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NOTES ON THE LAND MOLLUSCA OF DE GRASSI POINT, LAKE SIMCOE, AND OTHER ONTARIO LOCALITIES.

By E. M. WALKER, F.R.S.C., University of Toronto.

When the Royal Ontario Museum of Zoology was opened in the spring of 1914 it was our first aim to assemble such material as was available for the formation of a collection illustrating the Canadian fauna. One of the groups in which this material was found to be conspicuously lacking was the land Mollusca and to supply this deficiency the writer decided to spend a part of the summer of 1915 in making the nucleus of a collection of our local species of land snails and slugs.

I am not a malacologist and I am well aware that in collecting in an unfamiliar field one is sure to overlook many species, if the collecting is done without some previous knowledge of the fauna and of the habitats of its various members. I therefore endeavoured to familiarize myself with the subject as far as circumstances would permit and made an effort to determine each species as soon as possible after it was collected. Had this not been done there is no doubt that many of the more minute forms would have been overlooked.

The season of 1915 was unusually cool and wet and thus proved to be a very favourable one for land Mollusca. Most of the summer was spent at De Grassi Point, on the west shore of Cooke's Bay, Lake Simcoe, about three and one-half miles from the upper or southern end of the lake. A few days were also spent at Go Home Bay (Bushby Inlet), on the east shore of Georgian Bay, and some collecting was also done in the vicinity of Toronto and at Port Rowan and St. William's, near Long Point, Lake Erie. During the season of 1916 a number of species were collected by Miss Norma H. C. Ford in the vicinity of Toronto and she has kindly permitted me to include her records with my own.

As the greater portion of the collection was made at De Grassi Point and is believed to contain a nearly complete representation of the species found there it may be worth while to describe briefly the

general features of this locality in so far as they affect the character of the molluscan fauna.

The Lake Simcoe district differs considerably from that of Toronto in its flora and fauna, which is of a more northern character, due to its comparative remoteness from the modifying influence of Lake Ontario and its somewhat greater elevation, Lake Simcoe being about 475 feet above Lake Ontario. Whereas Toronto may be said to be on the edge of the Carolinian or Upper Austral Zone, Lake Simcoe is typical of the Alleghanian or Transition Zone. The shores of the lake are almost everywhere low and flat and in the vicinity of De Grassi Point are for the most part inclined to be more or less swampy. The existence of the "Point" is due to the presence of a somewhat higher area of boulder clay forming an angular prominence, the shores of which face north and east to southeast respectively. The lake banks rise abruptly to a maximum height of about ten feet near the apex of the prominence but gradually descend on either side to the usual low level.

The clay area is connected with the higher land farther from the lake by a sand-covered ridge, which follows a southwesterly direction roughly parallel to the lake shore for about three-quarters of a mile. On the southeast side of the ridge there is a gentle slope to the lake shore, while on the other side is an extensive area of low, densely wooded land, bounded on the north by the north shore of the "Point."

The tree growth of De Grassi Point consists of a mixture of deciduous and coniferous trees, presenting a considerable variety of forest types within a very limited area. The clay area is largely covered by a fine grove of red oak, particularly along the shore where the summer cottages are situated, while the characteristic trees of the sandy ridge, are red oak, white pine and balsam fir, although many other kinds are also present.

The southeastern slope is partly occupied by pastures but there is a considerable area of woodland, varying in character from a mixture of coniferous and softer deciduous trees, which prevail on the lower areas, particularly near the shore, to a typical hardwood forest on some of the higher parts of the slope. The prevalent trees of the former type are white cedar, balsam fir, aspen and balsam poplar, canoe-birch, elm, black ash, white spruce, etc., while in the typical hardwood areas sugar maple, beech, basswood, yellow birch and hemlock are the principal species, though many others occur. The extreme hardwood forest type is represented by a small area, wooded almost entirely with sugar maple and beech, with a scattering of other trees, such as butternut and basswood and having a very rich soil, as indicated by the larger size of many of the herbaceous plants, notably the red and white trilliums and adder's-tongues and the presence of several species such as the spring beauty and squirrel-corn, which do not occur elsewhere

on the Point.

