persistent member of the marl bed faunas throughout the Northeastern United States and Canada that it seems especially fitted for such a habitat. The living species prefers clear water more or less in movement, which fact probably excludes it from the lake at present.

8. *Pisidium abditus* Haldeman.

	Height	Width	Length
a. Marl form	2.25	1.96	2.62
b. Present form	3.25	2.83	4.03
c. Chicago form	Measurements not available.		
Ratio b:a	1.44	1.44	1.54

P. abditum is the only pelecypod found common to the fossil and present faunas of MacKay lake. The figures above show the present form to be much larger than the fossil shell.

It is interesting to consider for a moment the pelecypod fauna. *Pisidium abditum*, the only representative in the marl, is uniformly small, and, though fairly abundant, is not comparable in numbers at all with the gastropods. In the present lake fauna *Lampsilis radiatus* and *L. luteolis* are found but in small numbers, and not far from the outlet. These members of the Unionidae cannot thrive apparently in stagnant water. On the other hand, the members of the Sphaeriidae, represented by *Sphaerium simile* and the species of *Pisidium* are to be found in fairly large numbers in these waters.

DEPAUPERATION.

An examination of the data for the species discussed above shows all the fossil forms with the exception of *Amnicola porata* and *Planorbis bicarinatus* to be smaller than their existing descendants in the lake of to-day. Even these exceptions are smaller than normal. The tables show that exclusive of ostracods only eight species are common in the marl beds while sixteen are found in the present lake and this number would be exceeded if an exhaustive search were made. What caused the depauperation of the marl bed fauna? As noted above it seems probable that the bottom environment had a great deal to do in this connection and that the marly bottom was very unfavourable to most of the species. No marl is being deposited in the lake at the present time. But in the shallow bay to the east the bottom is composed of this material. This represents either an old marl bed in situ below water level or the accumulated wash from higher beds. The water is seldom more than four feet in depth in this bay. A very small amount of muddy sediment overlies this marl and is covered by a scanty aquatic vegetation consisting mainly of algae. The molluscan life in this area is scanty, few living shells were obtained, and these were mostly the ubiquitous species *Valvata tricarinata* and *Amnicola porata*. The latter was mostly found attached to the submerged plant stems and comparatively few were found on the bottom itself. *Pisidium* can live attached to algae and other aquatic plants, and thus remain somewhat away from the influence of the marl. The heavy shelled forms like the Unionidae, however, must live directly on the bottom. The marl acts unfavourably on such species probably by clogging their gills. It is not surprising therefore, that these forms are entirely wanting in the marl fauna.

In contrast, on the western side of the lake there are two different types of bottom, one composed of soft mud with an abundant plant growth, while the other is composed of rock covered with debris both organic and inorganic. The first named area provided every species obtained in the lake in great abundance except *Campeloma decisum*, *Lymnaea stagnalis*, and *Planorbis trivolvis*. The two latter species were found here also but were attached to submerged objects and not on the bottom. The rock covered with debris had also a considerable fauna—much greater than that of the marl beds in the eastern bay so it seems that here at any rate the marl bottom is perjudicial to a flourishing molluscan fauna. The marl bottom is not conducive to growth of many water plants. Certain algae and other low forms are the most common. Such species as *Amnicola*, small forms of *Planorbis* and *Valvata* can attach themselves to these algae but prefer lily stems and pads and other plants with vigorous stem and leaf growth.

As mentioned above the marl matrix is not composed of shell fragments but of a fine impalpable powder of calcium carbonate. Two theories have been propounded to account for such a type of de-

position. Both consider the lime to have been precipitated from solution by various agents. The older hypothesis holds that the high percentage of carbon dioxide in spring water is reduced when it enters the lake. As a consequence, the calcium carbonate, which has been held in solution through the presence of the excess carbon dioxide, is precipitated. The other theory attributes the same result to the work of algae which remove the carbon dioxide. It is quite possible that both agencies have been operative at MacKay Lake; but, however precipitated, the marl in a finely divided state, would be injurious to the molluscan fauna and account for its depauperation.

Another factor which no doubt must have exerted considerable influence in this connection was the colder climate which probably existed when the marl was accumulating. Such conditions would tend to make short thick shelled forms with the vital organs concentrated as much as possible. A glance over the marl fauna shows this to be conspicuously true. *Valvata*, *Amnicola*, the represented species of *Planorbis*, all belong to this class. *Lymnaea galbana* with its shouldered thickset whorls is a remarkable contrast to *Lymnaea stagnalis appressa*. *Planorbis trivolvis* a large thin shelled species is missing from these marl beds.

The marl of MacKay Lake, therefore, seems to have a depauperate fauna due to an adverse bottom environment and, probably, to a cold climate. It would be interesting to note if, in other districts, similar results could be obtained from a comparative study of the fossil and recent forms. MacKay Lake, however, lends itself particularly well to this kind of study as the marl beds are in such close proximity to the lake. Instructive results would probably be obtained if the fresh water fauna of the Toronto formation were subjected to this type of study.

NOTE—The writer wishes to gratefully acknowledge the valuable assistance and suggestions received from Dr. E. M. Kindle of the Geological Survey of Canada.

