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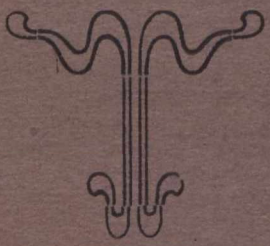

JOURNAL OF THE

Wellington Field Naturalists' Club

GUELPH, - ONTARIO

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No. 8 1913

Notes on the Orchidaceae of Ontario.

BY THEO. HOLM, BROOKLAND, D. C.

(With Plates 1 and 2, drawn from nature by the author.)

IN the Catalogue of "Canadian Plants" John Macoun[1]) enumerates species of the following genera of Orchidaceae recorded from Ontario: *Microstylis,* Nutt.; *Liparis,* Rich.; *Calypso,* Salisb; *Aplectrum,* Nutt.; *Corallorhiza,* R. Br.; *Listera,* R. Br.; *Spiranthes,* Rich.; *Goodyera,* R. Br.; *Arethusa,* L.; *Calopogon,* R. Br.; *Pogonia,* Juss.; *Orchis* L.; *Habenaria,* Willd., and *Cypripedium,* L. To *Pogonia* are referred *P. ophioglossoides,* Nutt., and *P. verticillata,* Nutt, but the latter belongs more naturally to the genera *Isotria* Rafin. on account of the structure of the flower, the petals being longer than the sepals, beside the very different habit, the leaves being whorled; to *Orchis* is referred *O. rotundifolia,* Pursh, which surely agrees with this genus so far as concerns the presence of a bursicula surrounding the glands, but otherwise it is better referable to *Platanthera* section *Crassicornes,* Pfitzer, to which *P. obtusata,* Lindl., also belongs. Finally in respect to the genus *Habenaria,* Willd., this is not represented in Canada, and with exception of *H. virescens,* Spreng, the other species must be placed under *Platanthera;* in *Habenaria* the two stigmata are free, projecting, instead of being sessile, slightly concave. In regard to *Habenaria virescens,* Spreng, this is *Perularia fuscescens,* Lindl., with the habit of Orchis, but with the sepals and petals of about the same length and shape, and with the glands enclosed by the valves of the anthers. As to the classification of these genera the one proposed by Pfitzer[2]) is undoubtedly the most natural, viz.:

1) Part IV, p. 2, Montreal, 1888.
2) Engler and Prantl: Nat. Pflanzen. Part 22, p. 76.

I. *Diandrae,* and II. *Monandrae. Cypripedium* is the only representative of the former, possessing two fertile stamens, and the three lobes of the stigma, being of about the same shape and constructed to receive the pollen. The other genera belong to *Monandrae,* characteristic of which is the suppression of all the stamens except the anterior of the outer whorl, and in which only the two lateral lobes of the stigma are developed, the mediane being rudimentary or transformed into the so-called *rostellum.* The *Monandrae* contain two distinct sections: *Basitonae and Acrotonae,* called so because in the former, the Basitonae, the anther is united at its base with the rostellum, while in the latter, the *Acrotonae,* it is connected at the apex. Comparatively few of our genera are basitonous, viz.: *Orchis, Platanthera* and *Perularia;* the remaining *Monandrae* are acrotonous.

The Orchids are all perennial herbs with diverse habits, and three types may be distinguished; Saprophytes, terrestrial, autophytes and epiphytes. *Corallorhiza* is the only saprophytic genus in Ontario, and the others are terrestrial autophytes with green leaves, even if sometimes rudimentary as in *Arethusa.* It is now interesting to see that, notwithstanding the very limited number of genera in Ontario, the monphological structure of the vegetative organs of these exhibit several very conspicuous features, which ought not to be omitted in the diagnoses. But, so far, in recently published manuals dealing with North American plants, the *Orchidaceae,* for instance, have been treated very poorly from this point of view, in spite of the fact that the literature contains several works on this subject, contributed by some of the ablest botanists: Irmisch, Lindley, Pfitzer, Reichenbach and others. In the so-called Gray's new manual[3]) the subterranean organs of *Orchidaceae* are described as: corms, tuberoids and solid bulbs; in N. L. Britton's manuals[4]) we learn of solid bulbs, corms, coralloid roots, and that *Corallorhiza* is a root-parasite with large masses of coralloid branching roots! Similar descriptions occur in Small's Flora of the Southern States[5]).

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3) Robinson and Fernald, 1908.

4) Manual of the Flora of the Northern United States, New York, 1901 and 1907.

5) New York, 1903.

Of these terms "tuberoids" are explained as "fleshy-thickened roots, resembling a tuber," but is not admissible since "tuber" is Latin, and "oid" Greek. Moreover there is no need of introducing a new term for these organs. In regard to "corm" this is explained as "the enlarged fleshy base of a stem, bulb-like, but solid," which is very wrong, since "cormus" simply applies to the stem, as "radix" to the root; it would be highly desirable if authors of botanical manuals would use the terms in conformity with terminology, for instance the very comprehensive work of Bischoff[6]) "Cormus" and "stirps" can only be used for a stem in general; they may, however, occur as "truncus," "caulis," "culmus," "calamus," and "scapus." Finally in respect to "bulb" this kind of stem does not occur in *Orchidaceae*.

Several other errors might be pointed out in respect to the descriptions of the subterranean organs of these plants, but they are so conspicuous that I do not deem it necessary to correct them; for instance the "coralloid branching roots" of *Corallorhiza* and *Calypso*, which we know are stems, since they bear leaves, a fact that has been mentioned many years ago, and described so excellently by Irmisch (1853).

Let us then pass to examine the methods of vegetative reproduction exhibited by the *Orchidaceae* occurring in Ontario. For this purpose it is necessary to compare the structure of the subterranean stem with its roots and buds, beside the ability of certain species to produce root-shoots. In beginning with the most simple structure we have in *Spiranthes* (Plate 1, fig. 1), a barely visible vertical subterranean stem which consists of only a few, very short internodes with membranaceous, scale-like leaves, and which bears a cluster of relatively large, fleshy, unbranched roots,densely covered with short hairs. At the base of the flowering stem (S.) is a bud (B.) covered with scale-like leaves, and this bud will develop into a few green leaves which winter over, and wither some time before the flowering stem appears. The figure (Fig. 1) represents *S. gracilis* (Big.) Beck., but the same structure recurs in *S. cernua* (L.) Rich., and latifolia Torr. with the exception, however, that the leaves appear later, and are still fresh, when the plant is in bloom. While the flowering stem

6) Handbuch der botanischen Terminologie Nurnberg, 1833.

terminates the shoot, axillary buds develop from some of the green leaves, repeating the same successive development of foliage and inflorescence. We have, thus, in *Spiranthes* a type of rhizome in which the buds remain in connection with the mother-plant for several years, and deprived of any power to wander or spread over a larger area. Plants equipped with a horizontally creeping rhizome, therefore, fare much better in this respect, and this kind of rhizome we find in the species of *Cypripedium*. It is generally somewhat compact, the internodes being short, and provided with numerous slender roots, the ramification is sympodial, and the over-wintering bud is surrounded by several large, scale-like leaves[7]). In *Listera* the rhizome shows the same structure, but furthermore the roots (*L. cordata*, R. Br.) are known to produce shoots, thus the individual is able to spread over a larger area than by the rhizome alone. Then in *Goodyera pubescens*, R. Br., (Plate 1, fig. 2) we notice the long creeping rhizone terminated by an inflorescence (S.), and provided with fleshy, very hairy roots. It represents a monopodium until the inflorescence appears. The leaves are not scale-like and membranaceous, but green and provided with petiole and blade. In this respect the rhizome of *Goodyera* makes a striking contrast to those of *Cypripedium* and *Listera*. The peculiar structure of the rhizome of *Orchis* and *Platanthera* has been described and figured so often, that it may not be necessary to mention it, but nevertheless, I have venturned to insert a drawing of *Platanthera dilatata*, Lindl., (Plate 2, fig. 8), since the American representatives show the details of the rhizome more plainly than is the case of the European. However, the ramification is identical. We notice in the figure (fig. 8) the leafy shoot (L.) which is terminated by the inflorescence, and we notice furthermore the descending stolon (S., 2,) breaking through one of the scale-like leaves; this stolon is terminated by a bud (B.) from the base of which a long, fleshy root (R., 2) and two pairs of more slender (r. 3 and r. 4) are developed. This bud will winter over to produce a floral shoot in the next season, and if we examine the posterior part of this same rhizome we notice a withered stem-portion (S. 1), and a long, partly withered root (R. 1), underneath the shoot, of which only the basal leaves have been figured (L.). It is

7) Merck's Report, New York, March, 1908, p. 60.

readily to be seen that the specimen illustrates the growth of two seasons with exactly the same organs developed, and in the same succession, viz.: S. 1, corresponds with the young stolon S. 2; the large root R. 1, corresponds with the younger R. 2; the shoot corresponds with the bud (B.) and the two pairs of secondary roots (r. 1-r. 2) correspond with those of the bud, r. 3-r. 4. It is actually a very simple structure of rhizome, a typical sympodium, the stolon being developed from the axil of one of the scale-like leaves, but in respect to the real nature of the long, fleshy body, which I have marked R. 1 and R. 2, botanists do not quite agree whether it be a root, or concrescence of several roots or a swollen bud axis. The various views about these points I have discussed in a paper dealing with North American Orchids[8]). In *Plantanthera rotundifolia* Lindl., and *obtusata,* Lindl., the rhizomes are very slender, but the ramification agrees in all respects with that of *P. dilatata,* and the others. To these Orchids, described above, with slender rhizomes may be added *Pogonia ophioglossoides,* Nutt., of which a rhizome has been figured on plate 2, figure 9. However, this specimen was developed from a root (R.), and I regret to say that I can offer no description of the rhizome except at this stage. The species was collected in great abundance in a sphagnum swamp in Maryland, but all the specimens originated from roots, and the same was the case with the fresh material which Professor M. L. Fernald kindly collected for me in Maine; the dried specimens in herbaria give no information in respect to this question. We may presume, however, that the structure of the root-shoot agrees with that of the plant, developed from seed, but it would be interesting to know for sure, how the latter behaves. The shoot appears at the tip of the long, horizontal roots (R. in fig. 9), and grows out in a vertical direction to reach the light. Unlike most other rhizomes it is very hairy; it is slender, and bears green, long-petioled leaves (L. 1-L. 2), alternating with scale-like (1. 1-1. 3), or more correctly tubular, membranaceous. The internodes are stretched, very distinct, and the shoot becomes terminated by the floral stem (S.); lateral buds occur, for instance in the axil of the green leaf (L. 2), but they hardly develop any further, except if the terminal might be injured. In this way *Pogonia* is very able to

8) Am. Journal of Science, Vol. XVIII, 1904, p. 197.

spread over a large area, since the roots attain quite a considerable length, and it is very common to find specimens of which the secondary root (r. 1) is terminated by a similar shoot. In respect to *Isotria* we meet here with the same structure as in *Pogonia,* but the roots are somewhat thicker, fleshy, and short-hairy; the internal structure of the vegetative organs of *Pogonia, Isotria* and *Triphora* has been described by the author in the American Journal of Science[9]). The rhizomes described above were composed of relatively slender cylindric internodes, and we shall now pass to give some illustration of the remaining genera in which tubers are developed. We must here distinguish between two kinds of tubers, viz., those that merely consist of the swollen base of the floral stem, and those that consist of several smaller internodes. The first type is represented by *Liparis* and *Microstylis,* and I have figured two specimens of *L. liliifolia,* Rich., (Plate 2, figs. 10-11) which agrees with *L. Loeselii,* Rich. The tuberous body (fig. 10) is here the basal portion of the flowering stem, and is therefore situated above the uppermost of the two green leaves, which may be seen from figure 11, where S. indicates the flowering stem, L. the green leaf, and B. an axillary bud. When the flower-bearing stem withers the swollen base persists with a scar at the apex (S. in fig. 10.) This tuber shows a large cavity on the one side (the right in the figure), and it is here that the axillary bud is located; the first leaf of this bud is a large, two-keeled, fore-leaf or prophyllon (P. in fig. 10), with its back turned to the mother-axis, and there are generally two membranaceous, scale-like leaves succeeding the prophyllon, and preceding the two green, assimilating leaves at the base of the flowering stem. There are several slender, very hairy roots developed from the base of the bud, and the tuber remains active generally for two years. As mentioned above this structure of the tuber is, also, characteristic of *Microstylis.* In the remaining autophytic genera *Arethusa, Calopogon, Calypso* and *Aplectrum* we meet with the second type of tuber which consists of several internodes, and in which the tubers show annular markings from the withered, membranaceous leaves. In regard to the ramification this is sympodial in these four genera, but if we examine the composition of the shoots from the tuber to the aerial, the

9) Vol. IX, 1900, page 13.

flowering stem, we notice several differences. In *Arethusa* the floral shoot consists of two, short, slender internodes above the prophyllon, with two membranaceous, tubular leaves, and of a swollen internode between the uppermost tubular and the green leaf; terminating the shoot is the floral scape of which the basal portion is tuberous, thus resembling that of *Liparis*. In the axil of the green leaf is a bud, which continues the growth of the rhizome, beginning with a fore-leaf, and frequently with distinct, one or two, slender internodes preceding the tuber. Similar to *Liparis* the axillary bud is located in a cavity of the tuber. In regard to the root-system there are mostly six slender, hairy roots developed from the basal internode of the shoot, and very regularly in three pairs.

A tuber of two swollen internodes between three membranaceous, tubular leaves occurs in *Calopogon*. In this genus the flower-bearing stem does not take any part in forming the tuber, but is slender throughout. The bud in the axil of the second tubular leaf is the one that develops and continues the growth of the rhizome; it begins with a fore-leaf, and two, short, slender internodes with mostly eight slender, very hairy roots; then follow the two swollen internodes, terminated by the long flowering stem. Thus in *Calopogon* as in *Arethusa* the green leaf appears at the same time as the flowers. Finally may be mentioned that the buds on the tuber are generally pushed somewhat away from the real axil of the supporting leaves. Now in respect to *Calypso,* Irmisch[10]) has described the tuber and calls attention to the fact that the tuber consists of two, or sometimes of only one, internodes below the green leaf, and that the leaf develops some time before the flower appears. Moreover, Irmisch cites a description of this plant given by Liboschitz and Trinius[11]) in which mention is made of the occurrence of a coralloid, palmate body accompanying the tuber.

In other words the coralloid rhizome so very characteristic of *Corallorhiza* may, also, be observed in *Calypso*. The last of the autophytic genera to be treated is *Aplectrum,* and in this plant the rhizome offers an excellent illustration of the developments of the

10) Beiträge zur Biologie und Morphologie der Orchideen, Leipzig, 1853.