This stretch of woods is the richest collecting ground for snails in the neighbourhood, particularly the maple-beech area just mentioned, which is the only spot where *Omphalina inornata* (Say) was found and where *Polygyra tridentata* (Say) and *P. palliata* (Say) are common. *Omphalina fuliginosa* (Griffith), *Vitrea multidentata* Binney and *Philomycus carolinensis* (Bosc.) were also frequently met with here but not often seen elsewhere.

The low land on the northwest side of the ridge extends to the lake on the north shore and its increasingly swampy soil is indicated in the gradual change in its tree growth from a mixture of poplar, birch, cedar, balsam fir, white pine and white spruce, etc., to a nearly pure stand of tamarack. In the opposite direction it passes into a somewhat open stand of poplar and birch with scattered conifers and other trees. This portion is a good place for many species of snails, certain forms such as *Polygyra thyroides* (Say) and *P. albolabris* (Say) being particularly common. Elsewhere this wood is very dense and not very productive of Mollusca, particularly in the tamarack swamp.

Half a mile west of the apex of the "Point" is a wide open marsh traversed by a sluggish creek, from which an interesting zonal distribution of vegetation can be traced back to the sandy ridge already mentioned. The creek rises in a small wooded ravine less than half a mile to the southwest and, until it reaches the open marsh, is a mere brook, following a devious course through woods, pastures and alder thickets.

The soil of De Grassi Point and the surrounding country is everywhere deep, there being no outcroppings of the bed-rock (Trenton limestone) but the higher parts are all plentifully bestrewn with boulders, chiefly of Laurentian gneiss.

It will be seen from the foregoing account that in spite of the general flatness of the district a considerable variety of conditions obtains in a very limited area (less than one square mile) and from a long acquaintance with the surrounding country I believe that nearly all the species of land Mollusca to be expected there will be found to occur at De Grassi Point or its immediate vicinity.

In the determination of the species of the following list I take pleasure in acknowledging my indebtedness to Mr. Bryant Walker of Detroit, Mich., who kindly examined the forms of whose identity I was in doubt. These included the species of *Vertigo*, *Euconulus*, *Strobilops* and *Gastrodonta* and several of *Vitrea* and *Bifidaria*. My determination of *Arion circumscriptus* Johnston was kindly verified by Dr. H. A. Pilsbry.

Since this paper was prepared for the press some additional collecting was done at De Grassi Point between April 27th and May

15th, 1917, and the data thus obtained have been included in the paper.

HELICIDAE.

1. *Polygyra tridentata* (Say). De Grassi Point, common but by no means abundant, occurring mainly in the hardwood bush, where maple and beech predominate. It was rarely seen elsewhere. Mature specimens were found from April 29th to September 20th. More abundant and generally distributed at Toronto. A single specimen was taken near St. William's, September 3rd, which was larger than those from the more northern localities.

2. *Polygyra fraudulentata* (Pilsbry). I found a large number of shells of this species on a steep wooded hillside at St. William's, September 3rd, where they were associated with *Gastrodonta intertexta*, *Polygyra thyroides* and *Pyramidula alternata*. They were distinctly smaller than the single specimen of *P. tridentata* from the same general locality, being of about the same size as the specimens of the latter species from Toronto and Lake Simcoe.

I have also seen a dead specimen of *P. fraudulentata* from the Don Valley, Toronto, taken on July 2nd, 1916.

3. *Polygyra palliata* (Say). De Grassi Point, rather scarce and almost confined to the beech-maple woods, though immature specimens were sometimes seen in the mixed woods. Adults were found only on June 23rd, July 25th. and September 20th. It is commoner at Toronto, Miss Ford having taken a number of specimens at several different stations in the vicinity of the city, and I also found it common in a rich hardwood bush near St. William's, September 3rd. It was not observed on the Giant's Tomb Island, although the locality appeared to be particularly favourable. It is probably near or beyond the northern limit of its distribution here.

4. *Polygyra albolabris* (Say). De Grassi Point, common and generally distributed, occurring in greatest numbers in the hardwood and poplar woods, but frequent also in the mixed deciduous and coniferous growth. Adults were apparently most numerous in June and early July and again in September. Occasional specimens of small size were found in somewhat dry or partly open grassy stations. They resembled the var. *maritima* in size but showed no other peculiarities.