The Division of Exhibits of the United States Food Administration, Washington, offers to assist any museum to develop a special exhibit to illustrate the need of conserving foods. A handbook of "Graphic Exhibits" has been printed. Mimeograph copies of plans for larger exhibits have been prepared. Copies have been secured of a series of 13 charts, designed and written by Elizabeth C. Watson, under the title, "Why Food Conservation is Necessary." All these are sent to any museum upon request.

MOST UNUSUAL DEER HEAD WITH EYE TEETH.

The White-tailed Deer (*Odocoileus virginianus*), is well known as a bearer of great variations. The horns of the older animals exhibit many freak forms but it is not usual that a natural freak is seen in a young deer. The following note is of a freak in a young deer not over four years old and refers to the teeth and not to antlers, in which there are "eye teeth" or tusks (quite well developed for the age); both are evenly matched and slightly curved back, standing out from the jaw about three-eighths of an inch. A characteristic of the deer family is the absence of front teeth in the upper jaw, the only exception being found in the Elk group (*Cervus*), which when over four years usually develop eye teeth in the male sex only. Taking the formation of teeth in all the larger animals, the majority still carry the eye teeth, or show signs that they did in generations of long ago, and I conclude, therefore, that the deer family also had normal teeth in earlier times so it would be hard to say just how many generations this little deer has been thrown back to his former ancestors. I enquired at the Victoria Memorial Museum, Ottawa, if the officers there had ever known of this freak before and the Director replied that he could find no previous record. I also wrote to the U.S.N.M., Smithsonian Inst., Washington, D.C., and was informed that it is of most unusual occurrence, though they have one from Arizona. I gather, however, that the Arizona record is the only one they know of, but, in this, I may be mistaken. The specimen here recorded was killed near Yahk, B.C., in December 1917, and now forms part of my collection.

C. GARRETT, CRANBROOK, B.C.

As an example of the possibilities of economic zoology, it is interesting to report that the U.S. Biological Survey which has long been engaged in the control of rodent and other pests in various parts of the country, has detailed a staff to France to make similar attempts against the rats that infest the battlefields. These animals, disgusting in themselves, are also a source of danger to the trenches by their habits of undermining and to the troops owing to the food and material they destroy and their potential possibilities as disease carriers. Should even partially effective means of control be evolved they will demonstrate the practical value of scientific research in a most convincing manner.

THE EVENING GROSBEAK (*Hesperiphona vespertina*) at ARNPRIOR, ONT.

By A. L. GORMLEY.

During the past few years bird-lovers of eastern Canada and the north-eastern United States have enjoyed an annual winter visit from the Evening Grosbeak, one of the most interesting and most beautiful species of our boreal birds. For five consecutive years, from 1912-13 to 1916-17, it was a regular winter resident at Arnprior, sometimes coming in large numbers, and I had every opportunity of observing and studying its habits. I distinctly remember having seen the Evening Grosbeak before 1912, but being a boy at that time, I had not sufficient interest in birds to keep records of their going and coming. During the winter, when avian life is little in evidence, the beautiful plumage and robin-like call of the Evening Grosbeak is sufficient to attract the attention of the most unobservant person, and many were the explanations given for their presence at this season, when all birds are commonly supposed to be happily sojourning in the sunny south, free from scarcity-of-fuel problems. One man who spoke to me about them, even went so far as to say that he thought they were European birds driven from their native home by the war; while another stated that he was certain the birds of this country had greatly changed since the time he was a boy. Such distinguished visitors at once gained the good-will of all nature-lovers and several people succeeded in getting them to come to their bird "cafeterias" to feed.

While here they feed almost exclusively on the fruit of the Manitoba maple (*Negundo aceroides*) and occasionally visit the sumacs. They eat a lot of snow, and I have often seen them fly to the rain-gutters on houses, presumably looking for water. Although they are somewhat pugnacious during the winter, they become much more so when spring arrives. At this season they also become much livelier and spend considerable time flying after one another, generally the males after the females. Compared to the Hermit Thrush or some of our more brilliant songsters, I have never heard anything from the Evening Grosbeak that could properly be called a song, but during the month of May especially, they certainly make a lot of noise, the whole flock usually "singing" together. Following the general rule, however, in regard to bright plumaged birds, it seems that nature has not endowed them with any great gift of song. As the snow disappears, they eagerly search the ground for bits of gravel, etc., and should a pool of water be near at hand, they will often be found clustered about its edge, merrily drinking and bathing, as, like most birds, they are very fond of water. By the first of May, they are generally all mated, and they then forsake the maples for the evergreens, preferably the cedars, where they spend much time chattering noisily, as if discussing the hardships of the past winter. Although they still remain in flocks, each male now keeps close watch over his mate, so that the pairs tend to keep more by themselves, especially when feeding. Last spring, when they remained until May 21, I had strong hopes that they would breed here, since so far as I know, the nidification habits of the species are as yet a mystery; but they all suddenly left and none have appeared since.

