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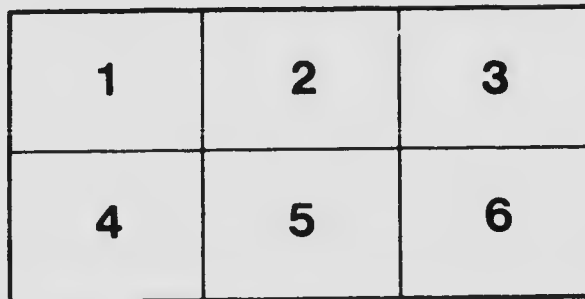
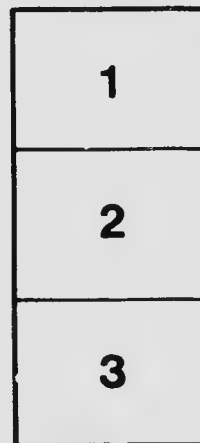
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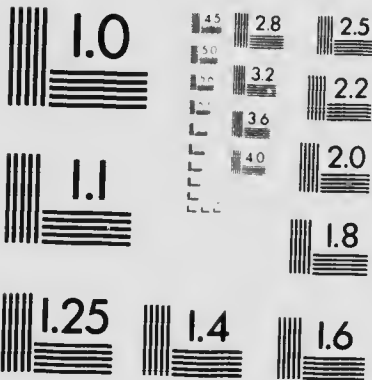
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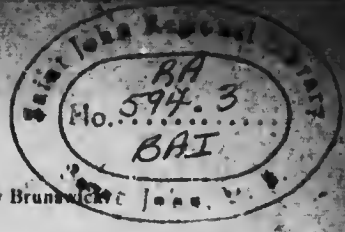
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ARTICLE III.

THE LAND SNAILS OF NEW BRUNSWICK.

BY GEORGE WHITMAN BAILEY.

Read November 4th, 1902

(CONTRIBUTION FROM THE FREDERICTON NATURAL HISTORY SOCIETY.)

INTRODUCTION.

*Historical.*—Although the marine mollusca of New Brunswick, and indeed of the shores of all Acadia, have been very carefully studied and listed, the land and fresh-water molluscs, on the other hand, have been almost totally neglected. This is due to several causes: 1st, because they are less often met than those of the seashore, being hidden from the eyes of the casual observer by their inconspicuous coloring, their usually small size, and the fact that they lie concealed beneath the decayed twigs and leaves of the forest; or some stump, chip or stone by the wayside; or among the vegetation at the bottom of a placid pool: 2nd, from their lack of economic importance.

Robert Willis, the first Nova Scotian zoologist, zealous in his study of the marine forms of life in the vicinity of Halifax—a lover of shells and a keen observer—could not fail to observe and study the land and fresh-water shells that came to his notice, so that we find him incorporating in his list of marine shells, several land and fresh-water forms. To him belongs the credit of first systematically studying our native forms, and publishing a list of them. His last list was published in 1863, and so far as the writer can ascertain, nothing has since been written concerning them. The present list is the first to be published in this province, and gives the results of the systematic study of the land shells undertaken by Messrs. Geoffrey Stead, W. D. Matthew and the writer, extending over a period of fourteen years.

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The necessity of a list of our provincial land snails arises not alone from a desire to have a perfect knowledge of our local natural history, but from the fact that, excepting the Maritime provinces of Canada, nearly every portion of the continent has been carefully and systematically studied. Apart from the few species listed by Willis, and one or two others mentioned in Binney's Manual, nothing has up to the present been known of the terrestrial mollusca of our Maritime provinces. The faunas of the New England states have been so carefully studied, and that of Labrador, Quebec and Ontario, that it is easy to determine what forms can be found here, especially after one obtains a knowledge of those species inhabiting Maine and the Gaspé peninsula contiguous to our borders. A careful comparison of the present list with one comprising the forms found in Maine and Quebec shows that but few species remain to be recorded from New Brunswick, probably less than a dozen. The number cannot be stated absolutely, as species normally found within certain limits, may be found as varieties in localities more or less remote. Species reported as occurring usually no farther north than southern Maine, have been found in localities much farther northward—so that there is a possibility of their being found here.

It must be borne in mind that our local species are in no way peculiar to this province, but that our fauna is intimately associated with that of the state of Maine,—in fact identical with that of the northern portion of that State. Both are included in the fauna of the northern region. The term "provincial forms" is only used for convenience, to express those species found within our borders, to which the present paper relates; and in no way implies that they are peculiar, or confined to this province. The distribution of species is not governed by arbitrary, fixed, inter-provincial, or international boundaries, but by topographical and climatic conditions. The term is simply used for the purposes of study. So closely related are the faunas of Nova Scotia and Prince Edward island to our own, that I would suggest that the term "Acadian Province" be used to designate those forms found within the limits of these provinces.

