TRANSACTIONS

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On the Flora of McNab's Island, Halifax Harbour, N. S.: Part 1, General Notes; Part 2, Work in Special Orders; Part 3, Narcotisation of Plants; Part 4, Occasional Notes.

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(Read 13th. November, 1905.)

Part I.—General Notes.

It is not my intention to deal fully with the flora of this island. I intend rather to just mention some of the principal things which struck me personally, leaving it to others who know the locality much better than I do, to fill in the details in after years, if this has not been already considerably done by observers in the neighbourhood of Halifax.

When we consider the position of the island, its size, the winters which occur, and the presence of the ocean around it, I think that we have on it a most wonderful variety of flowers, and the botanist may there find plenty of work to do in all departments. for he comes across woodland, littoral, meadow and sea plants growing in profusion within a small area.

One great peculiarity that one notices, is that the woodland plants descend right on to the shore, even to high-water mark,

and in fair numbers also. Never do I remember seeing so many woodland plants on one shore before, especially on the side of an island or district exposed to a good deal of the force, tides and winds of the Atlantic ocean, as is the case on the south side of the island looking out towards Devil's Island. Here at high tide one may cull raspberries with the water coming over one's boots, pick *Scutellaria* on the same spot, watch the milfoils growing in grand profusion and to a great height—as much as 3 to 4 feet or more. Then we have rock roses, not really littoral plants, everywhere, and at the proper season the margins are decked with masses of purple irises, so that one feels inclined to call the island " a garden of irises," for it is not only on the shore they are to be seen, but all over it. Grasses and sedges dip in the water and seem to enjoy the tide rippling over them. Other plants we find are rose-root, sea pea, sea rocket, sedum, asters, scarlet pimpernel, and the white nightshade, the evening primrose, and many more too numerous to mention. Another peculiarity which I noticed was the comparative poverty of the *Fucaceæ* on the shores, that is of species which find their habitat there. On the shore opposite Lawlor's Island, one meets with a couple or so of varieties of the *Melanophyceæ*. On the side towards the ocean opposite Devil's Island, it is about the same, a stray *Fucus vesiculosus* or *F. serratus* and *Laminaria;* while on the shores looking towards Halifax, practically none are to be seen. Along Meagher's Beach we do find various kinds of *Fucus, Florideæ*, etc., but nearly all these are washed up by the tides; few are settlers. Most shores exposed to the ocean are covered more or less with a sea-flora of a beautiful and varied character. The above flora generally appears to be that of brackish water rather than of the true sea type, or true fresh water one.

So far as the land flora generally is concerned, if I went into it in detail, it would occupy a paper by itself, therefore my remarks will of necessity be brief and general. Ferns are

numerous, but considering the nature of the island, a greater variety would have been expected, and that is by no means the case. Mosses are few in variety also, while among the *Equisetaceæ* there are several species. The *Coniferæ* are much as on the mainland, though the hemlock is very rare, and I found it only in one spot on the island.

Looking now for a moment on the Phanerogames of the island, it is curious to note the immense unmbers of beautiful violets, and a contrasting absence of their little allies, the wild pansies. I saw but one specimen of the *Hypercineæ*, which is peculiar, as they are very common on the mainland.

The island evidently is a veritable garden, in the season, for raspberries, and this brings me to suggest that it appears to me that McNab's Island might easily be converted to some good use as a spot wherein to grow various crops for economic purposes. Take, for instance, raspberries: the island is well suited for their production; they were very plentiful and of good size this last summer, wild as they are. With a little attention what quantities could be placed on the market in Halifax; there would be little or almost no train or transport rates to cut down the producer's results. Again, from the quantities or irises growing on it, the island is evidently well suited for the growing of them. Would it not be possible to manufacture a cheap and beautiful violet ink, stain, or dye from their rich, velvet perianths? I obtained some good purple writing fluid by a process of extraction from some this last summer, which had the property of darkening on exporsure to sun and rain. I had not time to complete my experiments, however, and the effect of time on the ink on paper can only be judged by how it will look in a year or two's time, and under various conditions of climate, etc., so that I do not intend to make public any results for the present.