It seems to be a general rule with our winter migrants, that, after visiting the east in increasing numbers for a few years, they suddenly reach a period of maximum abundance, after which they practically disappear, for some time. Such seems to be the case with the Evening Grosbeak. During the winter of 1916-17, they were very abundant here, and were reported from many places in Ontario and the northern United States. During the past winter, however, they have been entirely absent, although as far as this district is concerned, their favorite food has been plentiful. They may, of course, re-appear next winter, but it is quite probable that they will not be seen here for a few years to come.

The following is a list of the dates of arrival and departure, etc., for the past five years:—

1912-13.—Arrived December 31 and soon became common. During January and February several large flocks were seen, but they gradually diminished in numbers, until only twelve were observed on March 2. These remained until May 5, when they all left.

1913-14.—Arrived on November 16, when four were seen. Gradually increased in numbers, until twenty were observed on January 4th. Remained common until May 1.

1914-15.—Very few were seen this winter. Three arrived on January 12, and eleven were seen on February 3. According to my notes they were absent until April 5, when three appeared. None were seen after this.

1915-16.—This was another off-year. Although sixteen arrived on December 5, the largest flock seen after this was five, but they remained until May 20.

1916-17—More Evening Grosbeaks visited Arnprior this winter than ever before, perhaps more than in the preceding four years together. On October 29, the earliest date on record, fifteen arrived. They steadily increased in numbers until December 24, when at least sixty were seen. Dur-

ing January they gradually decreased but returned again on February 10, when about one hundred were seen. As many others were reported from the surrounding district, this year's migration easily surpassed all the others of which I have record. They remained common until May 21, when all disappeared. As they were here from October 29 to May 21, their breeding grounds cannot possibly be very far north.

1917-18.—Although their favorite food was abundant last winter, not a single bird has been seen or heard of up to this date (April 1). In Bird-Lore's 1917 Christmas Census, there is a single record, viz: Benington, Vermont, but I am inclined to doubt the correctness of this, as it is the only record from all the north-eastern States and eastern Canada.

A PROTECTED NEST OF THE BALD EAGLE.

By W. E. Saunders.

(Read at a Meeting of the McIlwraith Ornithological Club.)

On April 15th, 1916, I had the privilege of visiting the nest of a Bald Eagle on the farm of Mr. J. W. Gilbert on the lake shore west of Tyrconnell. Mr. Gilbert has taken a personal interest in this bird and his neighbors understand that he values its company and does not wish the birds to be shot. Consequently, it is no surprise to learn that they have nested in his woods for twenty-five years and that the memory of the oldest inhabitant proves that eagles have nested within three or four hundred yards of the present location since the first coming of the whites to Ontario.

For many years the birds were in an enormous chestnut tree which blew down about 1908, when they moved to the north side of the woods where they now are.

The 1916 nest is in a very large buttonwood tree thirteen feet in circumference and is placed in the highest available position, which I judge to be at least ninety feet from the ground. Less than 100 yards away is another nest which was used for perhaps only one or two seasons and then abandoned, possibly for the reason that the limb on which it was placed was dead and, therefore, dangerous. It is in an elm on an ascending branch which angles and curves a good deal as it rises and, therefore, looks as though the birds were justified in leaving it.

Some years since, Mr. Gilbert cut down the north end of his woods, leaving the eagle tree somewhat isolated, but this has made no difference in the use of that tree by the birds.

The size of the present nest would indicate that they have used it for six or eight years at least and the tameness of the female bird proves clearly that she has been protected. Mr. Gilbert met us on the road opposite the nest and as we went in the bird flew when we got within seventy-five yards of the tree, but while she scolded she was evidently not alarmed and by the time we got under the nest she settled in the tree and after circling a few times more she went directly on the nest while we were beneath it. She seemed to consider it outrageous when I rapped on the tree to request her to get off, and she complied in a very noisy manner but she soon lit in the tree again.

Doubtless the eggs were very near hatching or had hatched as these birds are supposed to lay in March and after the incubation period the young remain in the nest for a couple of months.

Six years ago one of these birds was shot in the spring and Mr. Gilbert was afraid that he was going to lose his eagles after all as the remaining bird left almost at once, but after having been away for four days it returned with a new mate to the great satisfaction of the owner of the wood.

I questioned him about possible injury to fowl from the presence of these birds but he had not noticed any at all. Moreover, he said that he was so interested in the birds and they were such a joy to see in the air that he thought that if they did take a chicken even as often as every month or two during the year, such loss would not be a high price to pay for the enjoyment he got from their presence.

The food of these birds consists almost entirely of fish which they pick up on the lake shore a quarter of a mile distant.

All through the country along the north shore of Lake Erie eagles formerly nested at intervals of only a few miles but a great many of these have been killed by misguided effort and there are not many of them left.

It would have been well if the Ontario Government had included large and spectacular birds like this species in their recent legislation protecting the game birds for the next few years.

The Forestry Branch of the Dominion Department of the Interior has just issued Bulletin No. 63 on Wood-Using Industries of Quebec. This is a valuable contribution of 89 pages and is published in both French and English. It has been compiled by Messrs. R. G. Lewis and J. A. Doucet. Application for the bulletin should be addressed to The Director of Forestry, Department of the Interior, Ottawa.