I wish to gratefully acknowledge the help received in the preparation of this paper from Dr. W. D. Matthew of New York, and Mr. Geoffrey Stead of St. John, for lists, specimens, and notes of those species collected by them in the vicinity of St. John; to Dr. Whiteaves, Geological Survey Department, Ottawa, for his kindness in confirming the identification of all the specimens in my possession; to Dr. W. F. Ganong, of Smith College, Northampton, Mass., for aid received, and Mr. S. W. Kain, of St. John.

The nomenclature adopted in Binney's Manual has been followed. For particulars concerning the continental distribution and origin of our native species, the student is referred to Binney's Manual of American Land Shells (Bull. U. S. Nat. Mus.) The New England species of land snails are considered by Morse in the American Naturalist, Vol. I.

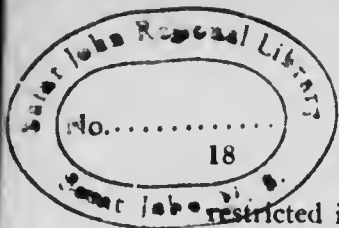
#### LOCAL DISTRIBUTION OF NEW BRUNSWICK SPECIES.

We may sharply divide the species of land snails found in New Brunswick into two groups: Those introduced into our province at our seaports through the agency of shipping,—the foreign, or *introduced* forms; and those native to the province and continent, the *indigenous* forms. In the present section we are only concerned with the factors which determine the spread, or check the distribution, of species within our borders, and not with the origin of the several species, and their spread into New Brunswick from other portions of the continent.

Although most of our indigenous forms are probably pretty generally distributed over the province in localities suited to their growth and multiplication, we find that certain agencies are at work tending to distribute them over ever widening areas, while still others tend to localize them.

#### *Causes of Distribution.*

*Natural Spread.*—A species of land snail, if in suitable surroundings for its growth, rapidly multiplies and spreads over a gradually increasing area, and this will go on until the species is



restricted in its spread by some physical barrier, such as encompassing mountains, altered vegetation, or some condition unfavorable to its growth.

The rapidity of the distribution of some species undoubtedly depends in part on the tendency of the species to wander. Some migrate to considerable distances from their original home.

*Physical Conditions.*—The climate of New Brunswick is too uniform over the province, to affect in any marked degree the distribution of our land snails, although it is not unlikely that the differences in climate between our inland counties and those of the seaboard, determine differences in the development, abundance and distribution of species. Temperature and moisture would be the factors at the base of any such difference, rather than the nature of the soil. It must be noted that each species of land snail has its own individual peculiarities—each has a habitat where it thrives best, and the species vary greatly in the surroundings best suited to them. While some flourish in a low, marshy, grass-covered region, others are only found on elevated lands still others thrive only in the midst of a forest; others in pastures, under stones, or chips by the wayside. A species naturally inhabiting low, swampy land, would be unable to thrive on elevated land, or to pass over a mountain barrier, whereas a species thriving in a hilly country would be unlikely to do so in a marsh. Species vary much in their adaptability to *changes* in their surroundings, and while some are very susceptible, and consequently are restricted in range and very much localized; other more hardy forms, are able to adapt themselves to unfavorable conditions of soil and vegetation.

The nature of the soil, degree of moisture, character of the vegetation covering it, are the important factors which influence, in our province, the spread of any particular species. A species may be very generally distributed over the province, and yet be confined to high land, or to marshes, or to the woods, according to the habit of the species.

*Transportation.*—It is not unlikely that snails have been carried by the agency of the railway, or by boat to more distant parts, concealed in wood or cargoes of various kinds. They have been



known to be transported alive for long distances in the cargoes of vessels; as eggs, or, as the adult snail, in timber, sawdust, etc. They possess very great vitality. In this province many are undoubtedly carried from place to place in the carting of wood, or carried down our streams by the lumber. In the annual spring freshets the water, which sweeps over the islands and intervale land, must carry away the shells.

Birds are responsible for the distribution of species. This is well seen in the case of introduced species, which are brought into our seaport towns, and generally spread inland from the point where they were introduced. The finding of these shells some distance from the coast, often on some elevated land, suggests that they have been carried there by birds.

#### *Check to Distribution.*

The non-migratory tendencies of some forms of land snails tends to localize them, as well as unfavorable conditions of soil, vegetation and moisture.