This species is equally common at Toronto and was taken also at Go Home Bay, Giant's Tomb Island and near St. William's.

5. *Polygyra thyroides* (Say). De Grassi Point, about as common as *albolabris*, frequenting similar stations but apparently more partial to poplar woods, or mixed growths of poplar, birch, elm, cedar, balsam fir, etc., than the typical hardwood bush. Adults appeared throughout the season but seemed to be scarcer during August than at

other times. It has also been taken at Toronto and was abundant at St. William's.

6. *Polygyra sayana* Pilsbry. This species occurs sparingly at De Grassi Point, only five mature examples having been found. The dates of these are July 3rd, 25th, August 15th, 19th, September 20th. These were taken in both hardwood forest and poplar woods. I also took another specimen at Canoe Lake, Algonquin Park, July 26th, 1916.

7. *Polygyra fraterna* (Say). Adult and young individuals of this species were very common at De Grassi Point, throughout the season from April 27th to September 20th, particularly in the latter month and in early spring. It was very generally distributed in the woods. I found it also in a low wooded ravine at Go Home Bay, July 16th, and on Giant's Tomb Island, July 30th. It is also common at Toronto and St. William's.

CIRCINARIIDAE.

8. *Circinaria concava* (Say). De Grassi Point, common and generally distributed in moist woods, mature specimens occurring throughout the season. It is likewise common at Toronto, Miss Ford having collected a number of specimens in the vicinity of the city (Mimico, York Mills, Lambton and the "old Belt Line Cut"), from July 22nd to September 4th; I have also found it here in May. It grows to a larger size at Toronto than at De Grassi Point. I have observed this species feeding upon *Zonitoides arborea*.

ZONITIDAE.

9. *Omphalina fuliginosa* (Griffith). De Grassi Point, fairly common in the hardwood forests, adults having been taken from June 29th to September. When inactive they were usually found under dead leaves. I have also taken it in the vicinity of Toronto.

10. *Omphalina inornata* (Say). De Grassi Point, August 19th and 20th, four mature specimens from the maple-beech woods. These are the only specimens of this species that I have seen. It is one of the rarest species in this locality.

11. *Vitrina limpida* (Gould). During the latter part of June I first noticed the delicate shells of this species under boards and rubbish along the edge of a belt of trees skirting the lake shore at De Grassi Point. The ground here is low and the trees consist largely of tall elms, basswood, white cedar and balsam fir with nannyberry (*Viburnum lentago*) and hawthorns in the more open places and along the edge next to the pasture. Some young individuals were found with the shells but they were more abundant in the grass along the edge of the pasture, where it was necessary to lie down and examine the ground closely in order to detect them. These immature specimens grew gradually larger during the summer and full grown specimens were seen in September.

A single specimen of this snail was found by Miss Ford at Point au Baril, Georgian Bay, on August 11th, 1916.

12. *Vitrea cellaria* (Muller). This European species was found by Miss Ford in considerable numbers in the greenhouse of the Botanical Department of the University of Toronto. It was first noticed on February 16th, 1917. It had already been taken in Toronto many years ago by the late Dr. Wm. Brodie.

13. *Vitrea hammonis* (Ström). De Grassi Point, July 4th-24th, under logs, chips and bark in woods. It does not appear to be very common. It was also taken by Miss Ford in the vicinity of Toronto (Lambton and York Mills) in September.

14. *Vitrea binneyana* (Morse). Not uncommon at De Grassi Point, occurring with the preceding species in the hardwood and mixed forest. My specimens are dated from July 22nd to August 25th, but they probably occur throughout the season. It was also found on Giant's Tomb Island, July 20th, and Miss Ford took a single specimen at Point au Baril on August 16th, 1916.

15. *Vitrea rhoadsi* Pilsbry. Miss Ford took a fine specimen of this rare species in the "Belt Line Cut" Toronto, on August 28th, 1916.

16. *Vitrea indentata* (Say). A very few specimens were found in a wooded ravine at Go Home Bay, July 16th. It was not noticed elsewhere.

