REPRINTS OF RARE PAPERS ON MOLLUSCA

THREE PAPERS BY JOSEPH FREDERICK WHITEAVES

1. "Trans-Atlantic Sketches. -- No. 1. On the Little Miami River, Waynesville, Warren County, Ohio." (From the "Zoologist," for February, 1863, pages 8119-8124)

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It is a sultry afternoon in the latter end of July, as we leisurely stroll from our little village hotel in the "buck-eye" State, the thermometer at from 90° to 95° in the shade. We have been watching the ruby-throated humming bird hovering over the flowers of the trumpet-creeper at the end of the verandah. Into the village street, shaded by "trees of heaven," locust trees and the beautiful Indian bean, with its pods fully a foot long. Along a dusty turnpike road, running parallel or nearly so, with the little Miami river, our main object being to collect the Unionidae of that stream. On one side of the road, fields of Indian corn stretch down to the river; opposite to these are hills, partly cultivated, partly woodland, crowned with large peach orchards. The commonest road-side weeds here are Mentha viridis, the cosmopolite Anthemis cotula, Scrophularia nodosa, Vernonia noveboracensis, Datura stramonium, Phytolacca decandra, Verbena hastata, V. urticifolia, Ambrosia artemisiæfolia, and Cynoglossum Morisoni. When just outside the town, we strike a short distance up the hill into a friend's garden to examine a nest of the American goldfinch (Chrysomitris tristis). It is built in a fork of a peach tree, and in its construction closely resembles that of the European species, the lining of the nest in each

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case being of thistle-down, but the eggs of the American species are white, with a very faint bluish tinge, and generally unspotted; the birds themselves are very distinct. Peach trees in Ohio, it should perhaps be observed, are not trained against a wall, as in England, but grow free, like apple trees. Speaking of birds' nests, not far from here I found a nest of the Virginian colin (Ortyx virginianus): it was placed in a field of Indian corn, between the rows, where two small decayed logs were lying at right angles, surrounded by a patch of weeds, principally Rumex and Chenopodium, with a little grass. The nest itself was a shallow hole scratched in the ground, in the angle formed by the aforesaid logs, and possessed hardly any lining, a very little dirty straw and a feather or two. The scantiness of lining and its want of cleanliness may account for the stains so often seen on these eggs, the original colour being probably pure white. The old bird was sitting as we approached, partly concealed by the logs and grass. The eggs in this particular case were six, the full complement being from about fifteen to twenty.

But to return to our stroll. On the hill-side, in grass fields, we observe Silene stellata and Tradescantia pilosa. A little further on we come to some woods with little or no undergrowth. Here the black walnut is frequent, also the fœtid or Ohio "buck-eye" (Æsculus glabra), the abundance of which in this part of the world has suggested the popular name of the State. Under their shade are flocks of the American goldfinch, occasionally a robin (Turdus migratorius), also blue birds (Sialia sialis), "chipping sparrows" (Spizella so-

cialis), and now and then a purple grackle (Quiscalus versicolor). We get into the road again, and, clambering over the fences, cross through the tall Indian corn to the river. In among the corn grow the beautiful wild potato vine (Ipomæa pandurata), the ground cherry (Physalis viscosa), Sicyos angulatus, Phaseolus diversifolius and Portulaca oleracea. Shells of snails of three species (Helix clausa, H. profunda and H. elevata) occur in myriads strewn over the fields, in a kind of semi-fossil state. Cultivation has had the effect of making these, especially the last-named, comparatively rare, at least in the immediate neighbourhood. Between us and the river a dense weedy thicket intervenes, conspicuous among which, both in size and relative number, is the tall coarse Ambrosia trifida, reaching here to the height of from twelve to fifteen feet. Other plants composing it are the tall nettle (Urtica gracilis), the horse mint (Monarda punctata), Actinomeris helianthoides, Teucrium canadense, with occasionally bushes of the American elder (Sambucus canadensis) and other trees.