11) Flore des environs de St. Petersbourg et de Moscow, 1818, p. 214.

various parts: the slender internodes, the swollen, and finally the appendage of a series of coralloid stem-portions. On Plate 1 I have figured this remarkable plant. We see in figure 3 one old tuber of three internodes, and a young one still enclosed by the membranaceous leaves, and with a green leaf developed (L.) We notice that the tubers are separated from each other by several slender internodes; that the roots develop from the basal internode of the tubers, and that each tuber consists of three internodes (fig. 3). In this plant the leaf appears late in the fall, thus about half a year before the flowers, and as may be seen from figure 5, the inflorescence is then visible only as a long bud, covered by tubular, membranaceous leaves, and developed in the axil of the third membranaceous leaf, but pushed somewhat out of place, thus not being exactly in the axil of said leaf. Then we see from figure 6 that the apex of the tuber bears a small, vegetative bud, which actually terminates the tuber. In other words the green leaf, which appears earlier than the floral stem, is situated above this, and above the green leaf is still a small internode terminated by a bud (fig 7), which stays dormant. Moreover, from figure 4 may be seen a palmate, coralloid mass of subterranean shoots exactly like those of *Calypso* and *Corallorhiza!* These coralloid branches I have only observed in very young, purely vegetative specimens of *Aplectrum;* they seem to disappear when the individual becomes mature. We have, thus, in *Aplectrum* a highly specialized rhizome of sympodial structure so far as concerns the rhizome "in toto," but in which the tuberous branches are monopodia, being terminated by minute, vegetative buds.

The saprophytic genus *Corallorhiza* differs from the other Orchidaceae described above by lacking roots; moreover by lacking chlorophyll, except in the ovary, and in connection herewith the foliage is reduced to mere scale-like or tubular leaves with no blades. Common to both, *C. innata,* R. Br., and *C. odontorhiza,* Nutt., is a widely branched rhizome of short, cylindric internodes prominently papillose in the latter, but much less so in the former, and these papillae (Plate 2, fig. 14), bear small tufts of hairs with the same function as ordinary root-hairs. These short internodes of the rhizome bear small, membranaceous, scale-like leaves (fig. 13), which last only for a short time, and may only be observed on the youngest, the apical portion of the subterranean shoots. While in *C. innata,* as described

and figured by Irmisch (l. c.), the subterranean shoot passes insensibly into the aerial flower-bearing stem, we notice in *C. odontorhiza* the development of a tuber which consists of a single, distinctly swollen internode (fig. 12). The very base of the flowering stem is surrounded by three tubular leaves, and the tuberous internode is the one between the second and third of these leaves. Buds were observed in the axils of the two uppermost leaves, above and below the tuber, but the lower one of these stays mostly dormant. The genus *Corallorhiza,* thus exhibits the same type of coralloid rhizome as is characteristic of *Aplectrum* and *Calypso,* and in *Corallorhiza odontorhiza* there is, also, a tuber of morphologically the same structure as in these, but lacking the roots.

These various types of rhizomes are, thus, characteristic of the genera of *Orchidaceae* represented in Ontario, and they are developed in the same manner farther south. It is interesting to notice that the nature of environment does not affect these particular structures, thus the species or, sometimes, the genus preserves its habit regardless of the surroundings. *Cypripedium, Listera, Calypso, Platanthera, Microstylis* and *Corallorhiza innata* do not change their habits, when they leave the swamps, and enter the woods or vice versa. No particular structure of rhizome seems to be dependent on bogs, for here we meet with the tuberous of *Calypso, Calopogon, Arethusa, etc.,* with the slender of *Pogonia,* the stouter of *Cypripedium, Platanthera,* and the singular *Corallorhiza innata.* Likewise in the woods, where the tuberous *Aplectrum, Microstylis* and *Calypso* occur with the creeping *Goodyera, Listera, Orchis* and *Platanthera* besides *Corallorhiza innata* and *odontorhiza.* It also, deserves notice that some of these extend so far north as to beyond the arctic circle, yet with the same structure, and those which have gained footholds at high elevations in the Rocky Mountains are likewise unchanged. But from a geographical point of view it seems strange that the genus *Orchis,* so profusely represented in Europe, is so rare in North America, at the same time as our continent is the home of so many, and excellent species of *Platanthera,* a genus so extremely poorly represented in Europe. It is, altogether, very surprising to see the results of a comparison between the European and North American Orchids; about 15 genera are common to both continents, about 10 are peculiar to Europe, and about 15 to North America, among the terrestrial. And

of these there are certain, very striking morphological types confined to the old world as for instance *Epipogon, Neottia* and *Limodorum,* all monotypic, while *Triphora, Aplectrum* and *Pogonia,* for instance, represent types peculiar to this continent.

Explanation of Plates:

PLATE 1.

Fig. 1. *Spiranthes gracilis,* Bigel; S.—base of flowering stem; B.—overwintering bud; natural size.

Fig. 2. *Goodyera pubescens,* R. Br.; letters as above; natural size.

Fig. 3. *Aplectrum hyemale,* Nutt.; 1 1, 1 2, and 1 3, the tubular, membranaceous leaves surrounding the young tuber with the green leaf developed, of which only the base is figured by L.; natural size.

Fig. 4. Same species; the coralloid rhizome with a tuber of a young specimen; L.—base of green leaf; natural size.

Fig. 5. Same species; B. is here the inflorescence covered by a long, tubular leaf; L. is the base of the green leaf; natural size.

Fig. 6 Same species; a mature tuber with part of the slender stolon (St.); S. is the base of the flowering stem, and at the apex of the tuber is a small bud marked B.; natural size.

Fig. 7. Same species; the bud from the apex of the tuber; magnified.

PLATE 2.

Fig. 8. *Platanthera dilatata,* Lindl.; for explanation see the text; natural size.

Fig. 9. *Pogonia ophioglossoides,* Ker.; R. is the root from the apex of which the shoot is developed. S.—base of flowering stem; L.—scars from the withered green leaves; l.—from the scale-like; r 1, r. 3.—secondary roots; natural size.

Fig. 10. *Liparis liliifolia,* Rich.; the old tuber is terminated by a scar (S.) from the withered, slender portions of the flowering stem; the large, overwintering bud shows the prophyllon by P.; natural size.

Fig. 11. Same species; S.—the base of the flowering stem, which is tuberous, and bears the green leaf (L.), in the axil of which the overwintering bud is already visible (B.); natural size.

Fig. 12. *Corallorhiza odontorhiza,* Nutt.; S. is the slender base of the flowering stem, and below this is the tuber with its leaves and bud borne upon the coralloid rhizome; about twice natural size.

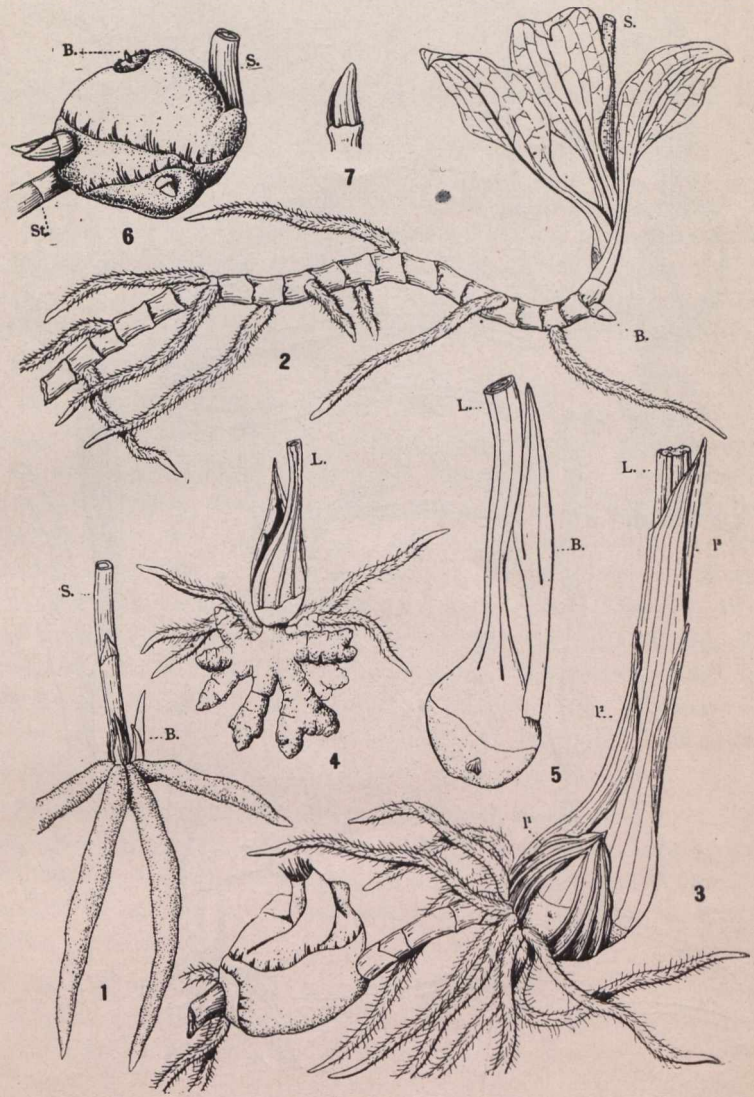


PLATE NO. 1

Fig. 13. Same species; branch of the coralloid rhizome, showing the scale-like leaves, and the papillae; magnified.

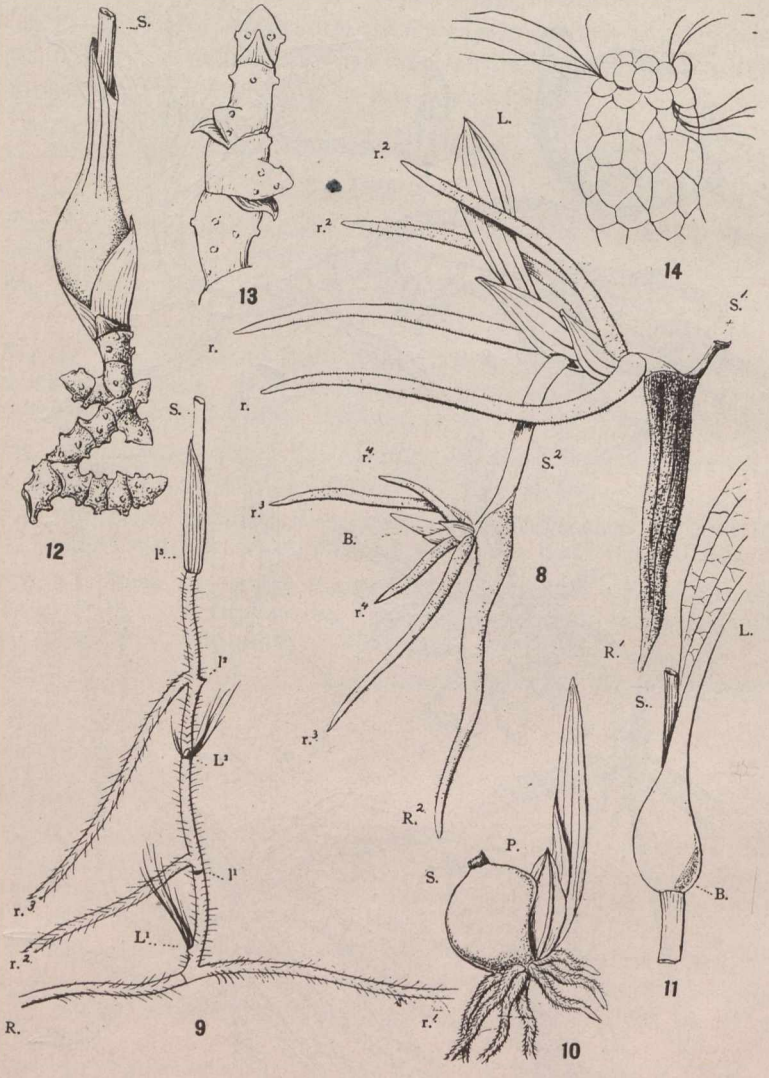


PLATE NO. 2.

Fig. 14. Same species; papilla with the tufts of hair; magnified.

Notes on the Plant Formations of the Shores of Georgian Bay.

BY A. B. KLUGH, M.A., QUEEN'S UNIVERSITY, KINGSTON.

FROM August 17th to September 19th, 1912, I was engaged upon a survey of the flora of Georgian Bay, in connection with the Biological Station at Go-Home Bay, Muskoka. While the main end in view was to ascertain the distribution of aquatic plants, particularly *Algae*, I was able to do considerable work upon the land flora of the shores of the Bay.

From August 17th to August 19th, I spent at the Biological Station. On August 20th, in company with Mr. A. D. Robertson, M. A., of the Zoological Department, Toronto University, I started on a trip round Georgian Bay in a twenty-five foot open motor boat. We carried a tent and camp outfit, and camped from one to four days at the following points on the shore of the Bay: Waubaushene, Shawanaga in Parry Sound District, French River in Nipissing District, Killarney in Algoma District, Big Burnt Island, off Manitoulin, Wekwemikongsing, Manitoulin, Rattlesnake Harbour, Fitzwilliam Island, south of Manitoulin; Tobermory, at the top of the Bruce Peninsula; MacGregor Harbour, Bruce Peninsula, and Collingwood.

From these points runs were made each day in the boat, which lightened of the camp effects was able to make good speed, to the neighbouring islands, shores and rivers. While en route from one camp-site to another we often landed to make observations and collections.

The Country round Waubaushene is rather flat with numerous low islands and extensive marshes. The following were the formations at Canary Island, Waubaushene, August 21st:

HYDROPHYTIC FORMATION.

Potamogeton heterophyllus, Potamogeton natans, Potamogeton zosterifolius, Najas flexilis, Ceratophyllum demersum, and Nymphaea advena.

HELOPHYTIC FORMATIONS.

Reed Swamp.—*Sagittaria hetcrophyllus rigida, Sagittaria latifolia gracilis, Eleocharis palustris, Scirpus validus, Scirpus fluviatilis, Scirpus americanus, Phragmites communis, Zizania aquatica, Pontederia caudata and Calamagrostis canadensis.*

Bush Swamp.—*Salix lucida, Aster paniculatus, Aster puniceus, Solidago canadensis, Eupatorium purpureum, Asclepias incarnata; Gerardia paupercula, Polygonum sagittatum, Verbena hastata, Mentha canadensis, Impatiens fulva, Juncus tenuis, and Juncus canadensis.*

We ran up to Port Severn on August 22nd, finding a

HYDROPHYTIC FORMATION

of *Potamogeton perfoliatus, Potamogeton natans, Najas flexilis and Myriophyllum spicatum.*

HELOPHYTIC FORMATION.