17. *Vitrea ferrea* (Morse). This pretty little ribbed form was occasionally found under bark and rubbish in the woods at De Grassi Point during July and August.

18. *Vitrea multidentata* Binney. This interesting little snail, so different in appearance from the other Vitreas, was found throughout the summer at De Grassi Point, occurring most plentifully in the hardwood, but nowhere abundant.

19. *Euconulus fulvus* (Muller). A specimen of this species was taken at Go Home Bay, July 16th, and it also occurred sparingly at De Grassi Point, but it was not distinguished in the field from the next species. The earliest adult was taken on April 29th, 1917.

20. *Euconulus chersinus polygyratus* (Pilsbry). A common little snail at De Grassi Point, where it is generally distributed in the woods, especially in more or less damp places. Adults were most plentiful during late June and July. Miss Ford found a single adult at Lambton (near West Toronto), September 4th, 1916, and an immature example at Victoria Park, Toronto, October 7th. I found it again in early May, 1917.

21. *Zonitoides nitida* (Muller). This dark-coloured snail occurs in abundance in open marshes at Toronto and De Grassi Point, where it is most easily found by turning over logs and boards. It was found throughout the summer and autumn.

(To be continued)

THE LAMPREYS OF EASTERN CANADA.

BY A. G. HUNTSMAN, B.A., M.B.,

Biological Department, University of Toronto,
Curator, Atlantic Biological Station.

The lampreys are of exceptional interest, owing to their peculiar structure and life history, as well as from the fact that they are the most primitive of vertebrates. Comparatively little is known concerning their distribution in our waters. It is therefore of interest to have the accessible records brought together.

I must express my indebtedness to Mr. C. W. Nash, Provincial Biologist, for the privilege of examining specimens from his collections in the Provincial Museum, to Prof. B. A. Bensley for access to the collection of the Biological Department, to Prof. A. Willey for enabling me to examine material in the Peter Redpath Museum, McGill University, to Mr. G. J. Desbarats, C.M.G., Deputy Minister, and Mr. A. Halkett, Curator, for material from the Fisheries Museum, Ottawa, Ont., and to Mr. F. Johansen for kindly examining specimens in the collection of the Victoria Memorial Museum, Ottawa.

Entosphenus wilderi (Jordan and Evermann). Brook Lamprey.

Syn. *Ammocoetes branchialis* (Auct. Amer.)

Lampetra wilderi.

Seven Islands, Quebec. (Huard, 1902, p. 169).

Northern and western streams of Ontario (?). Nash, 1908, p. 10).

Don River, York County, Ontario. (coll. Biological Department, University of Toronto and coll. Ontario Provincial Museum).

I have found it to be very abundant in the Don river near Toronto. Adults, both males and females, were taken during April in 1913, and on May 7 many were obtained. This is the breeding season, which, according to Gage (1893, p. 444), lasts usually from May 8 to May 20 in the tributaries of Cayuga lake. On October 20, 1913, an adult, 19 cm. long was obtained, and also a larva, 12½ cm. long, which is probably to be referred to this species. I have been able to examine a very complete series from Mr. Nash's collection, also from the Don river, consisting of immature adults, and mature males and females.

Regan (1911, p. 202) places this species in the genus *Entosphenus*, which he distinguishes from *Lampetra* by the presence of a semicircle of small teeth on the lower or posterior side of the buccal disk. This semicircle connects the last bicuspid teeth of either side. This character seems to be more constant than those used by Jordan and Ever-

mann (1896, p. 9) for separating the two genera. For example, *Lampetra* is said to have the extraoral teeth never tricuspid and yet *L. cibaria* is described as having the middle tooth of each side usually tricuspid. With their diagnosis of the genus this species is included.

Ichthyomyzon bdellium (Jordan). Silvery Lamprey.

Syn. *I. concolor*.

St. Lawrence river below Quebec (Fortin, 1864 as *Petromyzon*).

St. Lawrence river (Provancher, 1876, p. 262, as *I. castaneus*).

St. Lawrence river near Montreal (Huard, 1902, p. 169).

Go Home river, Georgian bay (Bensley, 1915, p. 9).