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We push through this tangled thicket towards the river, and hearing a heavy splash are just in time to see a large snapping turtle take the water. The leather-backed and the musk turtle (Trionyx ferox and Sternothærus odoratus) are abundant in this river, also many of the more critical forms, but having no books with us we are compelled, rather unwillingly, to ignore their existence. A little further on a narrow creek runs into the river, and here we propose to commence active operations. Where the small stream and river meet is a shady grove. The trees are principally planes (Platanus occidentalis), often festooned with the graceful winter grape (Vitis cordifolia), sugar maples, red and white oaks, and, rather more rarely, the red mulberry (Morus rubra) and the hackberry (Celtis occidentalis). We pause here and botanize for a short time. The plants of most general interest are Mimulus ringens, Impatiens fulva, Scutellaria lateriflora, Lobelia syphilitica, the Indian plantain (Cacalia suaveolens), the American blue bell (Campanula americana), the bunch berry (Cephalanthus occidentalis) and the cup plant (Silphium perfoliatum). At the point where the two streams meet is a small island covered exclusively with Dianthera americana. The bottom is gravelly and somewhat pebbly. The shore is strewn with dead valves of Unio, principally U. costatus, indications of the mania for hunting pearls which has existed, and yet does exist, in this village. Having examined many Unionidæ, I am led to infer --- first, that although pearls are most abundant in the animals of the genus Alasmodon, they are not peculiar to that group of shells; I have found them in the Unio phaseolus, U. gibbosus, U. costatus and U. multiradiatus: secondly, that they may be found in almost any part of the animal except the foot; I have found a tolerably large pearl thoroughly enveloped in the cardinal muscle of an Alasmodon.

We proceed to wade into the water, but cautiously, lest we should get our feet badly cut by dead shells. As soon as we are fairly out in the stream, we lift up and examine these defunct mollusks. In them we find Cyclas solidula, Melania depygis, Paludina integra and an Ancylus -- alive, also dead shells of Pisidium virginicum and Amnicola Sayana. The Amnicola Sayana is a terrestrial species, living in damp places with Helix, Succinea and Pupa, and occurs alive near the banks of the river, about a mile above the spot we are exploring. Occasionally with these we get the American crayfish (Astacus Bartoni?) and the curious larva of a Phryganea (?), whose case looks so much like the turbinated shell of a mollusk that Mr. Lea described it as a new species, under the name of Valvata arenifera. The living

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Unionidæ are abundant further out, where the

current is most rapid, and the water about knee-deep, two-thirds of the shell being buried in the gravel. We wade slowly for some time, feeling with our hands along the bottom for the points of the shells.

During a month's stay at Waynesville, in the most favourable part of the year, we found the following fresh-water shells in the Little Miami River, within a mile or two of the town:--

Anodonta plana, Lea
" edentula, Say
" imbecilis, Say
Margaritana (Alasmodon) rugosa, Barnes
° " " truncata, Say
° " " calceola, Lea
°Unio costatus, Rafinesque
(U. undulatus, Barnes)
°U. flavus, Raf.
(U. rubiginosus, Lea)
" cardium, Raf.
(U. ventricosus, Barnes
U. subovatus, Lea
U. occidens, Lea, female var.?)
° " triqueter, Raf.
(U. triangularis, Say)
° " clavus, Lamarck
" rectus, Lamarck
° " lapillus, Say
" dilatatus, Raf.
(U. gibbosus, Barnes)
Unio siliquoidens, Barnes
" alasmodontinus, Barnes
(U. pressus, Lea)
° " fasciolus, Raf.
(U. multiradiatus, Lea)
" fasciolaris, Raf.
(U. phaseolus, Hildreth)
° " parvus, Barnes
° " subrotundatus, Raf.
(U. circulus, Lea)
° " tuberculatus, Raf.
(U. verrucosus, Barnes)
Sphaerium (Cyclas) solidulum, Prime
Pisidium virginicum, Bgt.
(Cyclas dubia, Say)
Paludina integra, Say (and reversed variety)
°Melania depygis, Say
Planorbis trivolvis, Say
Physa heterostropha, Say
Ancylus (undetermined)

Of these twenty-seven shells about half are purely western species, and do not extend far north (say not so far as the 43rd or 44th degree of N. latitude) or east of the Alleghany Mountains; to these an asterisk is prefixed. All the rest (save Anodonta imbecilis and Paludina integra) occur as far north as Lower Canada, for example, and, the two species excepted, have been found so far north in the state of New York, that it is not unlikely they may exist in the "Eastern townships" of Lower Canada.