Typha latifolia, Zizania aquatica, Sagittaria heterophyllas rigida, Sagittaria latifolia gracilis, Pontederia candata, Elcocharis palustris, and Sparganium eurycarpum.

Matchedash Marsh, Waubaushene is a huge marsh with a narrow channel leading up to the North River. This marsh consists mainly of *Typhas latifolia, Zizania palustris and Phragmites communis.*

As one goes north from Waubaushene the character of the country changes. Islands become extremely numerous, a few large, but mostly small islands of pinkish gneiss rock, as a rule very sparsely wooded. Fig. 2 shows a characteristic portion of one of these islands with a thin growth of White Pine and the rounded gneiss rock. This latter view is the north point of Island No. 121, on which the Biological Station is located. The main constituents of the flora of this island are: *Pinus Strobus, Quercus rubra* and *Populus tremuloides; Vaccinium pennsylvanicum, V. p. nigrum* and *Hypericum kalmianum.* On the humus covered rock

lichens are abundant, particularly *Cladonia, ragiferina, Cladonia sylvatica* and *Stereocaulon paschale,* and on the otherwise bare rock *Gyrophora muhlenbergii* is conspicuous.

Fig. 1—GO-HOME BAY, MUSKOKA.

Along a sloping shore to the south the main species are: *Juncus canadensis, Juncus tenuis, Rhynchospora glomerata discutiens* (a form not previously reported from Canada), *Phalaris arundinacea, Calamagrostis canadensis, Lobelia kalmii, Gerardia pampercula Linum medium* and *Solidago graminifolia.*

From Go-Home Bay we ran up to Shawanaga in Parry Sound District, running nearly all the way through group after group of islands of various sizes, but on the whole larger and decidedly better wooded than further south. The scenery among these islands is beautiful. We pitched camp near the mouth of the Shawanaga River.

On front of camp the HYDROPHYTIC FORMATION consisted of the following species: *Isoetes marcrospora,* growing in about ten feet of water, *Potamogeton lucens, Potamogeton perfoliatus, Potamogeton zosterifolius, Najas flexilis* and *Myriophyllum spicatum.*

An island north of camp had the following as the main constituents of its flora:

XEROPHYTIC FORMATIONS—LITHOPHYTIC.

Cladonia rangifernia, Cladonia sylvatica, Stereocaulon paschale, Gyrophora muhlenbergii, Parmelia conspersa and *Polytrichum juniperinum.*

CHASMOPHYTIC.

Carex umbellata and *Danthoma sjicata.*

CONIFEROUS FORMATION.

Pinus strobus, Vaccinium pennsylvanicum, V. p. nigrum, Juniperus communis, Deschampsia flexuosa, Aspidium marginale and *Polypodium vulgare.*

An island west of the camp was covered with mixed Mesophytic Forest, containing the following: *Pinus strobus, Betula alba papyrifera, Dicrvilla trifida, Rosa blanda, Clintonia borealis, Solidago hispida, Aster macrophyllus, Agrimonia gyrosepala, Melampyrum americanum, Melica striata* and *Agropyrum tenerum.* Growing on the paper birch were the lichens *Ramalina calicaris* and *Rinodina sophodes tephraspis.*

On August 27th we ran up the Shawanaga River. Some two miles from the mouth is a little lake cut off at this season of the year by a narrow ledge of rock, and undoubtedly forming an expansion of the river earlier in the year. At the east side of this little lake is a well developed and interesting Hydrophytic Formation. Fig. 2

Fig. 2—HYDROPHYTIC FORMATION IN LAKE OFF SHAWANAGA RIVER.

shows part of this formation in the foreground, and Fig 3 is a map of this formation, and its accompanying Helophytic formation. The HELOPHYTIC FORMATION consisted of: — *Eleocharis ovata, Juncus canadensis, Eriocaulon septangulare,* and a few plants of *Carex hystericina.*

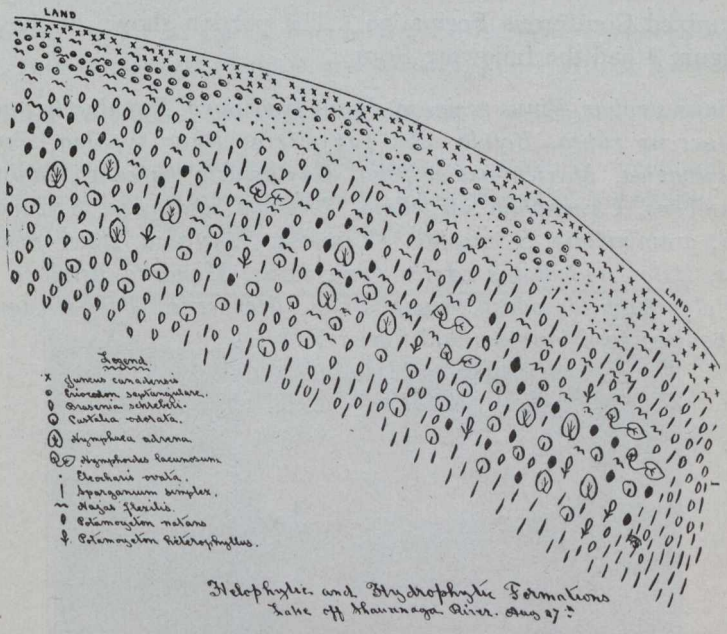


Fig. 3

The HYDROPHYTIC FORMATION consisted of the following species:

Brassenia schreberi, Nymphaea advena, Castalia adorata, Potamogeton natans, Potamogeton heterophyllus, Najus flexilis, Nymphoides lacunosum and *Sparganium simplex.*

Another marsh along the Shawanaga River had the following flora:

HELOPHYTIC FORMATION.

Scirpus validus, Eleocharis palustris, Juncus canadensis, Sparganium eurycarpum, Pontederia caudata and *Equisetum fluviatile.*

HYDROPHYTIC FORMATION.

Isoetes echinospara braunii, Nymphaea advena, Potamogeton dimorphus, Najus flexilis, and the aquatic form of *Hypericum boreale.*

The banks of the Shawanaga River are covered in most places by a mixed Coniferous Formation. The portion shown at the right of Figure 4 had the following flora:

Pinus strobus, Pinus resinosa, Pinus banksiana, Populus tremuloides, Quercus rubra, Betula alba papyrifera, Rhus typhina, Prunus pennsylvanica, Myrica asplenifolia, Gaylussacia baccata, Gaultheria procumbens, Chimaphila umbellata, Solidago squarrosa, S. canadensis, S. graminifolia, S. hispida, S. juncea, S. rugosa, Aster macrophyllus, Aster umbellatus, Aster paniculatus, Monarda fistulosa mollis, Polygonum douglasii, Gnaphalium decurrens, Pteris aquilna, Lycopodium complanatum and *Carex bebbii.*

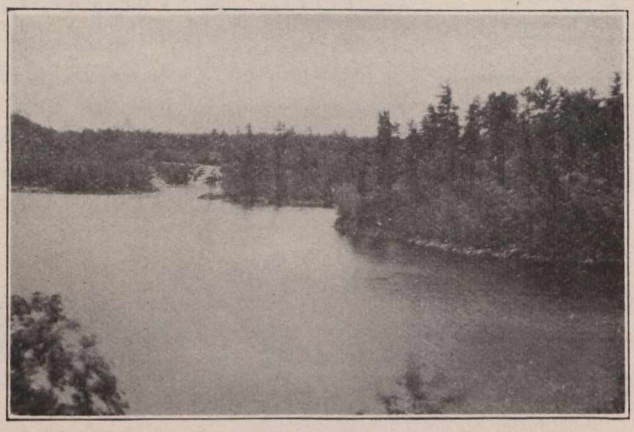


Fig. 4—SHAWANAGA RIVER. THE FALLS IN THE DISTANCE.

On August 25th we ran out to some islands in the mouth of Shawanaga Bay. One of these islands had the following flora:

Thuja occidentalis, Betula alba papyrifera, Salix discolor, Prunus pennsylvanica (all these trees were rather dwarfed on account of the exposure of this island to wind), *Pyrus melanocarpa, Vaccinium pen-*

nsylvanicum, Rosa blanda, Rosa humilis, Spiraea salicifolia, Myrica gale, Aralia hispida, Ribes oxyacanthoides, Rhus toxicodendron, Solidago canadensis, Solidago graminifolia, Solidago hispida, Solidago serotina, Aster panculatus, Deschampsia flexuosa.

On a small marsh at the end of a little inlet were:

Carex scoparia, Carex tribuloides, Carex oederi, Juncus canadensis, Juncus effusus, Phalaris arundinacea, and *Agrostis hyemalis.*

On a little bog in the centre of the island were:

Sphagnum cymbifolium, Woodwardia virginica, Osmunda cinnamomea, Eriophorum virginicum, Chamaedaphne calyculata, Ilex verticillata, and *Vaccinium macrocarpon.*

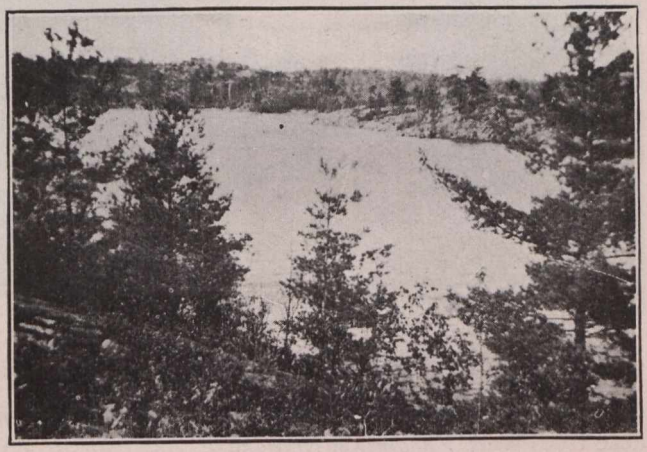


Fig. 5—BANKS OF THE SHAWANAGA RIVER.

From the island we ran over to "The Twins," two islands joined by a very narrow isthmus over which the waves break when there is a heavy sea. The southern Twin is made up of the most beautiful gneiss rock I have ever seen. It is pink and black and white in wavy streaks and worn smooth well up on the shore by wave and ice action. On many places the upper portions of the rock are nearly covered with huge specimens of *Gyrophora muhlenbergii.*

We next ran to French River, Nipissing District, and pitched

camp on the river below the last rapids. Behind camp was a DECIDUOUS FOREST FORMATION consisting of the following:

Populus tremuloides, Populus balsamifera, Fraxinus nigra, Acer spicatum, Cornus stolonifera, Rubus idaeus aculeatis simus, Heracleum lanatum, Ribes oxyacanthoides, Sanicula marilandica, Aster macrophyllus, Agrimonia gyrosepala, Solidago rugosa, Pteris aquilina, and *Aspidium marginale.*

Farther up the river, at the rapids, is a CONIFEROUS FORMATION consisting of:

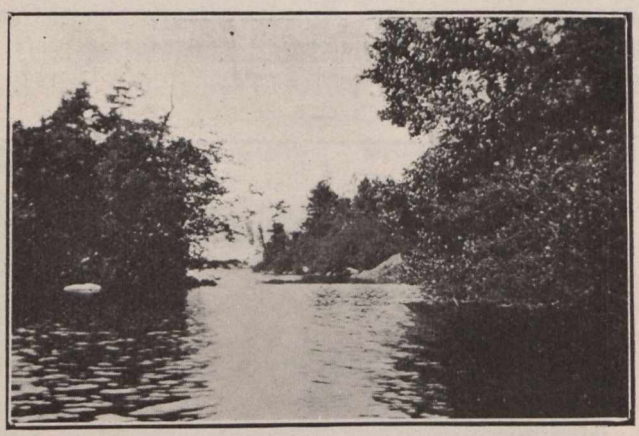


Fig. 6—AMONG THE BUSTARD ISLANDS. ALDERS OVERHANGING NARROW CHANNEL.

Pinus strobus, Picea canadensis and *Juniperus virginiana,* and among these trees were *Vaccinium canadense, Aster laevis* and *Woodsia ilvensis.*

In a large expansion between the upper part of the rapids and the lower part was a well developed HYDROPHYTIC FORMATION made up of:

Nymphaea advena, Castalia odorata, Vallisneria spiralis, Myriophyllum spicatum, Myriophyllum heterophyllum, Potamogeton perfoliatus, Potamogeton dimorphus, Potamogeton epihydrus cayugensis and *Elodea canadensis.*

On August 30th we ran out to the Bustard Islands, a large group of small islands lying off the French River. The channels between many of these islands are so narrow that there is barely room to paddle a skiff along them and these narrow channels together with the small well-wooded islands of the interior of the group make the scenery among the Bustards particularly charming.

Figs. 6 and 7 show the scenery among the Bastards.

These islands are covered mainly with a mixed COIFEROUS FORMATION consisting of:

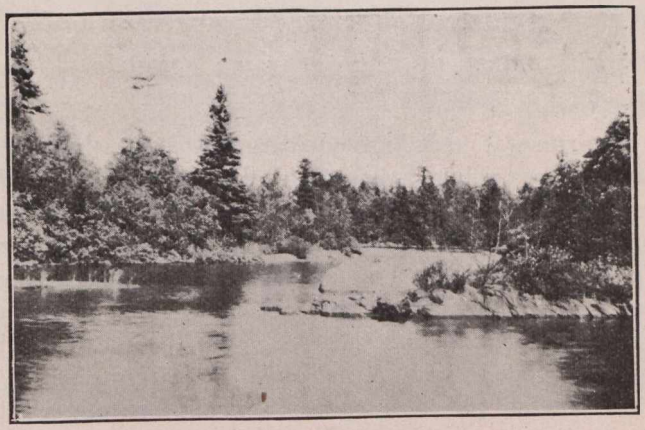


Fig. 7—AMONG THE BUSTARD ISLANDS. PARTS OF THREE ISLANDS WITH NARROW CHANNELLS BETWEEN.