Brigham's Creek, Hull, Que., May 6, 1908, (coll. Canadian Fisheries Museum, Ottawa).

"North River, Ottawa" (coll. Peter Redpath Museum, McGill University).

Point Pelee, Lake Erie, 1913 (coll. Victoria Memorial Museum, Ottawa, No. 1012).

Lake St. Clair, 1882, from a pike (coll. Biological Department, University of Toronto).

Mitchell bay, Lake St. Clair, April 30, 1880 and 1883 (coll. Biological Department, University of Toronto).

I have been unable to obtain any examples from the drainage area of Lake Ontario. Its occurrence both in the St. Lawrence river and its tributaries and in the upper lakes makes it fairly certain that it will be found in the waters of Lake Ontario also. Much collecting has been done, however, in the waters of northern New York State, yet I know of no record of its occurrence there except at Cape Vincent on the St. Lawrence (Evermann and Kendall, 1902b, p. 235). To the northwest it has been reported from the Hayes (or Hill) river in Manitoba (Evermann and Goldsborough, 1908, p. 90), which is not far from the boundary of Ontario. It is probably generally distributed throughout northern Ontario.

Jordan and Evermann (1896, p. 10) state that the anterior lingual lamina in *Ichthyomyzon* is divided by a median groove, whereas Regan (1911, p. 199) gives it as "a single transverse denticulated ridge." In a series of specimens, ranging from 9.2 to 37 cm. in length, in no case is there an actual division of the lamina into two parts, but in all cases there is a median groove (deeper in the larger specimens), which is similar to that seen in *Petromyzon marinus*. In the latter, however, the teeth on the lamina appear to be distinctly longer. The lingual lamina would seem to be of no value in separating these genera.

Characters, in the specimens at hand, that distinguish this species are:

Dorsal fin continuous, with a broad, shallow notch.

Supraoral lamina with from two to four cusps (two in all cases except one, where there are four).

Infraoral lamina with from five to nine cusps (5, 6, 6, 7, 7, 7, 8, 8, 8, 8, 9, 9).

Lateral teeth all unicuspid (one specimen, 17.5 cm. long of doubtful origin has one bicuspid tooth on the left side and three on the right).

18 to 21 complete radial rows of teeth, counted on side next mouth (18, 18, 18, 19, 20, 20, 20, 20, 20, 21, 21).

The new species, *I. fossor*, described by Reighard and Cummins (1916) from Michigan, differs in a large number of points from this species. The most striking thing is the degeneration of the dentition, the radial rows being incomplete peripherally. There is at the same time an increase in the number of cusps on the infraoral lamina (8 to 10) and in the number of the radial rows (28 in the specimen figured). The latter character is to be found also in *Entosphenus wilderi*, which has a still further reduction in the dentition.

Forbes and Richardson (1908, p. 9) consider that the western form (*I. castaneus*) is not distinct from this. Illinois appears to be in the transition region between the two forms, which are evidently only geographical varieties. Somewhat over half of their specimens had bicuspid extraoral teeth.

Regan (1911, p. 199) has rightly restored Jordan's name (*bdellium*) for this species. Kirtland's name (*concolor*), under which this species has ordinarily gone, was based on a larva which may or may not have belonged to this species.

Petromyzon marinus L. Sea Lamprey.

This form is found on the coasts of the lower provinces and enters their rivers.

"Saint-Joseph de Levis," Quebec (Roy, 1906, p. 33).

Petromyzon marinus, var. *dorsatus* Wilder. Land-locked Sea Lamprey.

Syn. *Petromyzon marinus unicolor*.

Great Lakes (Wright, 1892, p. 439 as *P. concolor*).

Great Lakes (Nash, 1908, p. 9 as *Ichthyomyzon concolor*).

Lake Ontario (Nash, 1913, p. 249 as *I. concolor*).

Lake Ontario (Bensley, 1915, p. 10).

Port Credit, Lake Ontario (coll. A. R. Cooper).

Lake Ontario (coll. Provincial Museum).

This form has for Canada been reported definitely only for Lake Ontario. Bensley suggests that a large lamprey reported by fishermen from the upper lakes may prove to be this species. Wright's figure of the oral hood is definitely referable to this species, which was confused with *Ichthyomyzon bdellium*. The latter had been found in Lake Erie, therefore the distribution was given as the "Great Lakes." Nash's reference was similarly due to a misconception.