But we are again digressing. During the wading we have been silently watching the proceedings of two musk rats, as they leisurely swim across the stream. Three red-headed woodpeckers (Melanerpes erythrocephalus), two males and one female, are investigating some rotten plane trees on the opposite side of the river. A belted kingfisher (Ceryle Alcyon) perches on a dead tree: suddenly we hear a

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splash, and looking towards the spot whence the sound proceeded, we observe the kingfisher jubilantly return to the tree crunching one of the river crayfish with evident satisfaction. "From the woods came voices of the well-contented doves," ° the dove in this case being the American turtle (Zenaidura caroliniensis). A little lower down several green herons (Butorides virescens) and some "kill deer" plovers (AEgialites vociferus) are wading about seeking what they may devour.

But, tired of wading, we cross the river to the railway, and walk some distance along the line.

° Tennyson's 'Gardener's Daughter.'

Passing by the station we observe some shady woods, towards which we turn. The trees are mostly the American beech (Fagus ferruginea), with little undergrowth save papaw bushes (Asimina). The May apples (Podophyllum peltatum) are beginning to ripen, and about the roots of the trees we notice the delicate green fronds of Adiantum pedatum. Some rotten logs are lying about, which we turn over and hunt for land shells. After about half an hour's search, we have obtained living specimens of Helix albilabris, H. thyroidus, H. clausa, H. palliata, H. tridentata, H. inflecta, H. alternata, H. striatella and H. perspectiva. After a short rest we turn towards the river again. Just below a dam, on one bank a section exposes alternations of the shales and clays of the Hudson river group, which are Lower Silurian. Its most abundant fossils here are † Strophomena alternata and S. planumbona of Hall, Orthis Lynx, O. subquadrata, O. testudinaria and O. occidentalis, Rhynchonella capax and R. modesta, Ambonychia radiata, Ciclonema bilix, Orthoceras crebriseptum; the delicate bryozoon Stenophora fibrosa, and the trilobite so common in Ohio, the Calymene senaria of Conrad, -- probably identical with the well-known British species Calymene Blumenbachii. Living under small pieces of timber lying about on the damp grass, &c., we find Helix ligera, Bulimus marginatus, Pupa armifera, P. contracta, P. ovata, and Carychium exiguum, one of the smallest of the American land shells.

But it has taken some time to collect these, it is getting dusk, and the fireflies, called "lightning bugs" in the elegant phraseology of the district, are beginning to appear; so we stroll gently homewards. Many interesting Coleoptera, Lepidoptera, &c., were observed, but these I have not enumerated, fearing lest I should overburden this sketch with mere lists of species.

† These fossils were kindly determined for me by my friend Mr. Billings, the palæontologist of the Canadian Geological Survey.

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It has been urged in favour of Natural History studies that they are eminently conducive to health. This appears to me to be a great fallacy. Three years practical out-of-doors work in Oolitic Geology has helped considerably, in my case, to induce severe asthma. On leaving England I found similar results awaited me. Not more than two months spent in collecting the fresh-water mollusks of the interior of the state of Ohio resulted in an attack of fever and ague; and I was told that collecting Unios in this very river cost Mr. Lea, the brother of the well-known author of so many papers on American Unionidæ, his life. The botanist and the ornithologist have to investigate swamps, &c., at the risk not only of malaria, but of bronchial complaints, &c., to which so many of our fellow-countrymen are already predisposed. That these evils may, to some extent, be guarded against is true, but the cause of Natural History can never have anything to gain either by the suppression of facts or the distortion of truth.

J. F. Whiteaves.

2. "NOTES ON RECENT CANADIAN UNIONIDAE."
(From the Canadian Record of Science, vol. 6, No. 5, pp. 250-263, 1895).