The clearing of large tracts of country of its natural vegetation, causes the disappearance of the species once found there. Cultivation in this country means extermination. The change in vegetation of any area, *e. g.*, from a grove to pasture land, may only determine a difference in species. Moisture is essential to many species, and the clearing of a large tract may cause the soil to be so dry in the summer season, that the snails cannot subsist upon it.

Fires determine an almost total destruction of species in the area burnt over. The snails are consumed and the surface soil rendered devoid of its covering of decaying vegetation. Many millions of snails were destroyed in the great Miramichi fire, and the same thing annually goes on over the entire province in isolated forest fires, involving areas of greater or less extent. The nature of the fire probably affects the growth and abundance of species, rather than the character of the fauna.

Appended is a table of localities and collectors. Where the name of the collector in any locality does not correspond with the table, the collector's name is inserted in the list.

## LIST OF LOCALITIES QUOTED IN THIS PAPER AND COLLECTORS' NAMES.

Lawlor's lake, St. John Co., . . . . .	W. D. Matthew, Geoffrey Stead.
Portland, St. John, . . . . .	W. D. Matthew, Geoffrey Stead.
Ashbrook, King's Co., . . . . .	W. D. Matthew, Geoffrey Stead.
Fredericton, York Co., . . . . .	W. D. Matthew, Geoffrey Stead, G. W. Bailey.
Tobique river, Victoria Co., . . . . .	Geoffrey Stead.
Carleton Co., . . . . .	Geoffrey Stead.
S. W. Miramichi river, . . . . .	Geoffrey Stead.
Restigouche river, . . . . .	G. W. Bailey.
Prince William, York Co., . . . . .	G. W. Bailey.
Marsh road, St. John Co., . . . . .	Geoffrey Stead.
Gordon's island, Kennebecasis river, . . . . .	Geoffrey Stead.
DeMill's "Bay Shore," Lancaster, . . . . .	Geoffrey Stead.
Taylor's island, Lancaster, . . . . .	Geoffrey Stead.
Quispamsis station, King's Co., . . . . .	W. D. Matthew.

## LIST OF THE LAND SNAILS OF NEW BRUNSWICK.

BY GEO. WHITMAN BAILEY.

**Mesodon albolabris.** Say.*(Helix albolabris.)*

Limestone region of Portland, (P. G. Hall): Islands of Keswick, Univ. of N. B. Museum: Mill Stream, F'ton, (G. W. Bailey): also found about Fredericton by W. D. Matthew; McLean's brook, Nashwaak river, (H. Bailey).

**Mesodon Sayii.** Binney.*(Helix diodonta, Helix Sayi.)*

Lawlor's lake; Portland; Fredericton, (Matthew); Tobique river, (Stead).

**Stenotrema Monodon.** Rackett.*(Helix monodon, Helix convexa, Helicodonta hirsta.)*

Lawlor's lake; Portland, St. John (Stead); Fredericton, (Stead, Bailey); Tobique river; S. W. Miramichi river; Centreville, Carleton Co. (Stead).

**Tachea hortensis.** Müller.*(Helix hortensis, Helix subglobosa.)*

Lawlor's lake; Quispamsis; bank above "Fern ledges," Lancaster, (Stead); Bay Shore, St. John, (Leavitt).

*Var. hortensis*—striped—Portland, (Stead); Bay Shore; Quaco? (Stead).

**Patula alternata.** Say.*(Helix alternata, Helix infecta, Helix dubia.)*

Lawlor's lake; Portland; Quispamsis; Ashbrook; Fredericton (Stead,

Matthew); Tobique river; Centreville, (Stead); Springhill brook, York Co.; Prince William, York Co., (Bailey).

**Vitrina limpida.** Gould.

(*Vitrina pellucida*, *Vitrina Americana*).

Fredericton, (Bailey); Ashbrook, (Matthew); Riverside; DeMill's field, Lancaster; Morrissey rock, Restigouche river (Bailey); Centreville, Carleton Co., (Stead).

**Zonites cellarius.** Müller.

(*Helix cellaria*, *Hyalina cellaria*, *Helix glaphyra*).

Mission Chapel yard, St. John, (Stead).

**Zonites arboreus.** Say.

(*Helix arborea*, *H. ottonis*, *Hyalina arborea*).

Lawlor's lake; Portland; Marsh Road, St. John; Quispamsis; Ashbrook; Gordon's island, Kennebecasis river; Taylor's island, Lancaster; Fredericton; Tobique river, (Stead); Prince William, York Co., Morrissey rock, Restigouche river; Stanley, York Co., (Bailey).

**Zonites viridulus.** Menke.

(*Helix electrina*, *Helix pura*, *Hyalina electrina*).