Picea canadensis, Pinus strobus, Thuja occidentalis, with some trees of *Betula alba papyrifera* and *Populus tremuloides,* and the islands are in many cases fringed along the shore with *Alnus incana.* Among these trees grew *Cornus stolonifera, Juniperus communis depressa, Myrica gale, Solidago hispida, Campanula rotundifolia, Fragaria virginiana, Arctostaphylos uva-ursi, Deschampsia flexuosa, Aspidium marginale, Cladonia rangiferina, Cladonia sylvatica,* and *Leucobryum glaucum.*

Towards the outside where the islands are exposed to the full sweep of the winds blowing from the south-west across the Bay they are covered with a THICKET FORMATION consisting of:

Populus tremuloides, Prunus virginiana, Rhus typhina, Salix humilis, Physocarpus opulifolius, Spiraea salicifolia, Rosa humilis, Rhus toxicodendron and among these small trees and shrubs were *Epilobium adenocaulon, Corydalis sempervirens, Polygonum cilinode, Saxifraga virginiensis,* and *Woodsia ilvensis.*

The extreme outer islands are bare rocks on which grow the lichens *Parmelia conspersa, Placodium elegans* and *Gyrophora muhlenbergii,* and beyond these are the shoals which run for a long distance out into the Bay.

On one of the inner islands is a little inlet, so nearly cut off that the skiff could only just enter. On this miniature, sheltered inlet a HYDROPHYTIC FORMATION had developed and consisted of:

Callitriche autumnalis, Myriophyllum spicatum, Potamogeton dimorphus and *Potamogeton pusillus ternussiums.*

Our next run was to Killarney, Algoma District, through a dense fog with a heavy sea going, and this with the innumerable shoals which run for miles out into the Bay made a most unpleasant combination for navigation. After rounding Grondine Point we ran into an island to wait for the fog to lift. This island had on the outer side a high boss of gneiss in which were pockets containing *Sphagnum, Vaccinium canadense* and *Vaccinium macrocarpon.* On the north of this boss was a valley wooded with *Betula alba papyrifera, Acer spicatum, Populus tremuloides,* and *Acer pennsylvanicum,* beneath which grew *Aspidium spinulosum, Aspidium marginale, Lycopodium lucidulum* and *Lycopodium obscurum dendroideum.*

The fog having lifted slightly we ran on to Killarney where we pitched camp at the entrance to the North Channel. On Sept. 3rd we ran into Collin's Inlet, a very beautiful channel cut off from the Bay by Philip Edward Island. In places this channel is wide and filled with little islands, in others narrow and between great cliffs of gneiss rock. A little distance inland lie the mountains of quartzite with their bare white tops. The shores of Collin's Inlet are fairly well wooded by *Pinus strobus, Pinus banksiana, Pinus resinosa, Picea canadensis, Thuja occidentalis, Betula alba papyrifera* and *Populus tremuloides,* while everywhere in pockets in the rock, the low Blueberries *Vaccinium pennsylvanicum* and *V. canadense* grow in profusion.

Coming out again from Collin's Inlet we ran out to one of the outermost islands outside Philip Edward Island. We had an example that day of the suddenness of change of weather on the Great Lakes. We had put out from Killarney early in the morning with a fresh breeze blowing and the spray breaking over us. When we emerged from Collin's Inlet a little after noon, the wind had completely died out and the surface of the Bay was smooth and oily, with only the long low undulations of the ground swell. Changes in this direction are not unpleasant when one has "power" in place of sails, but changes in the other direction, from smooth to a heavy blow, are equally surden and are often dangerous.

The shores of this island were bare gneiss, the higher portion was very sparsely wooded with *Pinus strobus, Thuja occidentalis, Larix laricina, Populus balsamifera, Cornus stolonifera, Spiraea salicifolia, Vaccinium pennsylvanicum, Ribes oxyacanthoides, Hypericum kalmianum, Pyrus melanocarpa* and *Myrica gale.* Among these grew *Deschampsia flexuosa, Agrostis hyemalis, Leucobryum glaucum,* and *Cladonia rangiferina.*

On Sept. 4th we went up into the North Channel. The mountains along the channel are almost bare quartzite at the summit, but the bases and part of their slopes are well wooded, though frequent openings, clothed mainly with Lichens, occur. This forest was a mixed one though mainly Coniferous. It was composed of the following species:

Pinus strobus and *Pinus resinosa.* Very fine specimens of these two pines occurred here. *Tsuga canadensis, Quercus rubra, Acer saccharum, Acer pennsylvanicum* and *Betula alba papyrifera.* Beneath these grew: *Gaultheria procumbens, Maianthemum canadense, Deschampsia flexuosa, Aster macrophyllus, Linnaea borealis, Pteris aquilina, Aspidium marginale, Aspidium spinulosum,* and *Polypodium vulgare.* In pockets in the rock in the openings the two Blueberries, *Vaccinium pennsylvanicum* and *V. p. nigrum* are abundant and their fruits reach a very large size, sometimes a centimetre in diameter. *Gaylussacia baccata* is also common in these pockets.

The following *Hydrophytes* occurred along the shore at the base of this mountain:

Isoetes echinospora braunii, Potamogeton perfoliatus and *Potamogeton pectinatus.*

On Sept. 5th I made an ecological survey of one of the mountains north of Killarney. Fig. 8 is a map of the region worked over showing the zonal arrangement.

At the shore was a thicket of *Alnus incana, Salix lucida, Physocarpus opulifolius* and *Populus tremuloides.*

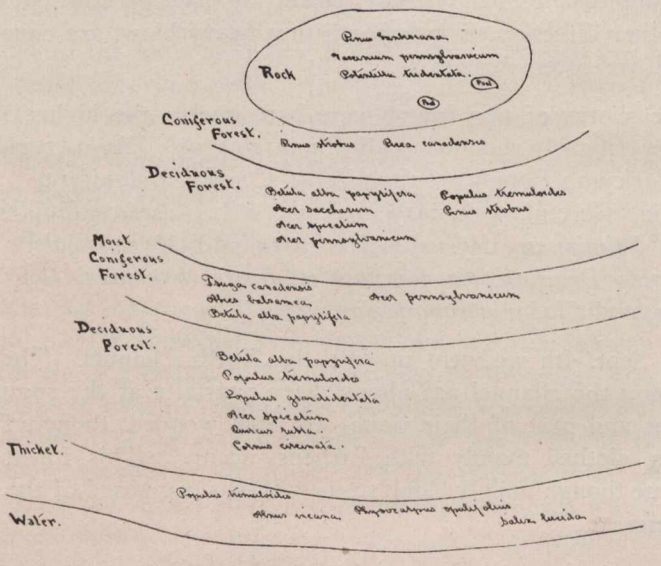


Fig. 8.—FORMATIONS ON MOUNTAIN NEAR KILLARNEY.

Next came a belt of Deciduous Forest, composed of *Betula alba papyrifera, Populus tremuloides, Populus grandidentata, Quercus rubra, Acer spicatum* and *Cornus circinata.*

Then came a depression where the ground was wet, with numerous springs. This was wooded with *Abies balsamea, Tsuga canadensis, Betula alba papyrifera* and *Acer pennsylvanicum,* and beneath these grew *Lycopodium lucidulum, Phegopteris polypodioides, Asplenium felix-foemina, Aspidium marginale, Equisetum scirpoides* and *Monotropa uniflora.*

Next the upward slope became steeper and was covered with a

Deciduous Forest of *Acer saccharum, Acer spicatum, Acer pennsylvanicum, Betula alba papyrifera, Populus tremuloides* and *Pinus strobus.*

After this the slope became very steep and clothed by a Coniferous Forest of *Pinus Strobus* and *Picea canadensis.* Finally one reached the summit which has mostly bare quartzite with here and there groups of *Pinus banksiana* and bushes of *Vaccinium pennsylvanicum.* Beneath the Jack Pines was *Potentilla tridentata.* There were some deep holes in the rock which had become pools around the border of which *Eriophorum virginicum* grew.

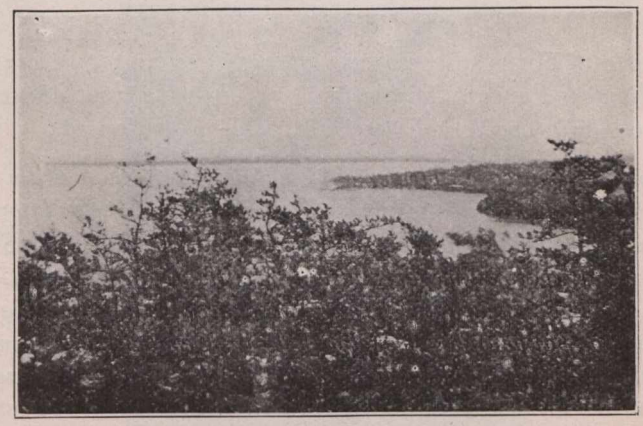


Fig. 9—VIEW FROM TOP OF MOUNTAIN NEAR KILLARNEY. *PINUS BANKSIANA* IN FOREGROUND.

Fig. 9 is a view taken from the summit of this mountain and shows the general character of the country, round Killarney. In the foreground scraggly trees of Pinus banksiana show.

Our next run was from Killarney to Big Burnt Island, off Manitoulin. As soon as one leaves Killarney and turns south the Laurentian gneiss and quartzite are replaced by limestone, and a corresponding change takes place in the flora. The Pines are largely replaced by the Balsam Fir and Cedar, the Blueberries disappear and the Raspberries become more abundant, *Solidago riddellii, Shepherdia canadensis, Gentiana procera, Prenanthes racemosa* and *Parnassia caroliniana* appear, among the *Pteridophyta, Woodsia ilvensis, Woodwardia*

virginica and *Selaginella rupestris* disappear and in their place one finds *Cryptogramma stelleri, Asplenium trichomanes* and *Selaginella selaginoides,* and in the *Algae* the *Rivularias* disappear and one finds *Ulothrix zonata* and *Ulothrix aequalis* as the commonest forms of the lake shore.

The character of the shores changes also. In place of the rounded bare outer islands and the innumerable shoals we find either high bluffs with deep water almost up to their bases or else low sandy shores.

The shores of Big Burnt Island are low and have the following flora:

Deciduous Forest Formation of *Betula alba papyrifera, Populus tremuloides, Populus balsamifera, Salix lucida* and *Alnus incana* with some *Thuja occidentalis* and a strand vegetation of:

Potentilla fruticosa, Hypericum kalmianum, Shepherdia canadensis, Rubus idaeus aculeatissimus, Aster puniceus, Aster lateriflorus, Aster lindleyanus,Solidago canadensis, Solidago riddellii, Solidago graminifolia, Eupatorium perfoliatum, Gentiana andrewsii, Gentiana procera, Asclepias incarnata, Prenanthes racemosa, Potentilla anserina, Gerardia paupercula, Lobelia kalmii, Campanula rotundifolia, Lilium philadelphicum, Isanthus brachiatus, Mentha canadensis, Smilacina stellata, Linum medium, Galium triflorum, Fragaria virginiana, Andropogon scoparius, Bromus ciliatus, Deschampsia caespitosa and *Carex oederi.*

Fringing the shores was a Helophytic Formation consisting of:

Scirpus validus and *Eleocharis palustris,* and outside this a zone *Potamogeton natans* and *Potamogeton zosterifolius.*

Our next run was to Fishing Island Cove, Manitoulin. Here the woods consisted of: *Betula alba papyrifera, Populus tremuloides, Alnus incana, Abies balsamea, Picea canadensis* and *Thuja occidentalis.* On a stony-sandy shore was the following strand vegetation: *Salix lucida, Salix candida, Solidago canadensis, Solidago graminifolia, Aster puniceus, Aster lindleyanus, Aster lateriflorus, Eupatorium perfoliatum, Geum avens, Gentiana procera, Gerardia paupercula,*

Lobelia kalmii, Hypericum virginicum, Cladium mariscoides, Juncus balticus littoralis, Scirpus pauciflorus, Eleocharis acuminata, and *Cyperus diandrus.*

Fig. 10 shows a white flowered form of *Aster puniceus* photographed at Fishing Island Cove.

We next ran round Cape Smith to Wekwemikongsing, Manitoulin. Here the shore was low and sandy with the following topography: First, the strand, then a long pool in the sand of the rear-strand, then a sand-ridge (of dry sand), then a bog, then the woods.

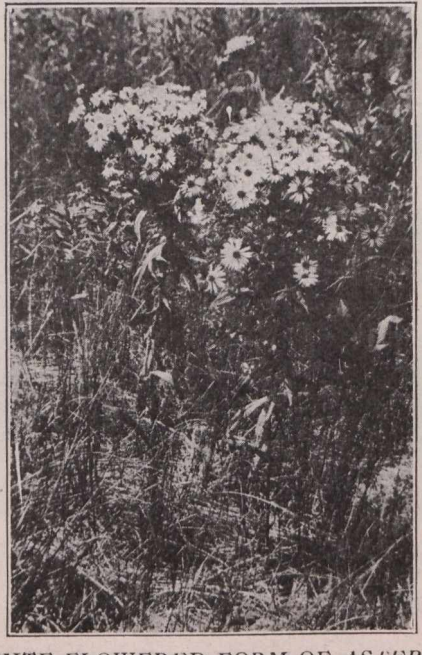


Fig. 10.—WHITE FLOWERED FORM OF *ASTER PUNICEUS.*

The wet sand of the fore-strand was interesting not only for its flora, but because of what it revealed of the Mammalia of the locality. On the morning of Sept. 8th tracks at the water's edge near our tent revealed where a bear and a deer had come down to drink and where a lynx and a raccoon had wandered up and down the shore.

The fore-strand had the following flora:

Juncus nodosus, Juncus brachycephalus, Juncus balticus littoralis and *Scirpus americanus.* The pool in the rear-strand contained the above four species and also *Carex interior, Rhynchospora capillacea laeviseta, Lobelia kalmii, Gentiana procera* and *Solidago riddellii.*

The sand ridge (see Fig. 11) had the following flora:

Picea canadensis, Pinus resinosa, Thuja occidentalis, Larix laricina, Betula alba papyrifera, Juniperus horizontalis, Arctostaphylos uva-ursi, Hypericum kalmianum, Gentiana procera, Artemisia caudata, Solidago hispida, Brunella vulgaris, Andropogon scoparius, Equisetum vareigatum, Equisetum hiemale and *Selaginella selaginoides.*

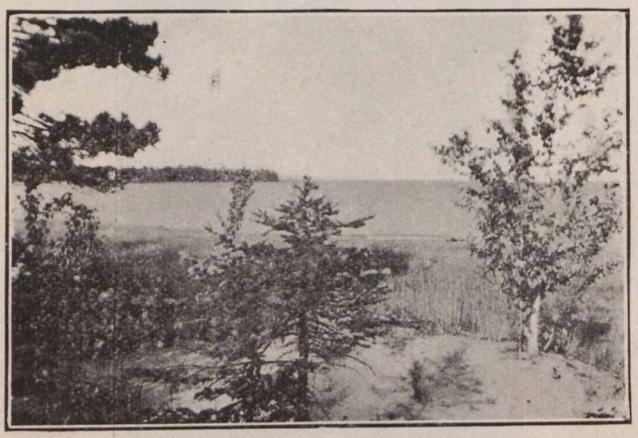


Fig. 11.—SHORE AT WEKWEMIKONGSING, MANITOULIN. SAND RIDGES WITH PAPER BIRCH, WHITE SPRUCE AND RED PINE IN THE FOREGROUND.