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The present paper is intended as a contribution to our knowledge of the geographical distribution of the Unionidæ in North America. It consists of a list of all the species from Canadian localities that are now represented in the museum of the Geological Survey at Ottawa, and is based almost exclusively upon specimens that were either collected by members of the Survey staff or presented by friends interested in its museum. So far as the writer is aware, however, the Unio tenuissimus of Lea, which was collected by Dr. G. M. Dawson in 1873, in the

Souris River, Manitoba, is the only species of Unionidæ known to occur in Canada that is not represented in the Survey museum. Specimens of most of the nominal species of Anodonta and of a few of the more difficult species of Unio enumerated in this list have been kindly compared by Mr. Charles T. Simpson, of the United States National Museum, with Dr. Lea's types of North American Unionidæ now preserved in that institution, and identified as correctly as the small number of shells sent from each locality and the incompleteness of his studies of the family would permit. The nomenclature employed throughout this list is that which is now in general use among students of this group in North America, as it is still quite uncertain which of the earlier names of Rafinesque,

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Lamarck and others, will ultimately have to be retained for some of these shells.

ANODONTA, Lamarck, 1879.

ANODONTA BENEDICTII, Lea.

Specimens which appear to have been identified with this species by Dr. Lea have already been recorded by Dr. R. Bell[1] as having been collected by himself, in 1860, at Batch-ah-wah-nah Bay, Lake Superior; in the St. Mary River, near Sugar Island, and on the north shore of Lake Huron, at Lacloche Island. Professor Macoun has recently (1894) collected it at Rondeau, near Point aux Pins, on the Ontario side of Lake Erie, and a few specimens, which Mr. Simpson thinks are probably referable to A. Benedictii, were collected by Dr. R. Bell, in 1883, at Lake Winnipeg, between Fort Alexander and Elk Island. Mr. Simpson is inclined to believe that A. Benedictii may be only a variety of A. ovata, Lea.

ANODONTA DECORA, Lea.

Eight full grown specimens and one immature shell of a very large Anodonta, which Mr. Simpson refers to A. decora, were collected by Mr. Law, of Chatham, at Rondeau, Ontario, and presented by him to the Museum of the Survey, through Professor Macoun, in 1884. One of the adult shells from this locality, a fairly average specimen, measures 6.6 inches in length, 4 inches in height and 3.1 inches in breadth or thickness. The umbones of each are remarkably ventricose and prominent. The test is rather thick, the hinge line short, and the cardinal angles are rounded in front and obtusely angular behind. The writer has long been under the impression that these shells could be identified with the typical form of A. grandis, Say, as they do not correspond at all well with Lea's figures or measurements of A. decora,

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the "breadth" or, as it would now be called, the length of which is stated to be 3.9 inches. The recent receipt from Mr. Simpson of outline drawings of specimens from Dr. Lea's collections, labelled "A. decora, from the canal at Cincinnati, Ohio," has, however, convinced the writer of the correctness of Mr. Simpson's determination, though it is very generally believed that A. decora is not more than a mere variety of A. grandis.

ANODONTA EDENTULA, Say. (A. undulata, Lea, et auct., but possibly not of Say; A. Pennsylvanica, Lamark, and A. areolata, Swainson.)

Dr. R. Ellsworth Call has expressed the opinion that A. edentula, Say, is peculiar to the Mississippi drainage system, and A. undulata, Say., to those waters that drain into the Atlantic, but the writer has never been able to see any tangible difference between these two shells. In a recent letter to the writer, Mr. Simpson says, "Anodonta undulata is no doubt the small form which we have here in the Potomac. Though Say gives no locality, he speaks of it as 'thin and fragile, length near half an inch; breadth seven-tenths.' The figure fairly

[1] In Canad. Nat. and Geol., Vol. VI., p. 269.

well represents our shell. This may run into A. edentula, but I have never yet been able to connect it with that. The material in Lea's collection, under the name of A. undulata, Say, is merely a form or forms of A. edentula."

Under one or the other of these names this shell has previously been recorded as having been collected in Lake Matapedia, P.Q., by Dr. R. Bell in 1857; in a small lake in the valley of the Riviere Rouge, P.Q., by W.S.M. D'Urban, in 1858; in the St. Charles River, near Quebec city, by the writer, in 1861, and at Brome Lake, P.Q., by Mr. R. J. Fowler, in 1862.