Lawlor's lake, (Stead); Ashbrook, (Stead); Taylor's island, (Matthew, Stead); Tobique river; DeMill's field, Lancaster.

**Zonites exiguus.** Stimpson.

(*Helix exigua*, *Helix annulata*, *Hyalina exigua*).

Ashbrook, (Matthew); Gordon's island; Taylor's island; Tobique river, (Stead); Fredericton, (Bailey); Mather's island, Kennebecasis, (Stead); Morrissey rock, Restigouche river, (Bailey).

**Zonites fulvus.** Draparnaud.

(*Helix chersina*, *Helix celsa*, *Helix fulva*, *Hyalina chersina*, *Conulus chersinus*).

Fredericton; Lawlor's lake; Ashbrook, (Matthew); Taylor's island; Portland; Gordon's island, (Stead); Quispamsis, (Matthew); Centreville, (Stead). Var. of *chersina* — Lawlor's lake, 1 specimen, (Stead).

**Vallonia pulchella.** Müller.

(*Helix pulchella*, *Helix minuta*, *Helix costata*).

Fredericton; Lawlor's lake; Portland, (Matthew); Marsh road, St. John; Quispamsis; Ashbrook, (Matthew); DeMill's field, Lancaster, (Stead).

**Patula striatella.** Anthony.

(*Helix striatella*, *Helix ruderata*, *Helix Cronkhiti*).

Lawlor's lake; Portland; Marsh road; Ashbrook, (Matthew); Gordon's island; DeMill's field, Lancaster; Taylor's island, Lancaster; Tobique river, (Stead); Fredericton; Prince William, York Co.;

Restigouche river, (Bailey); Chatham, (Stead); Carleton county; Watters' landing, King's Co., (Stead).

**Strobila labyrinthica.** Say.

(*Helix labyrinthica*).

Lawlor's lake; Portland, (Matthew); Quispamsis; Ashbrook; Fredericton, (Matthew); Centreville, Carleton county, (Stead).

**Helicodiscus lineatus.** Say.

(*Helix lineata*, *Planorbis parallelus*).

Quispamsis; Ashbrook, (Matthew); Gordon's island; Taylor's island; Watters' landing, St. John river, (Stead); Tobique river; upper S. W. Miramichi river; Centreville, Carleton Co., (Stead); Fredericton, (Bailey).

**Microphysa pygmaea.** Drap.

(*Helix pygmaea*, *Helix minutissima*, *Helix minuscula*).

Gordon's island, Kennebecasis river, (Stead).

**Succinea obliqua.** Say.

Portland; Taylor's island, Lancaster, (Matthew, Stead); Quispamsis; Fredericton; coast near St. John; Lawlor's lake.

**Succinea avara.** Say.

Coast near St. John, 5 specimens; S. avara? Ashbrook.

**Succinea ovalis.**

Red Head, St. John Co., (Stead); Ashbrook? (Matthew).

**Ferussacia subcylindrica.** Linn.

(*Helix subcylindrica*, *Helix lubrica*, *Bulimus lubricus*).

Lawlor's lake; Ashbrook; Quispamsis, (Matthew); Taylor's island, Lancaster; Marsh road, St. John; Gordon's island, 1 specimen; Tobique river; DeMill's field, Lancaster, (Stead); Fredericton, (Bailey, Stead); Prince William, York Co.; Morrissey rock, Restigouche river, (Bailey); Red Head, York Co., (Stead); Chatham, (Stead).

**Acanthinula harpa.** Say.

(*Helix harpa*, *Pupa costulata*, *Bulimus harpa*).

Morrissey rock, Restigouche river, 1 specimen, (Bailey).

**Vertigo Gouldii.** (Binney)?

Ashbrook, (Stead); Lawlor's lake, (Matthew?)

**Carychium exiguum.** Say.

Lawlor's lake, (Stead); Ashbrook, (Matthew); Gordon's island, Kennebecasis river, 1 specimen, (Stead); Tobique river, (Stead).

**Fruticicola hispida.** Linn.

(*Helix hispida*, *Hygromia hispida*).

Introduced from Europe. "The Marsh," St. John, 28th June, 1889, (Stead).

**Pupa corticaria.** Say.

Lawlor's lake; Ashbrook, (Stead).