The bog behind the sand-ridge contained the following species:

Picea mariana, Larix laricina, Pyrus melanocarpa, Hypericum kalmianum, Vaccinium oxycoccus, Potentilla fruticosa, Sarracenia purpurea, Utricularia cornuta, Drosera rotundifolia, Cypripidium hirsutum, Parnassia caroliniana, Tofieldia glutinosa, Smilacina stellata, Solidago uniligulata, Solidago uliginosa, Lobelia kalmii, Muhlenbergia glomerata, Cladium mariscoides, Carex interior, Carex hystericina,

Carex flava, Scirpus americanus, Scirpus caespitosus, and *Eriophorum viride-carinatum.*

The woods behind the bog consisted of:

Picea canadensis, Thuja occidentalis, Betula alba, papyrifera, Populus tremuloides, Populus balsamifera, Larix laricina and *Pinus resinosa.*

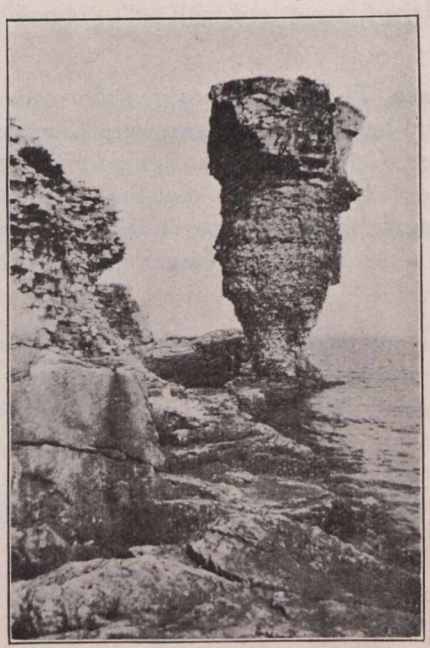


Fig. 12—"FLOWER POT" ON FLOWER POT ISLAND.

From Wekwemikongsing we ran out to Rabbit Island, and then into Rattlesnake Harbor on Fitzwilliam Island. On the east side of this island is a long stretch of terraced limestone, which, under the action of ice, waves and weather splits off in huge slab-like plates. These plates, where just submerged, were in many places coated with the *Algae, Ulothrix zonata, Tolypothrix penicillata, Gleocapsa fusco-lutea, Gleocapsa ambigua* and *Calothrix parietina.*

Next day, September 9th, we crossed from Fitzwilliam Island to the Islands off the head of the Bruce peninsula, first landing at

Bear's Rump Island. This latter island derived its name from the three columns of limestone which stood along its southern shore. The waves have gradually cut away their bases until one fell many years ago, and the two now remaining have very slender foundations and are likely soon to go the way of their companion. One of these "Flower-pots" is shown in Fig. 12.

Flower-pot Island is covered with a CONIFEROUS FORMATION consisting of:

Abies balsamea, Thuja occidentalis, Picea canadensis and *Betula alba paprifera,* and beneath these trees were *Linnaea borealis, Maianthemum canadense, Goodyera repens ophoides, Pyrola secunda, Moneses uniflora,* and *Carex eburnea.* On the moist moss-covered rocks were the following ferns: *Cystopteris bulbifera, Cystopteris fragilis, Aspelenium trichomanes* and *Asplenium viride,* and the Lichen *Baeomyces byssoides.*

From Flower-pot Island we proceeded to Tobermory at the head of the Bruce Peninsula. Here is one of the finest natural harbours in the world, protected from every wind, and with about 40 feet of water right up to its perpendicular sides of limestone rock.

The west side of the harbour consists of limestone with a thin layer of soil and is covered with a thicket of: *Thuja occidentalis, Abies balsamea, Populus tremuloides* and *Physocarpus opulifolius* and among these grew *Hypericum kalmianum, Potentilla fruticosa, Solidago graminifolia, Solidago hispida, Solidago nemorosa, Solidago canadensis, Prenanthes racemosa, Lobelia kalmii, Tofieldia glutinosa, Aster macrophyllus, Aster cordifolius, Aster leavis, Aster lindleyanus, Aster lateriflorus, Arctostaphylos uva-ursi, Muhlenbergia glomerata, Danthomia spicata, Carex scirpoidea, Carex eburnea, Carex capillaris elongata, and Carex aurea.*

It is interesting to compare the above list with that of the flora of Wekwemikongsing, Manitoulin, and both these with that of the western shore of the Bruce Peninsula as given in "Plant Formations of the Bruce Peninsula"—Ontario Nat. Sc. Bulletin No. 7. It will be seen that the flora of the west coast of the Peninsula extends up on to the east shore of Manitoulin.

The flora of the east side of the harbor of Tobermory is entirely different from that on the west side, and is the same as that which characterizes the whole eastern shore of the Bruce Peninsula. For notes on the flora of this part of the shore of Georgian Bay the reader is referred to my notes in the Ontario Nat. Sc. Bulletin No. 7. Our next stopping places were the Gregor's Harbour and Wiarton, both on the Bruce Peninsula, and then we ran to Collingwood and camped on Nottawasaga Island. The island is covered by a thicket formation consisting of:

Thuja occidentalis, Tilia americana, Betula alba papyifera, Populus tremuloides, Populus balsamifera, Prunus virginiana, Cornus stolonifera, Cornus circinata, Prunus pumila, Vitus riparia, Celastrus scandens, Salix lucida, Salix discolor, Shepherdia canadensis, Hypericum kalmianum, Rosa blanda, and *Rhus toxicodendron,* with the following herbs: *Gerardia paupercula, Parnassia caroliniana, Solidago graminifolia, Solidago serotina, Solidago riddellii, Aster sagittifolius, Monarda fistulosa mollis, Geranium robertianum, Smilacina stellata* and *Desmodium canadense.*

The shore of the mainland west of Collingwood had a thicket formation of *Populus tremuloides, Tilia americana, Betula alba papyrifera, Thuja occidentalis* and *Ulmus americana,* among which grew *Vitis riparia, Aster lateriflorus, Aster paniculatus, Aster cordifolius* and *Amphicarpa monoica* and between this and the water large moist flats with the following flora:

Scirpus americanus, Scirpus atrovirens, Scirpus validus, Potentilla fruticosa, Hypericum kalmianum, Alisma plantago-aquatica, Carex vulpinoidea, Juncus nodosus, Parnassia caroliniana, Selaginella apus and between the stems of these plants gelatinous masses of the Alga, *Nostoc commune.*

From Collingwood we ran to Go-Home Bay and left there next day for Midland.

Some Deadly Poisonous Fungi.

By R. E. STONE, Ph. D., Lecturer in Botany, Ontario Agricultural College.

THE last summer was one particularly favorable for the fruiting of many fleshy fungi. Perhaps there will also be large numbers of them again this season if the weather conditions are favorable, but we should not be surprised if they are not so numerous this year since many of them may have used up large quantities of food materials in fruiting last year.

Last summer was also characterized by the large number of deaths reported due to the eating of poisonous fungi, mushrooms, sometimes called toad stools, to distinguish them from the edible forms. In a number of cases it has been definitely ascertained that the form eaten was the White Amanita or Destroying Angel, (*Amanita phalloides var. verna.*) A good instance of this is the case of mushroom or toadstool poisoning in St. Catharines last August. Mr. W. A. McCubbin, of the Dominion Laboratory of Plant Pathology visited the woods where the fatal fungi were gathered and found large quantities of this most dangerous of poisonous fungi.

Since there was so much mushroon poisoning last summer, we have thought it advisable to publish a description of this very dangerous fungus in *order to warn against it.* We also publish a number of rules for distinguishing the other poisonous forms from the edible fungi.

The White Amanita or Destroying Angel.

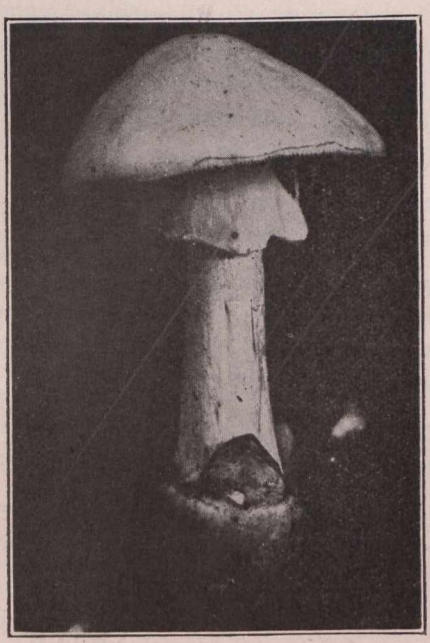
This is the fungus which causes more deaths than any other form and perhaps more than all the others put together.

This fungus is a very pretty one found growing in woods and recently cleared places from June until frost. It is pure white and a very beautiful plant.

The cap or pileus is from two to five inches broad and may be conical or hemispherical when young, becoming nearly flat when old. Usually smooth but there may remain one or two loose patches of the thin membrane forming the volva or poison cup which surrounded the entire cap when young. The gills are pure white and free from the stem or stipe.

In young specimens the gills are hidden by the white veil. As the cap expands this veil is torn loose from its edge and then hangs down around the upper part of the stipe to which it is firmly attached by its center. In this condition the veil forms a ring just under the cap.

The stem is nearly cylindrical 4 to 6 inches long and about one-half inch thick; it is pure white and in mature specimens is hollow but when young is loosely filled with white threads.



(*Amanita phalloides vai verna.*) DESTROYING ANGEL.

Photo by Prof. Geo. F. Atkinson.

At the base of the stem occurs the remains of the *volva* forming the so-called poison cup. This usually appears as an abrupt thickening at the base of the stem or stipe. Usually there can be seen standing up from the edge of this thickening or bulb a few flaps of tissue which originally surrounded the cap.

(CAUTION) In gathering wild mushrooms the plant should NOT be pulled up, but the collector should dig down so as to bring up the whole fruit body. When the plant is pulled up the stem very often breaks loose from the volva or poison cup if there is one and thus a very important point for the determination of the specimen is lost.

The accompanying photograph shows a very characteristic form of the *Destroying Angel.* Notice the bell-shaped cap, the ring or veil high up on the stem under the cap. At the base the abrupt thickening with the free flaps standing up from its edge forming the volva or poison cup.

This particular toad stool is probably mistaken for the smooth Lepiota or white mushroom, *L. naucina.* The two plants are the same color, but the white mushroom differs from the Destroying Angel in a number of points.

1st. The white mushroom has no volva or poison cup at the base of the stem, but instead has *a smooth oval bulb.*

2nd. In the white mushroom the ring forms a tight little ring, which may be loosened from the stem so as to slip up and down on it, while in the Destroying Angel the ring is always firmly attached to the stem high up just under the gills.

3rd. Finally the white mushroom usually grows in fields and lawns, never in woods or bushes.

In addition the Destroying Angel is said to have a slightly fetid odor while the white mushroom has a pleasant mealy odor.

This deadly fungus may be distinguished from the ordinary field or garden mushroom, *Agaricus campestris,* in the following ways:

1st. The field mushroom does not possess the volva or poison cup.

2nd. In the field mushroom the gills are first pink and later become brown or purple brown.

3rd. The cap in the field mushroom shows tinges of brown.

4th. The stem is solid.

5th. It grows in fields and gardens, not in the woods.

Very closely related to the Destroying Angel is the deadly Agaric (*Amanita phalloides* proper.) As the name implies it is deadly poisonous. It resembles the Destroying Angel in all points but color, the cap often being dingy yellow to slate or olive color. As it is almost as deadly it should of course never be eaten.

The poison in these two deadly poisonous fungi is an albuminous compound called *phallin*. It is not soluble in water or saliva, and consequently cannot warn one of its presence by taste. In fact both of these fungi have a pleasant and agreeable flavor.

There is no known antidote for the poison. In 6-12 hours after the toad stools are eaten the victims begin to show symptoms of poisoning such as nausea, diarrhea, convulsions, cramps, lock-jaw, weak pulse, etc., and finally coma sets in and lasts until death. The phallin is said by some writers to dissolve the red blood corpuscles but the statement is denied by others.

If the case is taken in time, i. e., before much of the fungus has been digested danger may be avoided by administering strong purgatives and emetics in order to rid the digestive system of the undigested material. A physican should always be called as soon as possible when it is known poisonous toadstools have been eaten.

That the fungus is extremely poisonous is shown by the fact that thirteen grains of the fruit body contains enough phallin to kill a man. A fruit body 4-6 inches in diameter contains enough poison to kill 6 or 8 people.

Another very deadly fungus is the Fly Agaric, *Amanita muscaria*. This fungus has a large stout fruit body, the cap often being 6 or 8 inches in diameter. In this plant the cap is usually some shade of yellow, orange or red, and is covered by numerous white or yellowish scales. The bulb at the base of the stem is large and scaly.

This plant is seldom the cause of mushroom poisoning, as we do not look favorable on large brilliant scaly fungi as attractive. Also the plant is more or less bitter. The poison in this case is an alkaloid, *muscarin*, which is also very dangerous, about 30 grains of the fruit body containing enough poison to cause death.

Some times we hear of cases of mushroom poisoning in which but one or two people in a party of several will be affected.

In such cases it happens that the party were eating wild mushrooms of a number of different species. Since *phallin* is insoluble in water and muscarin but slightly so only those who actually ate one of the poisonous forms will show symptoms of poisoning.

Since there are a number of mushrooms containing minor or irritant poisons it seems well to give some general rules for collecting mushrooms for the table.

1. Avoid fungi in the button or unexpanded stage.

2. Avoid all fungi if the flesh has begun to decay if even slightly.

3. Avoid fungi having a bulbous base surrounded by a sac-like or scaly envelope especially if the gills are white.

4. Avoid all fungi having a milky juice unless the milk is reddish or orange.

5. Avoid fungi having a thin brittle cap and gills of nearly equal length, especially if the cap is bright colored.

6. Avoid the tube bearing fungi if the mouths of the tubes are reddish or if the flesh changes color when cut or broken.

7. Avoid the fungi having a cobwebby veil especially if the gills are clay colored or yellow brown.

8. Always use the greatest care in collecting wild mushrooms and be sure to examine the base of the stipe or stem for the volva or poison cup, especially in those having white gills.

9. In case of doubt regarding the edibility of the forms it is far better to let them alone rather than run the risk of eating poisonous forms.