More recently, it has been collected by Dr. R. Bell in 1883, at Lake Winnipeg, between Forts Alexander and Simpson, and by Professor Macoun, in 1894, in Ontario,

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at Rondeau, on Lake Erie, and in the east and west branches of the Grand River at Galt and Ayr.

In another letter to the writer, Mr. Simpson makes the following remarks upon this species, "The so-called Anodontas of which this is the type, have more or less perfect cardinals and occasional vestiges of laterals. They group with Margaritana Elliotti, M. Spillmani, M. Raveneliana, etc. The genus Margaritana is a medley of forms, which, for the most part, are more nearly related to various groups of Unio than to each other. I believe that Margaritana should be merged into Unio, and with it the Anodontas of the edentula group."

ANODONTA FERUSSACIANA, Lea.

L'Orignal Creek, Ottawa River, Dr. R. Bell, 1855 (as A. pavonia, Lea). Ponds at the Mile End, Montreal, Dr. R. Bell, 1858, and J. F. Whiteaves, 1862.

ANODONTA FLUVIATILIS, Dillwyn. Sp. (A. cataracta, Say.)

Several specimens of this common eastern species, which has previously been recorded as occurring at many localities in the Province of Quebec and neighbourhood of Ottawa, were collected by Dr. R. Bell, in 1883, at Flying Post Route, 100 miles north-east of Michipicoten, and, in 1889, from a small lake near Proudfoot's north and south line, in the Sudbury district of Ontario. A single specimen, which may be referable to this species, was collected by Professor Macoun, in 1884, at White Fish River, north of Lake Superior.

ANODONTA FOOTIANA, Lea.

Specimens which are said to have been identified with this species by Dr. Lea were collected by Mr. W. M. S. D'Urban, in 1858, from three small lakes tributary to the Riviere Rouge, P.Q. Since then, specimens, which Mr. Simpson refers to A. Footiana, have been collected in

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Ontario, by Professor Macoun, in 1884, at White Fish River, north of Lake Superior, and at Lake Hannah, on the Nepigon River; by Dr. A. C. Lawson, in 1886, at Rainy Lake; by Mr. W. Spreadborough, in 1894, from the Muskoka River, near Georgian Bay; and in Manitoba, by Dr. R. Bell, in 1883, at Shoal Lake, Red River. Mr. Simpson also is of opinion that specimens collected by Mr. R. J. Fowler in the Lachine Canal at Montreal, in 1863, and referred by the writer to A. Lewisii, Lea, are young shells of A. Footiana.

ANODONTA FRAGILIS, Lamark (A. lacustris, Lea.)

This shell was apparently first collected in Canada by Mr. D'Urban in 1858, associated with A. Footiana, in three small lakes in the valley of the Riviere Rouge, and identified shortly afterwards by the late Dr. Isaac Lea with the A. fragilis of Lamarck. Specimens collected by Professor Macoun in 1885, from a lake six miles up the Becscie River, Anticosti, were identified with A. fragilis by Mr. F. R. Latchford, of Ottawa, and similar shells have long been

known to occur at Meach's Lake, near Ottawa. Some of these Anticosti specimens were sent to Mr. Simpson, who thinks that they are essentially similar to shells labelled A. fragilis in Dr. Lea's collection, but cannot see how these latter are to be distinguished from A. lacustris, Lea, and does not pretend to be always able to separate A. fragilis from A. fluviatilis.

ANODONTA IMPLICATA, Say.

Lake Winnipeg, between Fort Alexander and Elk Island, Dr. R. Bell, 1883; and Souris River, near Roche Percée, Dr. A.R.C. Selwyn, 1890; a few specimens from each of these localities, which have been identified with this species by Mr. Simpson. It had previously been recorded as occurring in the St. Charles River, near Quebec, where it was collected by the writer in 1861.

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ANODONTA MARRYATTANA, Lea.

Lake Hannah, Nipigon River, and east side of Lake Nipigon, Ontario, Professor Macoun, 1884; and Fairford River, Manitoba, J. F. Whiteaves, 1888; as identified by Mr. Simpson.