Strawberries and blueberries run wild, and what I said about raspberries applies equally to the former. I think the island would also yield grasses for baskets, mats and such like

contrivances, though probably not in the same quantities as might be obtained easier from elsewhere.

The fungi of the island are very numerous and varied. Seldom, if ever, have I seen, certainly not in colour, so many *Basidiomycetes* and *Gastromycetes;* they are beautiful, too, in many instances.

Lichens also are abundant, but with neither of these did I have much to do. What notice I did take of the mushrooms will be referred to in my notes at the end of this paper.

These few general observations are all I wish to offer on the flora generally. I have looked at it from my own point of view, and though probably I have told you nothing new, possibly I have suggested a new light in which to consider it.

This brings me to Part II. of my subject, in which I deal with work specially done in one or two orders. The results may not appear large, but only a few plants can be dealt with carefully in a season. The work done is, as in a previous paper I read before the Institute a couple of years ago, mainly on variation.

Part II.—Work in Special Orders.

Primulaceæ.

Trientalis Americana. Star flower.—One of your commonest spring flowers. 500 specimens at least examined, and on that data results given. Variations in calyx and corolla practically none. In a few specimens one sepal was normally absent. It was in the stamens the variations occurred. In 77 specimens I found 7 stamens in each; in 167 specimens I found 8 stamens in each; in 205 specimens I found 6 stamens in each; and this latter number seems to be the most usual number of stamens present. In 17 specimens I found 5 stamens in each; in 34 specimens I found 4 stamens in each. It is curious to

notice, however, that while you had seven stamens present, often with eight petals; in the case of those with eight stamens the reverse did not hold good. Nearly always when eight stamens were present, eight petals and eight sepals were. Those in which the stamens were below seven, had petals and sepals usually normal, and no corresponding decrease in numbers.

Oxalidaceæ.

Oxalis acetosella. White wood-sorrel.—The number of specimens examined ran into hundreds, but I have lost the exact number. On going through a very large number I found so very little variation, so directed my attention to the descriptions of this plant in floras and compared them with what I noticed for myself, and I think that a modification of those descriptions is desirable, for they do not appear to be full enough or accurate enough in some respects, judging from the results I have obtained after examining at least four hundred or more plants.

The following is the flora's description:—Low herbs with an acid juice and alternate compound leaves, the three leaves obcordate, and drooping in the evening; flowers long, heterogonus; sepals, obtuse; petals, pink, rarely white, veined with deep pink; capsule, subglobose, glabrous; seeds, ovoid, longitudinally grooved.

It is the petals which need a modified description:—Calyx and corolla regular. Petals, unequally divided apex, or as an alternate description, are unequally cordate. Petals may be white, but more usually they are tinted with purplish-pink, due to the ramifications of veins. The veins are of a darker purple-pink than are the petals, usually seven to eight in number, never more on each petal; they start from an orange-yellow corona situated close to the base of each petal.

The remaining description of the flower is an ample one, and does not appear to require to be changed.

Rubiaceæ.

Houstonia cærulea. Bluets.—Quite one of the commonest earlier flowers of the season. 1500 specimens examined, mainly collected on McNab's Island, but some on the mainland in this instance.

There is not much variation in the outer whorls of the flower; flowers with six instead of four petals were met with in a couple of dozen instances, and four or five had as many as seven.

The one great variation I noticed was seen in the length of the style and the number of the stigmas. In the floras, the flower is described as having one style and two stigmas. Now I have found a heterogony of styles in these flowers. One variety has a long style with two stigmas; the second variety has a short style and most usually one stigma. The former I hold to be the one usually described in our books on flora.

The latter I have ventured to distinguish from it by giving it a new name—*Houstonia cærulea var. Piersii*—after your esteemed secretary, Mr. H. Piers, who has aided me in so many ways in this kind of work.

The description, therefore, of the style in this new variety may be said to be as follows:—*Style*—Short, not longer than three-quarters, at most, of the length of the corolla tube. *Stigma*—Single nearly always, but two may be present which are partially united half way up their dorsal aspects.

This new variety I have found is based on the fact that practically one-third of the flowers examined presented these variations. They arise, too, not quite irregularly, for tufts of flowers occur in which all the flowers consist of one or other variety quite separate from those large patches where both kinds may be found indiscriminately.