The first three rules are the most important and the plants included under them should never be used for food.

With these restrictions which really are directed against comparatively few forms there remain hundreds of edible mushrooms.

All the black gilled forms, i. e., shaggy mane, ink caps, the field mushroom, many of the white gilled forms, etc. In addition the puff

balls are edible, all the coral fungi and fairy clubs as well as those having tooth like processes on the under side of the cap, as are also the Morell described in this issue of the bulletin.

If one feels inclined to make use of the fungi for food I would strongly advise him to first secure a book on mushrooms and learn to dintinguish the different forms, and then start with one or two easily recognized forms. As time goes on and the collector learns to know the different species he can add new forms to his list, but in all cases he should proceed cautiously.

The Morel.

BY W. A. McCUBBIN, ST. CATHARINES, ONT.

I THINK there are few people who take the smallest interest in edible fungi who do not know the morel and enjoy its delicate rather distinctive flavor. Aside from its edible qualities the reason for its wide popularity is largely due to the fact that there is scarcely a possibility of mistaking any poisonous form for it. There is no other fungus that resembles it any more than a boot does a hat, so that once it is learned it may be gathered and eaten with the same assurance that one has in the case of the apple or potato. Also the several species of morels are all equally edible though some of them are not quite so well flavored as the ordinary Morchella esculenta. It is a great pity that the morel season is so short, being confined to a couple or three weeks in May or June, according to the season and locality. One can, however, overcome this difficulty by drying quantities of them during their season, a method of preserving them, which is very little used so far as I am aware. In the dried state they keep indefinitely and retain their flavor to a remarkable degree.

The life habits of the morel are very peculiar. It shows a surprising latitude in its soil conditions, being found in clay, sand, gravel, limestone and forest humus. There is also a great variation in the moisture conditions of its habits, ranging from the very dry sandy hilltops to damp river bottoms. In the spring when there is a plentiful amount of moisture everywhere there is no question of the adequacy of the water supply, but one must bear in mind that the mycelium under-

ground is perennial and must pass the hot dry summer in these unfavorable locations. I have found morels in the spring on the very top of a sandy hill where even grass could hardly find a meagre and precarious subsistence.

Notwithstanding this latitude as regards soil and moisture conditions the morel is restricted in its occurrence in quite a surprising way. In the well-defined and limited areas where it is found it comes

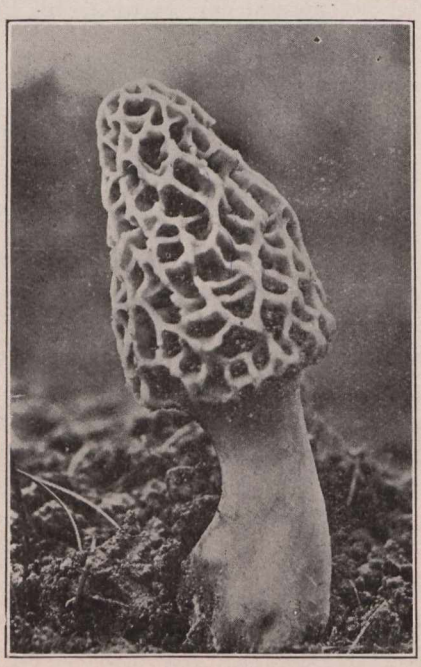


Fig. 1—THE COMMON MOREL (*MORCHELLA ESCULENTA*).

(Photo by Dr. J. H. Farell)

to increase much in size according to my observations. After six years in one case and eight in another very little difference could be noticed in the limits of the areas or in the yearly production. Apparently there is some factor, favorable or unfavorable which limits the activities of the fungus in this curious way. It is possible that certain soil chemicals may be necessary in its development either as a up year after year with unfailing regularity. Such areas do not seem

food material or by way of stimulant. Certain observations made in the New Ontario forests seem to point in this direction. A section of the country had been irregularly burned over in October, leaving stretches of land here and there untouched. As this was at the end of the growing season for that region little growth could have taken place again during that autumn. Next spring, during the last of June and July, the burnt-over areas bore immense numbers of morels. What makes this more striking is the fact that though I looked very carefully during the whole summer I did not find a single morel on the unburned land. They could be found right up to within a few inches of the edge of the burned portion, but never beyond it. It would seem as if the burning of the soil surface produced some substance necessary to the production of the spore-bearing stage.

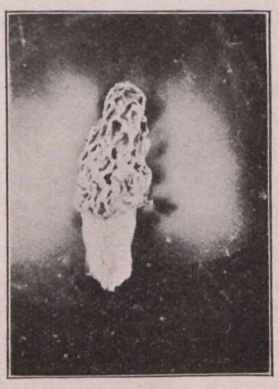


Fig. 2—A MOREL WHICH HAS SHED ITS SPORES. THE LATTER ARE EJECTED TWO OR THREE INCHES AND FORM A DENSE CREAM COLORED COATING ON THE SURFACE OF THE GLASS PLATE OR PAPER.

The case just cited brings up another interesting problem in the history of this fungus, viz: How did the morels start up so uniformly all over the area described after the fire? The most obvious explanation seems to be that the mycelium was universally present in the soil beforehand, and whatever of it was deep-seated enough to escape the fire, started into a renewed and vigorous growth next spring in the scorched earth. Another possibility is that the morel mycelium has an imperfect or conidial stage, and that the conidia borne from the

unburned forest land by the wind, reinfected the burnt areas. Such a conidial stage has been described for the fungus, but its authenticity is somewhat doubtful. I have grown the mycelium in cultures for several years, but have never succeeded in obtaining such a stage nor have several other men who to my knowledge have likewise tried it.

In either of the above possible explanations the interesting feature is the very strong probability that the mycelium is very widely distributed in the soil, but only under certain conditions does it produce sporophores. If these conditions could be discovered there is no reason why the morel could not be cultivated as are mushrooms. So far as I know only one man has succeeded in growing morels from spores or mycelium, and his one small result was very unsatisfactory from a scientific point of view. The spores germinate readily and can easily be obtained in a sterile condition because they are ejected from the spore-bearing head with considerable force. When a morel has been jarred or taken suddenly from a moist chamber, a little cloud of spores is scattered from it. (See Fig.) The mycelium grows very vigorously and on a variety of media. Soil inoculations could thus be made without difficulty, and if one could determine the factor or factors which induce the formation of sporophores there is no reason why the growing of morels could not be carried on profitably from a commercial standpoint and thus add another useful food product to humanity's bill of fare.

The Crowfoot and Poppy Families and Their Allies Around Galt, Ont.

BY W. HERRIOT, GALT, ONT.

AS a collecting field for the botanist Galt is particularly favored by the character of the surrounding country. The valley of the Grand River—thanks to its rugged slopes—still retains almost an unbroken line of woods for fourteen miles down to Paris.

With innumerable small lakes and sphagnum bogs back from the river the conservation of our native flora has much in its favor, but in spite of this, many of our most cherished plants are rapidly passing.

One no longer sees the blaze of Castilleja. The haunt of the Cypripedium is divulged in a whisper and the Turk's Cap Lily, once a conspicuous figure in many an open meadow, is making its last stand in the deep recesses of a few swamps. The 74 species recorded in the following list were collected within a radius of ten miles from Galt and extending over an observation of 25 years:

ORDER RANUNCULALES.

CERATOPHYLLACEAE (HORNWORT FAMILY.)

1. *Ceratophyllum demersum.* Hornwort. Ponds and Streams. Frequent.

NYMPHAEACEAE (WATER LILY FAMILY.)

2. *Nymphaea advena,* Ait. Yellow Pond Lily. Borders of ponds. Common.

3. *Castalia odorata,* (Ait. W. and W. Sweet scented Water Lily. Ponds. Common.

4. *Castalia tuberosa,* (Paine) Greene. Tuber-bearing Water Lily. Ponds. Less frequent than the preceding.

5. *Brasenia Schreberi,* Gmel. Water Shield. Ponds. Frequent.

RANUNCULACEAE (CROWFOOT FAMILY.)

6. *Ranunculus aquatilis,* L. Var. capillaceus D. C. White Water Crowfoot. Slow flowing streams mostly in spring water. Frequent.

7. *Ranunculus delphinifolius,* Torr. Yellow Water Crowfoot. Stagnant ponds. Infrequent.

8. *Ranunculus sceleratus,* L. Cursed Crowfoot. Wet ditches and along streams. Common.

9. *Ranunculus abortivus,* L. Small flowered Crowfoot. Rich woods and ravines. Common.

10. *Ranunculus recurvatus,* Poir. Hooked Crowfoot. Woods Common.

11. *Ranunculus fascicularis,* Muhl. Early Crowfoot. Open grassy places. Infrequent.

12. *Ranunculus septentrionalis,* Poir. Swamp Crowfoot. Swamps and along streams. Frequent.

13. *Ranunculus hispidus,* Michx. Hairy Crowfoot. Woods mostly on hillsides. Infrequent.

14. *Ranunculus repens,* L. Creeping Buttercup. Wet ditches and along streams. Common.

15. *Ranunculus pennsylvanicus,* L.f. Bristly Crowfoot. Along streams and borders of marshes. Frequent.

16. *Ranunculus acris,* L. Tall Buttercup. Fields and meadows. Common.

17. *Thalictrum dioicum,* L. Early Meadow Rue. Rich and rocky woods. Common.

18. *Thalictrum polygamum,* Muhl. Tall Meadow Rue. Open swamps and along streams. Frequent.

19. *Anemonella thalictroides* (L.) Spach. Rue Anemone. Dry open woods. Infrequent.

20. *Hepatica triloba,* Chaix. Round lobed Liverleaf. Woods Common.

21. *Hepatica acutiloba,* D. C. Sharp-lobed Liverleaf. Woods chiefly in moist places. Frequent.

22. *Anemone cylindrica,* Gray. Dry open woods and banks. Common.

23. *Anemone riparia,* Fernald. Open woods and copses. Frequent.

24. *Anemone virginiana,* L. Open woods and banks. Common.

24. *Anemone canadensis,* L. Meadows and along streams. Common.

26. *Anemone quinquefolia,* L. Wood Anemone. Rich and grassy woods. Common.

27. *Clematis virginiana,* L. Virgin's Bower. Moist woods, banks and along streams.

28. *Caltha palustris,* L. Marsh marigold. Swamps and wet places. Common.

29. *Coptis trifolia,* (L). Salisb. Goldthread. Cedar swamps and low woods. Common.

30. *Aquilegia canadensis,* L. Rock Columbine. Open rocky woods and fields. Common.

31. *Cimicifuga racemosa,* (L). (Nutt). Black Cohosh. Collected along the Grand River above Galt by George E. Prescott in 1872, but has since disappeared in the wild state. From the original stock collected 40 years ago quite a large colony of plants is still in the possession of Mr. Prescott.

32. *Actaea rubra,* (Ait), Willd. Red Baneberry. Rich woods and ravines. Common.

33. *Actaea alba,* (L), Mill. White Baneberry. Rich woods. Frequent.

MENISPERMACEAE (MOONSEED FAMILY).

34. *Menispermum canadense, L.* Moonseed. Climbing over shrubs and in thickets along the Grand River. Frequent.

BERBERIDACEAE (BARBERRY FAMILY).

35. *Podophyllum peltatum,* (L). May Apple. Rich woods. Common.

36. *Jeffersonia diphylla,* (L) Pers. Twinleaf. Several clumps of this interesting plant grow on an island in the Grand River about 1 and 1-2 miles below Galt. Some years ago the timber was removed and it succumbed to exposure.

37. *Caulophyllum thalictroides,* (L) Michx. Blue Cohosh. Rich woods and ravines. Common.

38. *Berberis vulgaris,* (L). Common Barberry. Open woods and along fences. Frequent.

LAURACEAE (LAUREL FAMILY).

39. *Sassafras variifolium,* (Salisb) Ktze. Sassafras Tree. Woods and fields confined to country south of Galt. Frequent.

40. *Benzoin aestivale* (L.) Nees. Wild Allspice. Low rich woods and swamps. Common.

ORDER PAPAVERALES.

PAPAVERACEAE (POPPY FAMILY).

41. *Sanguinaria canadensis,* (L). Bloodroot. Rich and open rocky woods and banks. Common.

42. *Chelidonium majus,* L. . Celandine. Rich and rocky woods, chiefly along the Grand River. Common.

FUMARIACEAE (FUMITORY FAMILY).

43. *Adlumia fungosa,* (Ait) Greene. Climbing Fumitory. Rocky bank along the Grand River above Galt. Collected in 1895, not noticed of late years.

44. *Dicentra Cucullaria* (L) Bernh. Dutchman's Breechers. Rich Woods. Infrequent.

45. *Dicentra canadensis,* (Goldie) Walp. Squirrel Corn. Rich and rocky woods. Frequent.

46. *Fumaria officinalis,* L. Fumitory. Occasional as a weed in gardens.

CRUCIFERAE (MUSTARD FAMILY).

47. *Berteroa incana,* (L) D. C. Plentiful in a field with alfalfa near Galt, 1912.

48. *Alyssum alyssoides,* L. Alyssum. Fields waste places and along railways. Frequent.

49. *Thlaspi arvense,* L. Field pennycress. Somewhat rare as a weed in fields.

50. *Lepidium virginicum,* (L). Wild Peppergrass. Fields and waysides. Frequent.

51. *Lepidium apetalum,* Willd. Fields and waste places. Common.

52. *Lepidium campestre,* (L) R. Br. A weed in fields. Infrequent.

53. *Lepidium Draba,* L. Persistent in one locality for a number of years. Not noticed lately.

54. *Capsella Bursapastoris,* (L) Medic. Shepherd's. Purse. Fields, waste places and gardens everywhere.

55. *Canelina microcarpa,* Andrz. False Flax. A bad weed in fields in this locality.

56. *Brassica arvensis,* (L.) Ktze. Charlock. Fields and waste places. Seldom seen in quantity in this locality.

57. *Sisymbrium officinale,* (L.) Scop. Hedge Mustard Fields and waste places. Frequent.

58. *Sisymbrium altissumum,* L. Timble Mustard. Occasional along the C. P. R. line.

59. *Erysinum cheiranthoides,* L. Wormseed Mustard. Moist grounds and in fields. Common.

60. *Radicula Nasturtium aquaticum,* (L.) B. and R. Water Cress. Brooks and inundated land. Common.

61. *Radicula sylvestris,* (L.) Druce. Yellow Cress. Alluvial soil along the Grand River. Common.

62. *Radicula palustris,* (L.) Moeneh. Marsh Cress. Shallow water and ditches around ponds. Frequent. Var. hispida (Desv.) Robinson. More plentiful than the type.