## NOTES ON THE SPECIES LISTED.

## MESODON ALBOLABRIS—SAY.

LOCAL OR PROVINCIAL DISTRIBUTION.—This species has been found in several localities in York county, in the vicinity of Fredericton, both in hardwood groves (ex. locality at Mill Stream), and on islands (ex. Keswick); also found in the limestone region of Portland, St. John. This species seems better able to adapt itself to different conditions of life than our other native forms, which are, according to the species usually either limited to the woods or to the open country. The islands in the St. John, near Keswick, are not well wooded, the trees growing upon them being mostly confined to their borders, so that in these localities the species is more or less exposed. The limestone region of Portland should be a favorable locality for the growth of this species, owing to the abundance of calcium carbonate available for the construction of their shells, but the region, although constantly bathed in ocean moisture, cannot be regarded as well wooded.

It is presumed that the islands in the St. John, opposite mouth of Keswick, are referred to as the Keswick islands.

On further investigation this species will probably be found to be very generally distributed over the province, especially in rich woods, owing to its wide continental distribution.

REMARKS.—It is our largest indigenous species. In diameter, the shell measures one inch, but may exceed this in size.

## MESODON SAYII—BINNEY.

LOCAL DISTRIBUTION.—This species is reported from York, St. John and Victoria counties; hence from widely separated localities. It will probably be found on all the tributaries of the upper St. John, where the sides of the river valleys are steep, well wooded, and the soil rich, as well as upon the main river. The limestone region about St. John is very favorable to the growth of all the larger snails, owing to the lime required by them for purposes of growth. The high land is also favorable to the present species.

This species should be found eventually on the Miramichi and Restigouche rivers and their tributaries, as well as in other

parts of the province where the land is high, and conditions for growth favorable.

STENOTREMA MONODON—RACKETT.

LOCAL DISTRIBUTION.—Reported from St. John, York, Carleton and Victoria counties. It will be found to be pretty generally distributed over the province, but probably more abundant in some sections than others.

TACHEA HORTENSIS—MULLER.

LOCAL DISTRIBUTION.—This species, introduced into St. John by shipping, has spread in several directions from this centre, and is now found along the line of the Intercolonial Railway as far as Quispansis, a distance of eleven miles from St. John; at Lancaster; and along the "Bay Shore." We find both the striped and unstriped varieties about St. John. Mr. Leavitt sends me specimens of both from the "Bay Shore." In some localities the specimens are of either one or the other variety; for example, those collected at Lawlor's lake, six in number, were all unstriped. In Binney's Manual, p.12, will be found the following facts concerning the coloration of this shell:

"The few species of European snails which have been introduced retain their native habits. *Tachea hortensis*, for instance, which has been transplanted to some of the small islands in the vicinity of Cape Ann, is found there in countless numbers, literally covering the soil and shrubs. It is worthy of notice also, that each island is inhabited by a variety peculiar to itself, showing that the variety which happened to be introduced there has propagated itself, without a tendency to run into other variations. Thus, on one islet is found the yellowish-green unicolor variety, once described as *Helix subglobosa*; and on another, within a very short distance, we find a banded variety, and none others."

This subject is an interesting one for investigation in New Brunswick. The islands in the bay of Fundy and others along our eastern and northern coasts should be examined, and if found to contain this land snail should be each separately and carefully studied, in order to ascertain: 1st, whether or not the two varieties could be found on the same island, and if so, the relative abundance of each; 2nd, if the unstriped variety was peculiar to one island, while the striped was peculiar to another; 3rd, whether neighboring islands differed in this respect; 4th, the abundance of the species.

The island forms should be compared to those found on the mainland near at hand.

In regard to St. John, it is probable that there have been several importations of these shells, which might account for the two varieties being found in the same locality. It should be ascertained whether one variety only occurs from St. John to Quispamsis, in order to determine whether those at Lancaster and the Bay Shore are distinct importations brought to the west side.

The generally low, grass covered and marshy land of the "Marsh" is well adapted for the spread of this species. Even to Quispamsis the country is generally low and offers no barriers to its march. The wooded, rocky hillsides of the valley probably keep this animal within the limits of the low country. Its spread towards Red Head should be noted. It may have been first brought to the "marsh" by way of Courtenay Bay.

This species will continue to spread westward along the Bay shore, and its range should be determined.

For some distance, west of the so-called Bay Shore, the country, being generally flat and moist, and, for the most part, covered with shrubs, or, in places, swampy meadows, is, by its barren appearance, favorable to the spread of this animal. This species may have already crossed the high ground bordering on the valley of the St. John, in the rear of the "Bay Shore," and should be sought for in the vicinity of Fairville, where, although the conditions are unfavorable, it may have gained a foothold.

This species should be watched for at all points on our shores where shipping is carried on, such as St. Andrews, Musquash, St. George, Richibucto, Chatham, Dalhousie and Campbellton.