Iridaceæ.

Iris versicolor. Blue flag.—Subject to little variation. 250 examined. The variations occurred in the flat, petaloid, arching stigmas. In 160, the stigmas possessed two irregular lobes at the apex, which may be considered to be what usually happens; 66 specimens had three lobes; 20 specimens had but one lobe. In four specimens I found one stigma absent, and in these the corresponding stamen was also absent.

Sisyrinchium angustifolium. Blue-eyed grass.—300 specimens examined. I have practically nothing new to add to what I said about this flower in a paper read before this society two years ago. I have not examined so many specimens of this plant this year as I did then, but the results work out the same. There was but one new feature I noticed, and that occurred only in six or eight specimens—it was the presence of little wings on the divisions of the perianth, one on each side.

A question was asked me at the time I read my last paper, which then I could not reply to. I now wish to say the cotyledons have nothing whatever to do with the variations observed; rather it is, as in *Iris versicolor* as well, a selective effort on the part of the flower to increase its surface area to attract certain insects more frequently and suitably, and it depends, I think, on that instinctive faculty, unconscious perhaps in a sense, which I believe animals and plants possess in common, though in varying degree, to reproduce more and more of their kind, even to the detriment of others, if not obtainable otherwise.

Caprifoliaceæ.

Linnæa borealis. Twin flower.—400 specimens examined. No variations worth noting were seen. This flower is one of the most regular plants I have ever examined, and its beauty is only enhanced by its modesty.

Ericaceæ.

Moneses uniflora. One-flowered pyrola.—This peculiar flower, which is the last I have to offer any special notes on, appealed to me much, on account of its prominent anthers, and the apparent want of conformity in the arrangement of its stamens; so much so, that I looked up different floras to see if I could find out what was the most usual arrangement of the whorl. I could not find anything on this subject, so I have undertaken to try and determine what is the most usual arrangement, and in this case, since I have a number of figures to deal with, I will say only that over 1,000 specimens were examined, and the following are the conclusions I arrived at:—(1) that the stamens are in one whorl; (2) the corolla may be complete or incomplete—that is, with five petals or less.

Considering now the flowers from the view that the stamens are ten or less, I want you to look at them as *regular* or *irregular*. Let us first consider the regular flowers:—

(*a*) Regular flowers, with corolla complete. By far the larger majority have the following arrangement of stamens in the whorl, 3, 2, 2, 2, 1. The next commonest is a variation on this, 3, 2, 2, 1, 2. Then come, some little way behind, another arrangement—3, 1, 2, 3, 1, and its variant, 3, 1, 3, 2, 1. Then in order we get 2, 2, 2, 2, 2, and far behind, and in only a few instances, comparatively speaking, 3, 2, 1, 1, 2, 1; 3, 3, 3, 1; 3, 1, 3, 1, 1, 2.

(*b*) Regular flowers with incomplete corolla.—The above arrangements hold good because only one or two flowers were met with in which the corolla was incomplete, and they possessed only four petals.

Let us now consider the irregular flowers:—

(*c*) Irregular flowers with corolla complete.—The usual arrangement was for one of the last pairs of stamens to be absent, if we consider the arrangement to be 3, 2, 2, 2, 1—

thus we get 3, 2, 2, 1, 1. Nine stamens, instead of ten. Next come those with only seven, and then those with eight.

(*d*) Irregular flowers with corolla incomplete.—The usual arrangement is one of eight stamens to four petals—2, 2, 1, 2, 1. Speaking generally, there is much variation in the arrangements among the irregular flowers, the following being the commonest:—

3, 2, 2, 1, 1. 3, 2, 2, 2. 3, 2, 1, 2, 1. 2, 2, 2, 1, 1, 1. 3, 1, 2, 3. 2, 2, 2, 2, 1.	9 stamens in the whorl.
3, 2, 2, 1. 3, 1, 1, 2, 1. 3, 2, 1, 2. 2, 2, 1, 2, 1.	8 stamens in the whorl.
2, 2, 2, 1. 3, 2, 2.	7 stamens in the whorl.
3, 1, 1, 1.	6 stamens in the whorl.