63. *Radicula Armoracia,* (L.) Robinson. Horse radish. Moist waste places and along the Grand River. Frequent.

64. *Barbarea stricta,* Andrz. Winter Cress. A weed in fields. Infrequent.

65. *Dentaria diphylla,* Michx. Toothwort. Rich and moist woods and swamps. Common.

66. *Dentaria laciniata,* Muhl. Pepper Root. Rich woods and ravines. Frequent.

67. *Cardamine bulbosa,* (Schreb) B. S. P. Spring Cress. Swamps and around springs. Frequent.

68. *Cardamine Douglassii,* (Torr.), Britton. Damp rich woods. Common.

69. *Cardamine pratensis,* L. Cuckoo Flower. Wet places mostly along streams. Infrequent.

70. *Cardamine pennsylvanica,* Muhl. Borders of brooks and ponds. Frequent.

71. *Arabis glabra,* (L.) Bernh. Tower Mustard. Rocky banks and ravines. Infrequent.

72. *Arabis Drummondi,* Gray. Purple Rock Cress. Found at one station only, a gravelly bank along the Grand River below Galt.

73. *Arabis hirsuta,* (L.) Scop. Hairy Rock Cress. Dry and rocky banks and fields. Frequent.

74. *Arabis canadensis,* L. Sickle-pod. Dry woods and ravines. Infrequent.

Ranunculaceae and Labiatae of County Peel.

BY J. WHITE, SNELGROVE, ONT.

RANUNCULACEAE.

Actaea alba, (L.) Mill.—Open woods. Common.
Actaea rubra, (Ait) Willd.—Open Woods. Common.
Anemone canadensis, L.—Low ground. Common.
Anemone quinquefolia, L.—Open woods. Common.
Anemone virginiana, L.—Shady places. Common.
Aquilegia canadensis, L.—Open woods. Frequent.
Aquilegia vulgaris, L.—Roadsides. Scarce.
Caltha palustris, L.—Low meadows. Abundant.
Clematis virginiana, L.—Banks of streams. Common.
Coptis trifolia, (L.) Salisb.—Low woods. Common.
Hepatica acutiloba, D. C.—Woods. Abundant.
Hepatica triloha, Chaix—Woods. Rare.
Nigella Damascena, L.—Roadsides. Scarce.
Ranunculus abortivus, L.—Woods and fields. Abundant.
Ranunculus acris, L.—Fields and Roadsides. Abundant.
Ranunculus aquatilis, L.—Var capillaceus, D. C.—Ponds. Local.
Ranunculus circinatus, Sibth.—Slow water. Rare.
Ranunculus pennsylvanicus, L. f.—Wet grounds. Common.
Ranunculus recurvatus, Poir.—Wet ground. Common.

Ranunculus repens, L.—Low grounds. Local.

Ranunculus sceleratus, L.—Ditches. Abundant.

Ranunculus, septentrionalis, Poir.—Low ground. Common.

Thalictrum dioicum, L.—Borders of woods. Common.

Thalictrum polygamum, Muhl.—

" " *Var hebecarpum,* Fernald—Low ground. Common.

LABIATAE.

Galeopsis Tetrahit, L.—Fields. Common.

Hedeorna pulegioides, (L.) Pers.—Low ground. Rare.

Hyssopus officinalis, L.—Roadsides. Rare.

Lamium amplexicaule, L.—Rare.

Leonurus Cardiaca, L.—Roadsides. Abundant.

Lycopus americanus, Muhl.—Wet places. Common.

Lycopus virginicus, L.—Moist places. Common.

Marubrium vulgare, L.—Roadsides. Rare.

Mentha arvensis, L. var. Canadensis, (L.) Briquet.—Common.

Mentha piperita, L.—Wet places. Common.

Mentha spicata, L.—Roadsides. Frequent.

Monarda, didyma, L.—Wet meadows. Very rare.

Monarda fistulosa, L.—Open places. Frequent.

Nepeta Cataria, L.—Roadsides. Common.

Nepeta hederacea, (L.) Trevisan.—Roadsides. Scarce.

Prunella vulgaris, L.—Fields. Common.

Satureja hortensis, L.—Roadsides. Not common.

Satureja vulgaris (L.) Fritsch.—Fields. Common.

Scutellaria galericulata, L.—Wet places. Common.

Scutellaria lateriflora, L.—Wet places. Common.

Scutellaria parvula, Michx.—Gravelly shores. Local.

Stachys palustris, L.—Wet places. Not common.

Teucrium canadense, L.—Low ground. Local.

Conditions Against Which Bird Life is Contending.

BY MR. FRED. MITCHELL, INNERKIP, ONT.

A FEW personal words at the outset. I have no collection of stuffed birds, bird-skins or eggs. I never take the life of any bird unless it is seriously destructive.

I do not pretend to much book-lore about birds, but from boyhood up I have taken an abiding interest in them and the measure of knowledge I possess was gained by personal observation of the birds themselves.

In the attainment of this first-hand information I have had special advantages for a few years past, in the acquisition of a piece of land, a part of which is woodland, another part is bush, another meadow, and another portion is cultivated land. All stock is excluded from this land; and I have tried in a small way to make it an asylum or preserve for some of our fast disappearing birds and plants, and the land being under such varying conditions it is an attractive place for birds of widely differing habits. I drive out there most fine days in summer and thus can make daily acquaintance and observation of the same birds, and the same nests, and thereby note actual progress or failure. In the matter of reproduction the general result is so unsatisfactory as to be one of grave concern to a bird lover as to the future of bird life with us. As I have followed the unequal struggle for continued existence of many of our birds against the forces and foes arrayed against them, I cannot but fear that some, perhaps many other familiar and desirable species of our native birds may soon go the way of the passenger pigeon, and be but things of the past. It is only natural that with the clearance of the forest the numbers of forest birds must be materially lessened, yet that is not all for although the present areas of forest land are fairly well tenanted with birds, many species produce but few or no young. A few species of birds have already disappeared, locally at least.

The pileated woodpecker, but a few years ago, was a constant resident, or nearly so, has now entirely disappeared from this locality. The winter wren, until lately a continued resident, is seen no more at any season. Other birds, still fairly plentiful at some seasons,

seem to have given up the fruitless effort to rear their young here, and do not nest locally now. Among these are Juncoes and chicadees. Both of these nested freely here at one time.

As examples of birds that remain with us throughout the summer season and nest freely, but seem to produce no young, I may cite the Red-eyed Vireo, which is plentiful in the woods and builds many nests but I have not seen a fledgeling for many years. The Chestnut-sided Warbler builds nearly as many nests in the brushland as the Vireo does in the woods, but seems to be completely unsuccessful in its efforts to rear young, and so with other Vireos and Warblers I see no young birds.

The Oven bird is very plentiful and nests freely but apparently fails to rear any young. The Maryland Yellow-throat is equally unsuccessful. The Wood Thrush nests, but the nests are invariably robbed. The Wilson Thrush is still with us, but I have not seen a nest for some time. The Rose-breasted Grosbeak is becoming scarcer and fails to rear any young. The scarlet Tanager was notably absent last year. In other seasons it occasionally reared young. The Towhee is still quite common in the brush, but of late years has reared but few young.

I could extend this list to include almost all of the birds of the forest and brushland. One exception is the Indigo Bunting; it is quite common, perhaps more so than in former years. It nests in a variety of places. Sometimes in a small tree near the edge of the wood, sometimes in isolated pollards and frequently in raspberry and other brush. It contrives to raise a few nests of young each season. Until last year one and sometimes two broods of partridges (Ruffed Grouse) were raised in my small piece of bush each season. Last year vagabond bird dogs raided the place in the breeding season and utterly destroyed all the young. Killdeer reared their young in the open ground every year until last season, when eggs and young were destroyed by bird dogs.

Birds of the open fields as Vesper Sparrows, Meadow Larks and Bobolinks are still fairly successful in raising young.

Fledgelings of Bluebirds are quite common along the roadsides at the proper season. These seem to be raised chiefly in holes made

by the Flicker in telephone and telegraph posts. Robins and Grackles still breed freely.

Among the conditions against which bird life is contending, the changeful condition of the country is a very important one. This particularly applies to forest and brushland birds. Of all the destructive forces arrayed against bird life and reproduction the worst seems to be the red squirrel in the places which he frequents. In earlier years it did not seem to be such a persistent little destroyer as it now is.

Bird dogs which are allowed to run wild in the breeding season operate seriously against the conservation of bird life.

Other factors to the sum of failing bird life are the thoughtless and unlawful shooting of birds by boys, and sometimes by older persons. Meadow Larks are slaughtered heavily each autumn when flocking for their return to the south. The making of collections of birds' eggs by school children and others. The abuse of permits to take birds and eggs for scientific purposes. In this, even if not abused, the killing of rare birds must make them scarcer still.

Some of the adverse conditions of bird life are irremediable, others perhaps may not be.

The red squirrel is such an engaging little fellow that few could bring themselves to enter on a campaign against him. The bird dog could be kept in his proper place—at home. Thoughtless children could be warned, and although most of our forests are gone forever, at least a few preserves might be established where original conditions could be restored. *Real* preserves where birds are not preserved for future slaughter only, but for life and reproduction.

Guelph Winter Birds in 1912-13.

BY E. W. CALVERT, O. A. C. GUELPH, ONT.

THE erratic visitors from the north have been almost entirely absent in this locality during the past winter. However, many of the more southern species were abundant in proportion.

The regular common residents were of usual abundance. These are the Chickadee, White-breasted Nuthatch, Downy and Hairy Woodpeckers, Brown Creeper and Golden-crowned Kinglet. The Ruffed Grouse was of unusual abundance at Christmas time and probably all winter. No Blue Jays were noted. The Blue Jay seems to be scarce or entirely absent in this locality during winter.

Of the regular residents which come from the north the Snow Bunting was rather scarce, while the Tree Sparrow was unusually abundant. A Northern Shrike was noted on January 1st, and Snowy Owls were reported during February.

The Junco was very common in sheltered places in early winter, and the Goldfinch was present. The latter species was seen on Dec. 14th, 15th and 24th, and in January.

The Cooper's Hawk was seen on Dec. 15th and 21st, and on January 3rd.

An immature Great Blue Heron was seen along the Speed on December 15th and 21st, and doubtless remained in the vicinity for the season. Two or three Kingfishers were also staying there and were seen on the same dates.

A pair of Crows was seen on December 19th, and again two days later, and some half dozen were seen about Jan. 7th.

Unidentified ducks have frequented open spaces on the river since January.

The Bartramion Sandpiper.

BY HERBERT GROH, PRESTON, ONT.

THE Bartramion Sandpiper or Upland Plover, which was recorded for this locality the past two seasons (see O. N. S. Bulletin No. 7, 1912), has again returned in 1913, to the same neighborhood. Its cry was first heard on April 22nd and frequently since. There is no evidence to indicate that more than one pair breeds here, the young reared in 1911 and 1912 doubtless being elsewhere.

Mites on Honey Bees.

BY C. J. SPENCER, O. A. C., GUELPH, ONT.

ON May 25th, 1912, when searching for mites on a great variety of hosts, I happened to examine a few honey bees which were among the insects of the day's catch. On one of the bees I found a great number of extremely minute mites clinging to the hairs of the abdomen. Mr. Nathan Banks has very kindly identified the mites for me, and in his words, "They are a very interesting form. We have one species from British Columbia from a Halietus, one from Texas from a Nomia, and in Europe one has been found on Bombus and several on ants. Very little is known of their habits; these forms on insects are considered to be migratorial nymphs and the adults live in the nests of insects or in moss or in decaying vegetable manner. It is, therefore, improbable that they injure the adult bee in any way, but may live in the hive on any vegetable substance there or else on dead animal matter. I shall describe it as a new species."

Migration Report

-- of the —

Wellington Field Naturalists' Club

Station - Guelph, Ontario

SEASON OF 1912

compiled by the Secretary

NOTE:—All remarks apply to this year only. C—*Common;* F—*Frequent;* S—*Scarce;* R—*Rare.*

NAME OF BIRD	First Seen	Last Seen	Abundance	Does It Breed?	Remarks
Prairie Horned Lark	Feb. 10		C	Yes	
Crow	Feb. 19		C	Yes	2 wintered in '12-'13
Robin	Mar. 10	Nov. 10	C	Yes	1 seen Jan. 4, 1912
Herring Gull	Mar. 16	May 10	C	No	
Song Sparrow	Mar. 19	Oct. 20	C	Yes	
Bluebird	Mar. 21	Oct. 20	S	Yes	Scarce in summer,
Killdeer	Mar. 27	Oct. 6	C	Yes	frequent during
Bronzed Grackle	Mar. 30	Oct. 31	C	Yes	migrations
Red-winged Blackbird	Mar. 30	Nov. 3	C	Yes	
Cowbird	Mar. 31	Oct. 6	C	Yes	
Meadowlark	Mar. 31	Oct. 20	C	Yes	
Loon	April 4	May 10	S	No	
Sparrow Hawk	April 5	Sept. 21	F	Yes	
Vesper Sparrow	April 5		C	Yes	
Yellow-bellied Sapsucker	April 6		C	Yes	
Migrant Shrike	Apr 1 6		F	Yes	
Belted Kingfisher	April 7	Dec. 1	C	Yes	2 or three wintered
Sharp-shinned Hawk	April 9		S		along the Speed
Towhee	April 10		F	Yes	'12-'13
Chipping Sparrow	April 10	Oct. 8	C	Yes	
Phoebe	April 11		C	Yes	
Northern Flicker	April 11		C	Yes	
Savannah Sparrow	April 12		C	Yes	
Canada Goose	April 14		F	No	
Mourning Dove	April 17		F	Yes	
Barn Swallow	April 17	Sept. 8	C	Yes	
Swamp Sparrow	April 17		C	Yes	
Tree Swallow	April 21		C	Yes	
Ruby-crowned Kinglet	April 21	May 16	C	No	
Hermit Thrush	April 21	May 5	C	No	
Hermit Thrush	Oct. 13	Oct. 13	F		
White-throated Sparrow	April 22	Oct. 20	C	Yes	
Chimney Swift	April 25	Sept. 1	C	Yes	
White-crowned Sparrow	April 28	May 25	F	No	
Brown Thrasher	April 30	Sept. 5	F	Yes	
Oven-bird	May 2	Sept. 29	C	Yes	