The chief points in which this species (both typical and land-locked varieties) differs from the preceding are the following,

Dorsal fins separated (except at the breeding season in the males, but the notch is always deep).

Four bicuspid teeth on each side of mouth.

Fifteen to eighteen radial rows of teeth on disk, counted next the mouth opening.

Jordan and Fordice (1886, p. 284) refer Dekay's (1842, p. 383) *Ammocoetes unicolor* to this variety. This is doubtful, since Dekay's description and name was based upon a larva from Lake Champlain. That it was the larva of this variety cannot be considered proved. Evermann and Kendall (1902a, p. 218) identify the *Ammocoetes unicolor* of Dekay with *Ichthyomyzon concolor* (= *bdellium*). Wilder's name *dorsatus* (in Jordan and Gilbert, 1883, p. 869) is therefore to be used for the land-locked variety of *P. marinus*, although based upon a character which is not distinctive of that variety.

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SOME NOTES ON ETHNO-BOTANY.

By F. W. WAUGH.

The number of things botanical employed by our Canadian Indian tribes, in spite of their non-agricultural tendencies, is not inconsiderable. These have to do with food, textiles, clothing, medicine, warfare, the hunt, ceremonial procedure, and, in fact, with almost every phase of their activities.

One of the most interesting of these uses of native raw materials is in connection with textiles and vegetable fibres for weaving, sewing or tying. It is not likely that any discoveries of great economic value will be made, but it would be interesting to note to what extent some aboriginal materials could be utilized in modern arts and handicrafts.

Several of our eastern woodland tribes, including the Ojibwa and the Iroquois, make, or formerly made, excellent bags for various purposes of basswood inner bark or bast. The Ojibwa of northern Ontario still manufacture these in a number of very pleasing colours and designs. The material is soft, flexible, possesses good wearing qualities and is easily prepared.

The first step in the process of bag-making is to pull off the bark from young trees in long strips, and then to detach the bast from the more brittle outer bark. The bast is then folded into small bundles and boiled for a while with wood ashes, or until it can be easily rubbed and shredded into a fine, soft material. A portion of this is twisted into a rather firm cord and used as the warp in an open twined weave, the woof consisting of larger rolls or wisps of the untwisted fibres, some of which are dyed and in this way worked into various patterns.

Other very good fibres, which are prepared and used in much the same way, are obtained from the outer portion of the stems of the swamp milkweed (*Asclepias incarnata*), also from various species of dogbane (*Apocynum*), and from the hemp nettle. These are taken in the fall or late summer when the stems are mature. Slippery elm bast is also employed.

An aboriginal tying material found quite plentifully around Ottawa is the bast of the leatherwood or moosewood (*Dirca palustris*). Farmers, in fact, sometimes use this for tying grain bags. It was formerly sometimes used by the Iroquois for the bow-string in the bow-drill method of firemaking by friction.

Swamp milkweed fibre is frequently used by the same tribe for pulling teeth. Its use is said to prevent the decay of those remaining.

Strings for bows in hunting and warfare were often made of the bark of young hickories twisted.

The Ojibwa around Lake Nipigon use the bark of one of the willows (*Salix humilis*) for attaching the anchor-stones and floats to nets.

A number of tribes use the long slender roots of the spruce, which are found just under the surface, for sewing canoes and in the making of birchbark utensils of various kinds. The roots are split so that each strip retains part of the smooth, rounded, outer surface; the heart, or inner portion being discarded. The strips are soaked or kept moist in sewing, holes being punched in the birchbark with an awl for the insertion of the sharpened end of the strand of root. The combination of the birchbark and the spruce root sewing or binding

material gives a very pleasing and decorative effect. The birchbark is kept moist, or used while fresh and is cut so as to form flat trays, oblong and round box-like articles; while some are made like buckets. A withe of some shrub, such as the alder or willow, is bound around the top to strengthen the edge. The birchbark is most easily detached in the spring. The bark of the common elm (*Ulmus americana*) is used by the Iroquois for basket or tray making. This is a very fine and beautiful material and is also taken off the tree in the spring. The rough corrugations on the outside are planed or pared-down somewhat to render the surface more even, this surface forming the outside of the receptacle. The bark is kept pliable by soaking, and is usually sewn with basswood bast, although spruce root could no doubt be used.