ANODONTA NUTTALLIANA, Lea (A. Oregonensis, Lea.)

Okanagan Lake, B.C., A.J. Hill, 1882; two specimens of the variety Oregonensis. Near Victoria, V. I., James Fletcher, 1885, and Rev. G. W. Taylor, 1889. Nicola Lake, B.C., Dr. G. M. Dawson, 1889; three specimens of the typical form and one of the variety Oregonensis. Salmon Arm, Shuswap Lake, B.C., Dr. Dawson, 1894; several examples of both forms of the species. Stream entering Clayoquot Sound, V.I., at Stubbs Island, W. Spreadborough, 1894.

ANODONTA OVATA, Lea.

Coulée No. 5, Vermilion River, Alberta, J. B. Tyrrell, 1886.

ANODONTA PEPINIANA, Lea.

Specimens which Mr. Simpson refers to this species were collected by Dr. R. Bell, in 1883, from the Winnipeg River, Manitoba, and in 1886, from the Attawapishkat River, in the Severn district, which now forms the eastern part of Keewatin. Two left valves of a shell which may be referable to this species were collected by Mr. J. B. Tyrrell, in 1884, at the Lake of the Woods. Mr. Simpson is of the opinion that A. Pepiniana may be merely a variety of A. Simpsoniana, Lea.

ANODONTA SIMPSONIANA, Lea.

In Ontario this species was collected by Dr. A. R. C. Selwyn in 1883, at Black Bay, Lake Superior; by Prof. Macoun, in 1884, at the north end of Lake Nipigon, in

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1885, at Port Dover, Lake Erie, and in 1890, at Port Colborne, on the same lake.

In Manitoba, it was collected by Dr. R. Bell in 1878, at the outlet of Lake Winnipeg and from Lake Winnipeg between Fort Alexander and Elk Island. It occurs, associated with A. Maryattana, Lea, in the Fairford River, and is the only species of Anodonta that the writer was able to find in Lake Manitoba (in 1888).

In the district of Saskatchewan one perfect specimen was collected by Dr. R. Bell, in 1882, at Buffalo Lake, near Methy Portage.

Mr. Simpson, to whom the writer is indebted for the identification of specimens from most of these localities, is convinced that A. Dallasiana and A. Kennicotti, of Lea, are both synonyms of A. Simpsoniana.

ANODONTA SUBCYLINDRACEA, Lea.

Widely distributed in the provinces of Quebec and Ontario, from Lakes Metapedia and St. John to the eastward, to creeks, rivers and bays at the east end of Lake Superior and north side of Lake Erie to the westward. Mr. Simpson, however, regards A. subcylindracea as a mere synonym of A. Ferussaciana, Lea.

MARGARITANA, Schumacher, 1819.

MARGARITANA CALCEOLA, Lea. (M. deltoidea, Lea.)

Lake Erie at Fort Dover, Professor Macoun, 1890. Grand River, at Belwood, Ontario, J. Townsend, 1892. East and west branches of the Grand River at Galt and Ayr, Professor Macoun, 1894.

MARGARITANA COMPLANATA, Barnes.

Manitoba. Upper Assiniboine River, Dr. R. Bell, 1874; Souris River, Dr. A. R. C. Selwyn, 1882 and 1884; Shoal River and near Elk Island, Lake Winnipeg, Dr. R. Bell,

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1883; Swan River, J. B. Tyrrell, 1887, and Assiniboine River, J. B. Tyrrell, 1884.

Keewatin. Nelson River, Dr. R. Bell, 1878.

Saskatchewan. Shell River (township 50, range 2 and 3, west of third Initial Meridian) north of the north Saskatchewan, O. J. Klotz, 1890.

MARGARITANA MARGARITIFERA, L.

From the Province of Quebec this species has already been recorded as having been collected by Dr. R. Bell (in 1857) in the Green and Rimouski rivers, at Lake St. John and both the Metapedia Lakes, and by the writer, (in 1861) in the River St. Charles, near Quebec City. More recently it has been collected in that province by Dr. H. M. Ami, in 1883, in the Assumption River, near Rawdon; by N. J. Giroux, in 1892, at the Lac de la Ferme, Riviere du Loup, en haut, and in that river; also by A. P. Low, in 1894, in the Romaine River.