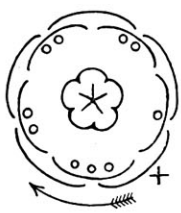
No other variants of any consequence noticed, so that these may be held to be the principal arrangements and numbers of stamens in the flowers.

In the irregular flowers with incomplete corollas, I wish to point out that the numbers of the petals present in the corolla weee usually four or five, and the sepals were decreased in a similar ratio. The carpellary leaves also were decreased in much the same manner.

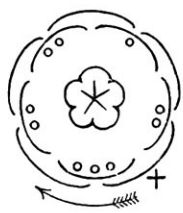
Having given the conclusions obtained, it will be necessary to show you practically how these results have been got at, how I started from a certain part of the whorl and went round it. Take the much more usual arrangement, 3, 2, 2, 2, 1. I always began with a three which I presumed to be on the side nearest to me, and passed round the whorl from right to left;

if I went the reverse way I would only get the above result reversed; but in all cases where three's were present I started to work from that number.

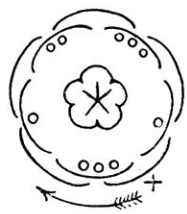
Look at these floral diagrams of flowers of the regular type with complete corollas. I passed round in the direction of the arrows from the spot marked by an x opposite a three.



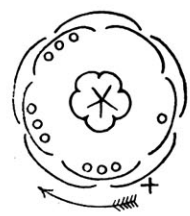
3, 2, 2, 2, 1.
Fig. I.



3, 2, 2, 1, 2.
Fig. II.



3, 1, 2, 3, 1.
Fig. III.



3, 3, 3, 1.
Fig. IV.

Of course it was only by observation for a while previous to systematically proceeding, that I found the most suitable spot to start from. I did the same when a two came first.

While doing this special work, one or two other peculiarities were sometimes observed in the stigmas.

The stigma is usually described in books on flora as "large and peltate, with five narrow, acute, radiating lobes." In a certain number I noticed that the lobes were only four in number, and in about a dozen or more, the stigma itself as a whole assumed a claw-shaped form like that of a bird, and was sessile.

In conclusion, briefly reviewing the results of the staminal arrangements, let me say that in nearly half the specimens examined, 3, 2, 2, 2, 1 was the formula, and consequently it is the normal arrangement of the ten stamens present. Then came its variant, and the other formulæ make up the remainder.

PART III.—NARCOTISATION OF PLANTS.

This part of my paper consists of a few experiments made on wet days when outdoor work could not be well done. The plants used were mostly common ones found on the island, and chloroform was the narcotic used. In many cases several experiments were done with the same kind of plant. I do not claim that the results gained are as accurate as they might be, but looking over some works on physiology of plants, I can say this, that certainly some of them are borne out as correct to a great extent; and remember, I was in camp with only rough contrivances to work with. I am satisfied myself with my results, but in any case I hope it may prove interesting to you to hear them. I take the flowers used in no special order; will say what I did, briefly, and sum up results afterwards.

Moneses uniflora.—Specimens dry. Placed in lethal chamber entirely; that is, with only the air in the chamber. Narcotic given. Flowers changed in colour to light brown in two minutes; corolla, brown; anthers, untouched; carpels blackish, styles and stigma untouched. In half an hour all parts of flower dark brown.

Trientalis americana.—Specimens dry. Placed in chamber as in former case exactly. Little change in half an hour; flowers just a little flaccid.

Oxalis acetosella.—Specimen dry, and put into chamber as in previous specimens. Almost at once the leaves fell down and drooped; the petals of the flower curled back, instead of in, as in sleep, in ten minutes. The flower became limp, but colour remained unchanged. The leaves later opened again, but remained flaccid. Compare these results with normal sleep.

Specimens moistened with water and placed in the chamber. Effects less, leaves affected the most. Flowers became limp, but colour unchanged in ten minutes.

Moss.—Quite unaffected in ten minutes, or half an hour.

Cypripedium acaule.—Specimens dry when placed in chamber. Affected in five minutes; the other greenish lobes, the perianth, becoming discoloured and droop. Other effects proceed very slowly indeed, it taking two to three hours to bring results. Curious to say, the flowers transpired more or less under the influence of the narcotic, and the final result is difficult to obtain,—complete anæsthesia as it were.