A very beautiful coiled basketry is made by the Salish and other western tribes from spruce root. The strands used for the sewing or binding are made as just described, while the coils around which these finer strips are sewn are made from the rougher shreds of the root. The method in general may be said to resemble that employed in raffia work, but the product is much more substantial and beautiful. A very good collection of spruce root basketry from the interior Salish and other tribes may be seen at the Victoria Memorial Museum.

THE AMERICAN GOLDEN PLOVER IN EASTERN ONTARIO.

BY E. BEAUPRE, KINGSTON, ONT.

After an absence of almost fifteen years, the Golden Plover has apparently resumed its migratory visits to eastern Ontario. During the long period of their absence one was forced to return from a visit to their former haunts with a feeling that an important and delightful feature of the out-door world was missing; the old pasture fields and gravel-covered shores formerly enlivened by the cheerful and friendly whistle of large flocks of plover were deserted, and the existence of these intensely interesting birds threatened to become a memory. The only opportunity to observe them locally was afforded during their migration southward in the months of August and September.

For some years previous to 1901, their numbers were gradually diminishing, but from September 1901 to August 1915, so far as the writer could possibly learn, this plover was not recorded as a fall migrant in eastern Ontario. During that long period, the only evidence of the bird's existence was afforded by the night flights of flocks over the writer's home, and recorded at different times. In a valuable bulletin written by the late Prof. W. W. Cooke of the Biological

Survey, Washington, D.C., the migratory routes of the Golden Plover have been carefully reviewed. So far as a spring visit from this bird is concerned in eastern Ontario, it might be safely ventured that a record is unknown.

The plover breeds well within the Arctic Circle, and at the close of the short northern summer, the birds gather in great numbers in preparation for their southern migration. The flocks flying south pass on their route to the east of Hudson's Bay, and make their first stop, we are informed, in Labrador where they enjoy feasting on native berries which grow in abundance along the bleak and wind-swept coast. Continuing their southward journey they make their way to the coast of Nova Scotia, from which locality they make their long flight of twenty-four hundred miles to South America, always waiting for favorable weather conditions before undertaking the flight. The time of arrival, dates of departure, and the route travelled can be accurately recorded, and yet the real concrete cause for the long journeys of these members of the feathered family, have remained, and probably always will remain, one of the unsolved problems of the bird world.

From notes on this subject of the migration of the Golden Plover, it is evident that this bird's route is by no means confined to the eastern or Atlantic coast, but that it has other means of reaching its temporary southern home during the rigorous months of the northern winter, the writer, as well as others, is satisfied. During the month of September vast numbers of plover follow the west coast of Hudson's Bay, and pass over the eastern end of Lake Ontario on their way south.

In September, 1906, a great flight of plover passed over the city of Kingston, which is located on the extreme eastern end of Lake Ontario. The flight was first noticed about eight o'clock in the evening, and to one familiar with the soft, sweet piping of the Golden Plover, there was no difficulty whatever in recognizing the bird. A record of flight showed that eight flocks passed over the city, flying very low, at intervals of about ten minutes. Towards midnight it was impossible to enumerate the flocks, the flight being continuous. This must have been the main migration for that year, and it continued until four o'clock in the morning, covering eight hours. Allowing a speed of twenty-five miles an hour—a conservative estimate—the distance between the leading flocks and the rear guard, must have been approximately two hundred miles. What a sublime spectacle this would have been had one the privilege of seeing it in the open light of day! The vanguard of this great aerial aggregation must have reached almost to the Atlantic seaboard, while the rear flocks were trailing their wonderful way over the eastern waters of Lake Ontario. They no doubt began their ocean journey some miles south

of the coast of Nova Scotia, but not far enough to seriously affect their regular route to Argentina, in which country they escape the hardship of a Canadian winter.