It occurs on the intervale land bordering Bear river, near the village of that name, and is liable to be found at any Bay of Fundy port. The specimens collected at Bear river were of the striped variety.

PATULA ALTERNATA—SAY.

LOCAL DISTRIBUTION.—Has been reported from St. John, York, Victoria and Carleton counties. At Prince William I found specimens in an open field, where a gully was kept moist by a thin

grove of trees and a small brook. It is found also in forests in plenty, and seems to be gregarious, like *H. monodon*, in habits, but more so. Moisture is necessary to its welfare.

Will be found generally distributed over the province; abundant in certain localities.

HABITS.—This species is not confined to the woods, but occurs in open fields, where the ground is moist, and shelter is at hand; also upon islands.

VITRINA LIMPIDA—GOULD.

LOCAL DISTRIBUTION.—Has been found in York, St. John, Restigouche, Carleton, and a portion of King's county. Probably very generally distributed, and common on low, marshy land throughout the province.

ZONITES CELLARIUS—MULLER.

LOCAL DISTRIBUTION.—The only specimens found so far in the province were collected by Mr. Stead at the southern end of Paradise Row, St. John. They should be sought for in other parts of the city.

They are liable to be found at all our seaport towns.

ZONITES ARBOREUS—SAY.

LOCAL DISTRIBUTION.—Very common, and universally distributed over the province. At present, reported from St. John, Kings, York, Victoria, Restigouche counties.

HABITS.—This shell is found along our country roadsides under fallen tree trunks, as well as in the woods.

ZONITES VIRIDULUS—MENKE.

LOCAL DISTRIBUTION.—Reported from St. John, Kings and Victoria counties. It is probably abundant in York county, as well as in other parts of the province. Owing to its resemblance to *Z. arborea*, it has probably been overlooked in some cases—being mistaken for that species. It is found associated with *Z. arborea*, under chips of wood or leaves, in damp places near the water. It has one whorl less than that shell, the last one rapidly dilating, its apex is not depressed, its structure is thinner, surface more glossy, and its umbilicus somewhat smaller. On its upper sur-



face it appears to be identical with *Z. indentatus*, while on the base its resemblance to *Z. arboreus* is striking.

ZONITES EXIGUUS—STIMPSON.

LOCAL DISTRIBUTION.—Reported from York, Victoria, St. John, Restigouche and Kings counties. The shell seems widely distributed, but cannot be considered as plentiful in any of the localities from which it is reported, as shown by the following observations: Taylor's island, 1 spec.; Tobique, 2 spec's; Gordon island, 7 spec's; Ashbrook, 3 or 4 spec's. In the vicinity of Fredericton this shell is scarce.

ZONITES FULVUS—DRAPARN JD.

LOCAL DISTRIBUTION.—Reported from St. John, Kings, York and Carleton counties. It should be generally distributed over the province. Not uncommon in York and St. John counties.

HABITS.—They are found in hardwood groves under decaying tree trunks, maple trees being, apparently, most favorable to them. They also frequent damp places near the water's edge, hiding under fragments of wood, and are often found under layers of damp leaves in the forest.

VALLONIA PULCHELLA—MULLER.

LOCAL DISTRIBUTION.—Generally distributed over the province. Abundant in St. John and York counties.

REMARKS.—Common about fields, scarce in woods. It is often found, in considerable numbers, on the banks of streams, in the grass, and in other open, damp situations.

PATULATA STRIATELLA—ANTHONY.

LOCAL DISTRIBUTION.—This species is very common all over the province. It may be found in hardwood forests, especially under large, lately fallen tree trunks. It is also found in more open places, such as country roadsides, sheltered by logs or small pieces of wood.

*Patula striatella* and *Zonites arborea* are the most common land snails in New Brunswick. It is difficult to say which is most abundant, but I think *Zonites arborea* is more commonly met with.

It is abundant in Victoria, York, St. John, Gloucester and Carleton counties, the only ones so far studied.

STROBILA LABYRINTHICA—SAY.

LOCAL DISTRIBUTION.—Reported from St. John, King's, York, and Carleton counties. Not uncommon in York and St. John counties. Probably generally distributed over the province.

HELICODISCUS LINEATUS—SAY.

LOCAL DISTRIBUTION.—It is reported from St. John, King's, York, Carleton and Victoria counties. Probably generally distributed over the province; and not uncommon.

REMARKS.—This species is found under the bark, and in the crevices of wet, decaying hardwood logs. It may also be found under layers of leaves in forests, and along roadsides.

MICROPHYSA PYGMAEA—DRAP.

LOCAL DISTRIBUTION.—At present only reported from Gordon island, Kennebecasis river. This shell is probably not uncommon in the counties studied, but owing to its extreme minuteness has been overlooked. It should be generally distributed over the province.