Hieracium canadenis.—Specimens dry. Flowers began to be influenced in 15 minutes. Completely under influence in 20 minutes. Stems below the head absolutely limp, so that the flower head hung sharply down. The strap-like rays became dark yellow, but not closed as in sleep; they remained one-half to one-third open, and slightly curled on themselves. Another curious effect was observed in this plant, that when a specimen was placed dry, and just as it had been plucked, and not under the influence of the narcotic, in a chamber free from narcotic, but in which also was a narcotised orchid, this latter plant seemed to affect the hawkweed, which became drowsy and closed as in sleep, more or less.

Potentilla tormentosa.—Specimens used dry. In ten minutes the leaves were affected. The flowers closed in twenty minutes.

Drosera rotundifolia.—Specimens dry. In ten minutes leaves became flaccid and curled backwards. The tentacles became irregularly twisted and crossed. Recovery from influence took place if flower was placed in soil after a time, which was most unusual in those flowers I experimented upon.

Specimens moistened or wet. Flowers more tardy about coming under influence of the narcotic. At the end of fifteen minutes, slight discoloration, but no closing of flowers or drooping of the tentacles for fifteen minutes more, and then it was incomplete. Leaves behaved as in previous experiments. Here again the results differed from those obtained when ordinary stimuli are applied.

Onoclea sensibilis.—Fronds drooped in ten minutes. Pinnæ curled back.

Chrysanthemum leucanthemum.—Specimens dry. Heads began to droop in twenty minutes, when the root is present. Heads without root drooped and closed, leaves darkened and became limp in eight minutes.

Head with roots present, roots in lethal chamber completely, but head and leaves outside chamber in fresh air. Little affected. Leaves became slightly discolored, and flower just began to close in two hours.

Cornus canadensis.—Specimens dry. Very resistant. No effects in one hour. In one and a-half hours leaves just began to turn yellowish. In two hours quite yellow. These flowers sometimes transpire slightly under the influence of narcotic.

Trifolium pratense.—Specimens dry. Leaves affected in ten minutes, becoming nearly black, and limp. The flowers changed to purple from red in 28 minutes. Scent disappeared first and early, in five minutes. Changes completed in one hour.

Prunella vulgaris.—Specimens dry. Very rapidly affected. Flowers turned brown and became limp in five minutes or less. Leaves darkened. Results same, whether roots were present or not.

Iris versicolor.—Specimens dry. Flowers drooped in 15 minutes. Transpired slightly.

Sedum acris.—Affected in five minutes.

Sarracenia purpurea.—Specimens slightly moist and wet. Flowers affected in fifteen minutes, drooping. Discoloration slight. Leaves not affected for a longer time.

Ranunculus acris.—Specimens dry. Heads drooped and became a darker yellow in twenty minutes; leaves changed to a deep olive colour, and became limp in ten minutes. In specimens in which the roots were in lethal chamber and heads in fresh air, leaves closed in ten minutes, but were not discolored. The flowers were unaffected for a long time.

Taraxacum officinale.—Specimens dry. Flowers closed in ten minutes; closing complete.

Stellaria media and *Cerastium arvense.*—Specimens dry. In 25 minutes flowers began to droop and close slightly; leaves were unaffected. In 30 minutes flowers were closed completely. No discoloration of flowers or leaves.

Fragaria virginiana.—Specimens dry. Resistant. Only semi-narcotised in one hour.

Arctostaphylos uva-ursi.—Specimens dry. Influenced only slowly. Leaves discolored, but not limp, and flowers semi-closed in one hour. Specimens moistened, results the same.

Trifolium repens.—Specimens dry. Scent disappeared in seven minutes. Leaves drooped in ten minutes and became brown. In one hour the flower is seen to have its florets mostly lying with their apices pointed outwards instead of upwards as when fresh.

Habenaria lacera.—Specimens dry. Flaccid generally in ten minutes. Flowers brown in 15 minutes.—Specimens wet. Flaccid generally in 15 minutes. Flowers brown in half an hour.