NAME OF BIRD	First Seen	Last Seen	Abundance	Does it Breed?	Remarks
Bobolink	May 2	Sept. 5	C	Yes	
Field Sparrow	May 3	May 7	R		First record for the locality
Veery	May 4		C	Yes	
Myrtle Warbler	May 4		C	Yes	Breeding this season
Black-throated Green Warbler	May 4		C	Yes	
Pine Warbler	May 4	May 29	S	No	
Blackburnian Warbler	May 4	May 20	C	No	
Blackburnian Warbler	Aug. 29	Aug. 29	S		
Bank Swallow	May 4		F	Yes	
Black and White Warbler	May 4		C	Yes	
Warbling Vireo	May 4	Sept 8	C	Yes	
Parula Warbler	May 5		S	No	
Spotted Sandpiper	May 6		C	Yes	
Rose-breasted Grosbeak	May 6		F	Yes	
Yellow Warbler	May 6		C	Yes	
Baltimore Oriole	May 6		C	Yes	
Whip-poor-will	May 6		F	Yes	
Catbird	May 7	Sept. 28	C	Yes	
Kingbird	May 7		C	Yes	
House Wren	May 7		C	Yes	
Red-headed Woodpecker	May 8		F	Yes	
Cedar Waxwing	May 8		C	Yes	Seen March 5 & 17
Bittern	May 8		C	Yes	
Great Blue Heron	May 8		F		One wintered on the Speed '12-'13
Marsh Hawk	May 9		C	Yes	
Least Flycatcher	May 10		C	Yes	
Ruby-throat Humming Bird	May 10	Sept. 15	F	Yes	
Northern Yellowthroat	May 10		C	Yes	
Crested Flycatcher	May 10		C	Yes	
Chestnut-sided Warbler	May 10		C	Yes	
Nashville Warbler	May 10		C		
Magnolia Warbler	May 10		C		
Bay-breasted Warbler	May 10		S		
Canadian Warbler	May 11		C	Yes	
Redstart	May 12		C	Yes	
Water-Thrush	May 12		C	Yes	
Black-throat Blue Warbler	May 18		C		
Red-eyed Vireo	May 19	Sept. 29	C	Yes	
Wood Pewee	May 21	Sept. 16	C	Yes	
Nighthawk	May 22	Sept. 1	C	Yes	
Black-billed Cuckoo	May 22		F	Yes	
Indigo Bunting	May 26		C	Yes	
Palm Warbler	Sept. 29	Oct. 13	S	No	
Red-breasted Nuthatch		Dec. 1	S	No	
Snow Bunting		Mar. 17	F	No	
Pine Grosbeak		Mar. 18	F	No	Common during March
Golden-Crowned Kinglet		April 20	C	No	
Redpoll		April 28	F	No	
Tree Sparrow		May 11	C	No	
Tree Sparrow	Aug. 22		S		
Red Crossbill		June 21	F	No	
White-winged Crossbill		June 21	F	No	

W. F. N. C. Bird Record.

BY MR. J. ALLAN, JR., ALMA, ONT.

NAME OF BIRD	First Seen	NAME OF BIRD	First Seen
Prairie Horned Lark	Feb. 18	Crested Flycatcher	May 6
Crow	Feb. 19	Yellow Warbler	May 6
Herring Gull	Mar. 17	Black & White Warbler	May 6
Bluebird	Mar. 19	Yellowlegs	May 6
Song Sparrow	Mar. 21	Chimney Swift	May 7
Killdeer	Mar. 27	Veery	May 7
Red-shouldered Hawk	Mar. 27	Redstart	May 7
Red-breasted Nuthatch	Mar. 30	Chestnut-sided Warbler	May 9
Slate-colored Junco	Mar. 30	Baltimore Oriole	May 9
Bronzed Grackle	Mar. 31	Whip-poor-will	May 10
Robin	Mar. 31	Red-headed Woodpecker	May 10
Canada Goose	April 1	Northern Yellowthroat	May 11
Meadowlark	April 3	Red-eyed Vireo	May 12
Marsh Hawk	April 4	Osprey Rare	May 14
Red-winged Blackbird	April 4	Osprey (last seen)	May 15
Cowbird	April 5	Myrtle Warbler	May 14
Vesper Sparrow	April 5	Blackburnian Warbler	May 16
Belted Kingfisher	April 5	Cape May Warbler Rare	May 17
Belted Kingfisher (last seen)	Dec. 24	Cape May Warbler (last seen)	May 23
Phoebe	April 5	Oven-bird	May 18
Northern Flicker	April 5	Ruby-throat Hummingbird	May 18
Yellow-bellied Sapsucker	April 5	Magnolia Warbler	May 19
Cooper's Hawk	April 6	Canadian Warbler	May 19
Towhee	April 6	Bay-breasted Warbler	May 21
Swamp Sparrow	April 9	Catbird	May 21
Winter Wren	April 11	Nighthawk	May 22
Purple Finch	April 13	Black-poll Warbler	May 23
Bittern	April 16	Wood Pewee	May 23
White-throated Sparrow	April 19	Yellow-billed Cuckoo	May 24
Savannah Sparrow	April 20	Tree Swallow	May 26
Barn Swallow	April 26	Indigo Bunting	Juue 1
Great Blue Heron	April 30	Morning Warbler	June 3
Black-throated Green Warbler	May 3	Pied-billed Grebe	Sept. 4
Kingbird	May 3	Ruby-Crowned Kinglet	Oct. 1
Hermit Thrush	May 4	Rusty Blackbird	Oct. 12
House Wren	May 4	Hooded Merganser	Oct. 27
Brown Thrasher	May 4	Wilson's Snipe	Oct 29
Pipit	May 4	Snow Bunting	Oct. 21
Pipit	Oct. 12	Pine Grosbeak	Nov. 16
Water-thrush	May 4	Tree Sparrow	Nov. 20
Black-throated Blue Warbler	May 5	Northern Shrike	Nov. 30
Bobolink	May 5	Redpoll	Feb. 27
White-crowned Sparrow	May 6	Pine Grosbeak	Mar. 7
White-crowned Sparrow	Sept 29	Snow Bunting	Mar. 26
Bank Swallow	May 6		

Publications Reviewed.

MAMMALIAN ANTAMONY, with Special Reference to the Cat, by Alvin Davison, 2nd Editor, Review of Books, P. Blakiston's Son and Co., Philadelphia.

This work can be recommended as a manual for use in Colleges in discretion of the cat, and also as a handbook for the high-school teacher to use to supplement less complete works.

The treatment of the anatomy of the cat is full and detailed, and the cuts are of high quality. Explicit directions for the preparation of the animal for dissection are given .

Reference to the physiology, histology and general characteristics of mammals are freely given throughout the book.

A. B. K.

FOOD OF OUR MORE IMPORTANT FLY-CATCHERS. By F. E. L. Beal. Bulletin No. 44, Biological Survey, U. S. Dept. Agr.

In this Bulletin Dr. Beal discusses very thoroughly the food-habits of most of the North American Tyrannidae. He shows that as a group they are beneficial, the only harm they do being to eat parasitic Hymenoptera, while they consume quantities of injurious insects. All the Fly-catchers are nearly exclusively insect-eaters.

In spite of the bad reputation which the Kingbird has among bee-keepers as a destroyer of bees, only 61 honey bees were found in the 665 stomachs examined, and of these 51 were drones.

The Phoebe is found to be wholly beneficial, and thus to merit the position it holds in the affections of the people.

The Wood Pewee eats a good many parasitic Hymenoptera, but destroys enough noxious insects to compensate for this loss, and the same is true of the Least Fly-catcher.

This Bulletin is greatly enhanced by four colored plates by Louis Agassiz Fuertes.

A. B. K.

FOOD OF SOME WELL KNOWN BIRDS OF FOREST, FARM AND GARDEN. By F. E. L. Beal and W. E. McAtee. Farmer's Bulletin, No. 506, U. S. Dept. Agr.

This Bulletin is supplementary to Farmer's Bulletin, No. 54. "Some Common Birds in Their Relation to Agriculture," as it deals with species which are common in various localities and which were not treated of in the former bulletin.

The Arctic Woodpecker is shown to be one of the great conservators of the forest, as 77.13 per cent. of its food consists of wood-boring insects.

The Yellow-bellied Sapsucker is pronounced injurious, not so much because of the small number of trees which it kills, but on account of the injury to timber which results from its work. The holes which it drills through the cambium causes distortion of the grain, formation of knotty growths, cavities, staining and resin deposits. Defects due ot Sapsucker work have been found in 174 species of trees, and in 90 of these the defects are sometimes so serious as to spoil the appearance of workability of the wood.

The Chipping Sparrow and Slate-colored Junco are pronounced wholly beneficial.

The White-rumped Shrike is found to eat some small birds and some beneficial insects, but on the whole to eat enough injurious insects to render it a beneficial species.

The Ruby-crowned Kinglet is shown to be very useful as a check upon minute insect pests of the forests and orchids.

A. B. K.

FIFTY COMMON BIRDS OF FARM AND ORCHARD. Farmer's Bulletin, No. 513. N. S. Dept. Agr.

This Bulletin will prove an extremely useful one as it not only gives much concise information as to the economic status of several of the commonest North American Birds, but also contains excellent colored pictures by Louis Agassiz Fuertes of these birds, which will enable the reader to identify them at a glance.

A. B. K.

MISSOURI BOTANICAL GARDEN. Twenty-third Annual Report, 1912.

This volume of the Report contains some excellent botanical papers.

In "Sap Density and Freezing Points of Leaves" W. N. Ohlweiler reaches the conclusion, "That extreme differences in sap density, in general, are accompanied by a corresponding difference in their resistance to freezing." "That in plants of the same genus, or varieties of the same species, differences in sap density correspond to differences in their resistence to freezing."

From his studies on "The Relation of Algae to Dissolved Oxygen and Carlon Dioxide," C. O. Chambers concludes that "There is an intimate and mutual relation between the algae and submerged aquatics in a body of water and the gases dissolved in that water. They fluctuate together."

"Air, or its constituents O and CO^2 are as essential to water plants as water is to land plants, and equally difficulty to secure. Warm and stagnant water is poorer in these essentials than colder water gently agitated by wind or currents."

"Some species demand more acration than others."

"Filamentous forms with large cells and thin outer walls are best adapted to stagnant water."

"The photosynthesis of rapidly-growing algae and aquatic plants in a body of water may diminish or deplete the supply of CO^2 and and increase the oxygen content beyond saturation."

On the absence of free CO^2 the plants may utilize half bound CO^2 of the dissolved bicarbonates, chiefly those of calcum and Maynasium."

"Stagnant water, on account of the large amount of CO^2 and the small amount of oxygen, favours the formation of colonies and filaments rather than of free individual cells."

"Aeration apparently favours the formation of Chlorophyll; and algae are brighter green when well aerated."

"The periodicity of spore formation is not readily influenced by aeration or gas contest of the water. It seems to be more a matter of heredity."

A. B. K.

FOREST CONDITIONS OF NOVA SCOTIA. By B. E. Fernow, Commission of Conservation, Canada, 1912.

The report embodies the result of "an attempt to take stock of one of the natural resources of one province."

Dr. Fernow says "When it is realized that fully two-thirds of the area of the Province consists of non-agricultural land covered with forest growth or not fit for any other use than timber growing, and that this forest resource, which furnishes not less than four to five million dollars in value of product annually is in danger of exhaustion within the next two decades, the importance and propriety of the inquiry into the character and possibility of continuing it, can hardly be questioned."

Speaking of estimating growth, Dr. Fernow says: "Most extravagant ideas exist as to the rate of growth of trees, observations of single trees in the open being taken as a basis to be translated into performance by whole acres of trees." "Some 550 trees were analyzed as to their rate of diameter growth. From these measurements it appears that to produce a spruce tree 12 inches in diameter on the stump, may require from fifty years for the most favoured trees, to one hundred and seventy years for trees which had for a long time to compete for light with their neighbors. Twelve years to form an inch of wood may be considered an average performance in the natural woods."

In concluding his report the writer says: "Here is a natural resource capable under proper management, of forever producing by annual increment, as interest, at least twice as much as is now being cut from capital stock, a resource which, basing its value on reasonable rates of growth, both of wood and of wood values, may reasonably be stated as representing a potential capital of at least $300,000,000."

Dr. Fernow finally makes several recommendations as to how the forests may be conserved.

A. B. K.

BIRD LORE. Vol. XIV., Nos. 1—6.

This volume contains many excellent articles, among them being "The Duck Hawk on the Palisades," by W. C. Clark; "A Bluebird Study," by L. Claude, in which is recorded the most unusual action of a nestling of the first brood helping the parents in feeding the second brood, "A list of Trees, Shrubs, Vines and Herbaceous Plants Native to New England, Bearing Fruit or Seeds Attractive to Birds" by F. H. Kennard and Phoebe vs. Catbird—A study in adaptability by A. A. Allen in which it is shown how the Phoebe meets and masters an unusual situation while the Catbird is nonplussed by it. The Educational Leaflets of the Audubon Society are continued and in tis volume E. H. Forbush, J. Grinnel and Francis Allan are among the writers of these little monographs, while the colored plates accompanying them are excellent. We are pleased to notice that our Canadian bird artist, Allan Brooks, is now doing some of this work. His full-page plates of the Yellow-headed Blackbird, Hudsonian Curlew, and Willow Ptamigan are excellent. The volume is profusely illustrated with numerous fine colored plates and photographs of remarkable merit.

A. B. K.

THE WILSON BULLETIN. Vol. XXIV., Nos. 78—81.

Many articles of interest to Ornithologists of the Great Lake Region are contained in the 1912 numbers of this excellent quarterly. "A Study of the Avifauna of the Lake Erie Islands," by Lynds Jones, is a useful supplement to work on Point Pelee. "A Study of the Home Life of the Brown Thrasher," by Ira N. Gabrielson, is a valuable contribution towards our knowledge of this species. "A Robin's Roost," by A. J. Stover, is an account of a piece of woods at Northfield, Ohio, where Robins congregate in immense numbers for the night during August and September. There are also many short ornithological notes of interest in these four numbers.

A. B. K.

The Programme of the Wellington Field Naturalists' Club for the Winter of 1913.

"Game Protection"..... .....By Mr. A. Kelly Evans—Jan. 16

"Concealing Coloration in the Animal Kingdom"
By Prof. J. W. Crow—Jan. 9

"The Poisonous Mushrooms in Ontario in 1912"
By R. E. Stone, Ph.D.—Jan. 23

"Beekeeping in Various Lands" (*Illustrated*)
By Mr. Morley Pettit—Feb. 6

"Progress and Method of Teaching in the Schools"
By Prof. S. B. McCready—Feb. 20

"Bird Study for the Beginner" (*Illustrated*)
Mr. W. E. Saunders, London—Mar. 1

"Ferns and their Haunts"..... .....By Prof. J. E. Howitt—Mar. 6

"A Botanical Subject..... ....By Mr. T. J. Moore—Mar. 20

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