REMARKS.—This is our smallest land shell, measuring only six-hundredths of an inch.

SUCCINEA OBLIQUA—SAY.

LOCAL DISTRIBUTION.—Reported from St. John, and York counties; common in both. This species is very common at Fredericton.

Probably common, and universally distributed over the province.

REMARKS.—The genus is world-wide in its distribution. *Succinea obliqua* prefers moist situations, but it is also spread abroad upon the hillsides. At Fredericton specimens may be collected in very swampy ground along the side of the railway below College Grove, while in the grove above, where the land is high, we find them under decaying tree-trunks.

I have kept these animals in aquaria, but found that before they had been in the water long they would commence to climb

up the sides of the vessel containing them, and reaching the surface of the water bend over in order to expose the lung to the air. They had a tendency to crawl from the vessel.

SUCCINEA AVARA—SAY.

LOCAL DISTRIBUTION.—At present reported from but two localities—coast near St. John; Ashbrook, King's Co. The specimens from Ashbrook are doubtful, but the five specimens of *Succinea* collected on the coast, near St. John, have been determined as *Succinea avara* by Dr. Whiteaves. When our species of *Succinea* have been more closely studied, the distribution of the three species occurring in the province will be more accurately determined. The many variations in the shape of the shells of each of the species renders their identification, in many cases, very difficult.

HABITS.—Found under stones and fragments of wood in damp places, but, like *S. obliqua*, also found on hillsides far removed from water.

SUCCINEA OVALIS—GOULD.

LOCAL DISTRIBUTION.—Reported from Red Head, St. John Co., and Ashbrook, King's Co. Those from Ashbrook doubtful. This shell is probably pretty generally distributed over the province in swampy regions, but has been overlooked, or confounded with *S. obliqua*. It should be carefully watched for in those situations to which it is confined. All specimens of *Succinea* should be very carefully observed—and subjected to the descriptions given of the species in order that variations, which are liable to occur, may be noted.

HABITS.—“This species seems to be confined to the margin of pools in wet grass, and is often found clinging to the leaves of aquatic plants in ponds.”—*Morse*.

FERUSSACIA SUBCYLINDRICA—LINN.

LOCAL DISTRIBUTION.—Reported from the following counties: York, St. John, a portion of King's, Victoria, Gloucester and Carleton. Probably generally and abundantly distributed over the entire province.

HABITS.—This species is found in the forests under decaying leaves, also under stones and in grass by the wayside. I have found them abundant under railway sleepers where these were rotting in swampy ground. This species is quite abundant in some places under cedar bark.

ACANTHINULA HARPA—SAY.

LOCAL DISTRIBUTION.—I collected a single specimen of this shell at Morrisey Rock, Restigouche river, in the summer of 1899. It is not reported from any other locality. The shell was collected, with other varieties, on the hillside above the rock, in a hardwood grove where the soil was very dark in color and rich in mould. This shell probably occurs in many other localities where the soil is rich and well wooded; although it will not be common or very generally distributed in the province.

VERTIGO GOULDII—BINNEY.

LOCAL DISTRIBUTION.—The only specimens collected were found at Lawlor's lake and Ashbrook. There is some doubt as to their identity. The shell of this species is only one sixty-sixth of an inch in length, while the other species of the genus are also exceedingly minute. It is, on this account, very difficult to distinguish with certainty one species from the other—the main distinguishing mark in each being the arrangement of the teeth around the aperture of the shell. The shells have been sent to an expert for identification. There are several species of *Vertigo* in New England. Six of these are liable to occur here, but it will take some time, and very close searching, to find them and get them properly identified. The present list is most defective in this genus.

REMARKS.—It occurs in woods and groves under leaves. The animal has no tentacles.

Mr. Stead reports that *V. Gouldii* (?) is common at Ashbrook late in the year when it is found on the under side of dry wood along the freshet line on the intervalles.

CARYCHIUM EXIGUUM—SAY.

LOCAL DISTRIBUTION.—Reported from St. John, Victoria and King's counties. Is probably generally distributed over the province.

REMARKS.—This species is air breathing, but amphibious in its habits. It is not included in Binney's Manual. It is found in very wet and boggy places in woods. Owing to its amphibious habits and the very wet localities where it is found, it has probably been overlooked in the search for land snails. Its distribution in the province will be better known when it has been more carefully looked for.

## FRUITICOLA HISPIDA—LINN.

LOCAL DISTRIBUTION.— This species has been introduced into St. John. Mr. Stead found several specimens on "the marsh," St. John, in the month of June. Its distribution over this area of land should be studied. The specimens were collected near on old barn under boards, and from grass; the locality being a mile from the city.