Chrysanthemum leucanthemum and *Oxalis acetosella* were both placed with their leaves and flowers in air, but with their roots in chloroform fluid. In the case of the former, the chloroform seemed to act as a stimulant; the flowers thrived in it for 24 hours. In the latter, however, the leaves fell in ten minutes, and the flower drooped soon after. These were the only plants experimented with in this way.

The conclusions drawn from these few rough experiments were as follows, but they must not be considered conclusive, but rather as incentives to others to more accurately work up this physiological section:—

Conclusion I., is that some flowers are more sensitive to the influence of the narcotic than others, and in various degrees and times, even when removed from its direct influence.

II.—It is through the leaves, flowers and stem that this influence acts, more than by the roots, for often when applied to the latter, the results take longer to arrive at. Sometimes it even appears to act as a stimulant when applied directly to the roots.

III.—Colour is always affected practically, and purple flowers and leaves seem to be more influenced than a good many lighter ones.

IV.—In many instances, the results obtained are more or less the opposite to those seen when natural influences, such as wind, rain, heat or cold are applied. They are also the reverse of natural sleep.

V.—Some flowers transpire under the influence of a narcotic, and those which do most are the hardest to be affected.

VI.—Though I have not mentioned it in my experiments, flowers slightly under the influence of a narcotic may recover if removed from it; those deeply under it rarely, if ever, do.

VII.—Cell contents become altered. Granules may become disorganized or swell.

The practical reasons for my experiments are the same as so many others have done them for, and resolve themselves into three questions—What are the best flowers and plants for a town or house in and around which noxious chemical products are formed? Which are those least likely to be affected by soot, dust, harmful vapours, etc., containing narcotising elements? How may we still keep our towns and parks beautiful under such conditions? These simple experiments with wild flowers throw little light, I grant, on such things, but possibly one or two ideas may be gained, although similar experiments accurately conducted have often been done, which may be the stepping stones to greater efforts on the part of those who are interested in the beautifying of their native city, and who can teach those

in slum-land the simple methods of keeping in the way of thriving, their few window plants, possibly their only knowledge of the country beyond the city's outskirts.

PART IV.—OCCASIONAL NOTES ON FLORA OF McNAB'S ISLAND.

Early fruit.—A ripe blackberry was found by me and eaten on July 20th, before I saw ripe raspberries.

Instances of similarity in colour and shape between various plants.—A couple of strawberry flowers which were found in different spots, but in both cases in the middle of a patch of *Oxalis acetosella,* had taken on the purple-white or pink colour of this latter flower, and both had only four petals. At a distance they were indistinguishable from the *Oxalis,* and it was only by chance, when picking these flowers, I noticed those of the strawberry.

Linnæa borealis I found quite white in the middle of bunchberries.

The *Basidiomycetes,* or mushrooms and toadstools of the island also in many instances seem to take on the colour of plants near which they grow; whether it is due to assimilation of colouring matter from such plants which can be quickly elaborated by these fast-growing fungi, or what is its special use I cannot say. For protection it cannot be; for fertilisation purposes it is very nearly unnecessary. As instances of what I mean I give the following, which I saw myself:

I saw a concolvulus flower trailing close to the ground; beside it was a toadstool, purple-red in colour, with a dirty white mottling as well, and a slight dimple on the upper surface of the pileus. The convolvulus flower was almost exactly the same in appearance, the white of the flower being dulled also. Moreover the opening of the tube of the corolla was so closed that one would say it was more like a fissure or dimple. At the first glance I thought both flower and toadstool were both the latter.

Another instance: I was passing some bunches or iris leaves, the veins of which are usually purplish in colour. Close to, in fact touching, them was a stump of what looked to be the remains of another bunch of leaves. I knocked it with my foot and found it was the stipe and partially unopened cap of a toadstool. The purple of the latter was exactly the same as the former.

So have I seen orange-yellow coloured ones growing close to the yellow loosestrife, bright red ones among the red bunchberries, perfectly white ones near the Indian pipe, and so alike were they that they could not be distinguished till you were right upon them. Little, tiny white specks of toadstools among the moss, near where other little white flowers abound; variegated near where variation in many colours abound.

Of course many occur in situations quite independent of such conditions, but a certain number do find their habitat according to the above, and many other instances I have not noted.