It is well known that some species of migrating birds when passing over large bodies of water in daytime, fly quite low, often skimming the very surface, but when flying over large tracts of land, they fly at a great height. In this connection it may not be amiss to detail some personal field experience on this interesting phase of bird life and conduct. About May 20th in each year small flocks of Ruddy Turnstones begin to arrive in this northern country from the sunny south. By the end of the first week in June the shores of many of the Islands adjacent to the city of Kingston present scenes of life and activity well worth travelling many miles to witness. On two distinct occasions the writer had the unusual good fortune to be privileged to witness the departure of this gathering of birds for a place situated farther north where their breeding grounds were located. Towards evening a sudden commotion occurred among the birds, and with a movement born of common impulse, all formed into one large flock, and after taking a short flight which looked like a farewell survey of their location, they moved upwards in a great circle. With the aid of glasses it was possible to follow their flight, and see them setting their course due north, pursuing it high above the land surface far beyond the scope of the naked eye.

Another striking example of this nature occurred late in the month of October, 1916. A bleak north wind was blowing with frequent showers of rain. Towards noon a flock of Tree Swallows suddenly came twittering down out of the sky from a great height descending from the rain-laden clouds. The straggling flock looked like dead leaves blown about by an autumn gale. The flock settled on some trees on the lake shore, and by crowding and huddling together they completely covered the branches. Some settled in the grass under the trees. So exhausted was the entire flock that a near approach was permitted without alarm or apparent concern. In the afternoon, they quietly left their resting place, and flying low over a pasture field, began to gyrate in a great circle, their spiral ascent carrying them higher and higher until they faded beyond the range of human vision.

Returning to the subject of the Golden Plover, on August 28th, 1915, a few were noted and in 1916 on the same date, a more extensive visitation occurred. Rev. C. J. Young observed some of these birds on the sand beach at Brighton, Ont. The writer saw eighty or more at Amherst Island, Ont., and several small flocks were seen at Wolfe Island, Ont. August and September this year will be watched with great interest for more interesting developments in connection with the Golden Plover's visits and sojourn in eastern Ontario.

THE OCCURRENCE OF THE BOHEMIAN WAXWING
(BOMBYCILLA GARRULA) AT ARNPRIOR.

On the afternoon of April 28th last while out on one of my usual, almost daily, bird walks, I had the good fortune to observe a single male specimen of this beautiful northern species. I was walking through a rather thick growth of prickly ash and hawthorne, when a waxwing suddenly flew up into a neighboring pine. Its large size and the considerable amount of white on its wings at once convinced me that it was not the Cedar Waxwing. As I approached the pine tree, the bird flew back into the shrubbery, where I was able to observe it closely with my glasses for nearly ten minutes. Its large size, black chin and the yellow and white markings on the wings were plainly visible, so I have not the slightest doubt of the correctness of my identification, even though the bird was not collected. This is the first record I have of the Bohemian Waxwing at Arnprior.

A. L. GORMLEY.

BOOK NOTICE.

ANIMAL MICROLOGY, by Michael F. Guyer, Ph.D., Profesosr of Zoology in the University of Wisconsin, with a chapter on drawing by Elizabeth A. Smith, Ph.D., Instructor in Zoology in the University of Wisconsin. Revised edition, February, 1917. The University of Chicago Press, Chicago, Ill.; price \$2.00.

The reception accorded the first edition of *Animal Micrology*, printed in 1906, induced the author to revise the volume and include some of the many new methods employed in zoological micro-technique. Certain portions of the volume have been entirely rewritten and two new chapters, one on "Cytological Methods" the other on "Drawing" have been added. The latter chapter was prepared by Dr. Elizabeth A. Smith.

The volume is a most useful one, comprising 289 pages and therefore considerably larger than the first edition. It will undoubtedly have a wide distribution. As in the first edition the policy has been, the author states, not to attempt to give all "best" methods, but rather to select representative good ones which have proved their work by satisfactory tests in American laboratories. 74 illustrations are included in the text.

NOTE.

About 9 a.m., April 3, a flock of forty-two wild geese passed over the Victoria Museum, Ottawa, flying in a northwesterly direction. At the same time a flock of six ducks passed northward crossing directly above the geese.—C. L. PATCH.

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