## PUPA CORTICARIA—SAY.

LOCAL DISTRIBUTION.—Reported only from Lawlor's lake and Ashbrook by Mr. Stead. It is probably not uncommon in other parts of the province, but, up to the present, has not been observed.

REMARKS.—Dr. W. D. Matthew states that species of *Pupa* are surprisingly scarce about St. John. "I found more, in one or two trips near New York, than all I came across in New Brunswick."

## CONCHOLOGICAL NOTES.

(The following notes on the land snails of St. John and vicinity are taken from note-books kindly furnished me by Mr. Stead, and represent the results of his observations for the years 1888 and 1889).

1888.

## MESODON SAYII, Binney.

Not common about St. John, but abundant on the Tobique river. Infrequent at Lawlor's lake.

## TACHEA HORTENSIS, Müller.

Lawlor's lake, common; "Bay Shore," stripes different.

(NOTE.—In addition to the unicolor variety of this species found at Lawlor's lake, it is evident that the striped variety also exists here, although the two may be locally separated).

STENOTREMA MONODON, Rackett.

Common at Lawlor's lake.

PATULA ALTERNATA, Say.

Lawlor's lake, common; specimen from Ashbrook.

VITRINA LIMPIDA, Gould.

Abundant in orchards, where it is found in company with a *Succinea* (*S. obliqua*, young?) around the base of tree trunks; also abundant in the wooded intervalles of the Tobique.

PATULA STRIATELLA, Anthony.

Found alone in pine woods, near Dark lake, late in the season.

STROBILA LABYRINTHICA, Say.

Common at Lawlor's lake; Ashbrook, two specimens.

HELICODISCUS LINEATUS, Say.

Not uncommon about St. John.

In 1888—Watters' landing, 1 specimen; Tucker's road, 2 spec's; Ashbrook, 6 spec's; Taylor's island, 1 sp.

ZONITES FULVUS, Draparnaud.

The variety of this shell found at Lawlor's lake (see list) resembled both *S. labyrinthica* and *Z. fulvus*. It is between them in size. Mouth narrower than either. Six whorls flatter than *Z. fulvus* of six whorls. Larger than full grown *S. labyrinthica*.

These species are found in woods and uncultivated places, being common at Lawlor's lake above the fresh-water marl, and the small kinds with *P. alternata* in the damp leaves and decayed wood of Lawlor's lake and Ashbrook.

## PUPA CORTICARIA, Say.

Mr. Stead reports this species from Lawlor's lake and Ashbrook. I have not seen the specimens.—(G. W. B.) I collected 100 specimens in one afternoon.—(G. S.)

## ZONITES FULVUS, Draparnaud.

Found in leafy woods, with alder and elder bushes. Lawlor's lake woods. I collected some shells beside the road near Everside, under a damp board near alder bushes. At Taylor's island I found them under old spruce bark. At Ashbrook under old logs by the side of the road near the field.

1889.

March 31st.—Land snails on "the marsh" not out yet, except perhaps *Succinea*, a few of which were found under stones by the railway, with the mouth of shell covered by a translucent shining operculum. The animal became lively after being kept a day or two in the house.

April 7th to 21st.—The warm spell between these dates brought out of the land snails, for *Ferussacia subcylindrica*, *Zonites arboreus*, and others were common at Marble cove.

Four specimens of *Helix cellaria* (*Zonites cellarius*) lived all winter in the house in a glass jar with earth and ashes, and a sunflower root at the bottom. They seemed to eat the small roots of the sunflower, also the sprouts from sunflower seeds and a bean.

Either on April 25th or the night between April 25th and 26th, one of the animals in captivity layed ten eggs, and on the night between the 26th and 27th of April it layed five more. They are round, slightly flattened, opaque, white bodies, about the size of a mustard seed.

About nineteen were counted later on in the day (27th April).

On the 26th May I found a young light-colored shell with a piece of white egg-shell sticking to it, in the jar. The animal was alive and may have been hatched for some days.

The shells of the eggs of *H. cellaria* are brittle and of the color of hens' eggs. Just before being hatched the animal is surrounded with a watery substance, and has a shell of one complete turn, or perhaps more than one (?).

#### HELIX STRIATELLA.

Seems to be the hardiest of wood snails, being latest to go into the ground in autumn, and among the earliest to come out in spring. It is found almost everywhere, except in well cultivated fields, and often, as in spruce woods, by itself.

#### SUCCINEA.

Is the hardiest of our land snails in cultivated ground. It is our earliest, and is widely distributed.