In British Columbia, small and thin but characteristic specimens were found by Dr. G. M. Dawson, in 1885, in small streams entering Malaspina Strait, on the mainland side; also, in 1890, in Kakwous Lake, the source of the Bonaparte River, at an altitude of about 4,000 feet.

MARGARITANA MARGINATA, Say.

The small and typical eastern from of this shell is common in the province of Quebec and in eastern Ontario. A few specimens of the large western variety known to students of the Unionidae as M. truncata, Say (M. S.) were collected by Professor Macoun, in 1894, at Galt and Ayr, from the east and west branches of the Grand River.

MARGARITANA RUGOSA, Barnes. (?=M. costata, Rafinesque, sp.)

This species is widely distributed in the provinces of

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Quebec and Ontario. In the latter province unusually large and thick specimens, measuring five inches and a half in length by three inches in height, were collected by Prof. Macoun, in 1894, in the east and west branches of the Grand River, at Galt and Ayr. The species has been recorded by Dr. G. M. Dawson as occurring, though rarely, in the Roseau River, Manitoba.

MARGARITANA UNDULATA, Say.

St. Lawrence River, at Montreal and Quebec, J. F. Whiteaves, 1861. Near Ottawa City, G. C. Heron, 1879.

UNIO, Philipsson, 1788.

UNIO ALATUS, Say.

Widely distributed throughout Ontario. The most easterly locality at which it has been collected is the Ottawa River at L'Orignal, as recorded by Dr. R. Bell, in the Canadian Naturalist and Geologist for June, 1859 (Vol. IV., p. 219). In Manitoba it has been collected in the Red River by Dr. G. M. Dawson, in 1873, and by T. C. Weston, in 1884.

UNIO BOREALIS, A. F. Gray.

A pair of specimens of this species, from the Ottawa River, at Duck Island, the typical locality,

was presented to the museum of the Survey by Mr. F. R. Latchford, of Ottawa, in 1886.

UNIO CANADENSIS, Lea.

Two specimens, from the Ottawa River, near Ottawa, which are believed by the donor to be referable to this enigmatical species, were presented to the Museum of the Survey by Mr. Latchford, in 1893.

UNIO CIRCULUS, Lea. (?=U. subrotundus, Rafinesque.)

Lake Erie, at Kingsville, Ontario, J. Mc Queen, 1880,

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two specimens. Thames River, at Chatham (several specimens) and Detroit River, below Sandwich, Ontario (one specimen), Professor Macoun, 1894.

UNIO COCCINEUS, Lea.

Grand River, Cayuga, Ontario, Professor Macoun; one "fairly typical specimen," (C. T. Simpson).

UNIO COMPLANATUS (Solander?) Lea. (U. purpureus, Say.)

Abundant in Nova Scotia, New Brunswick, Quebec and Eastern Ontario. Collected by Dr. R. Bell, in 1859, in creeks, rivers and bays on the north shore at the east end of Lake Superior, along the entire north shore of Lake Huron, also in the St. Mary River. Lake Nipissing, Dr. A. R. C. Selwyn, 1884 (whence it had previously been recorded by Dr. Bell, in 1859). Montreal River, Lake Temiscaming, Ontario, Dr. R. Bell, 1887.

UNIO CORNUTUS, Barnes. (?=U. reflexus, Rafinesque.)

Grand River, Cayuga, Ontario, Professor Macoun, 1890; a perfect and fresh left valve.

UNIO ELEGANS, Lea. (U. truncatus as of Rafinesque.)

Thames River, at Chatham, (Ontario), Professor Macoun, 1894; one dead but perfect specimen.

UNIO ELLIPSIS, Lea. (?=U. olivarius, Rafinesque.)

Ottawa River, opposite L'Orignal, R. Bell, 1854, and near Ottawa, G. C. Heron, 1879 (as U. olivarius, Rafinesque). St. Lawrence River, at Montreal, R. Bell, 1858, and near Quebec, J. F. Whiteaves, 1861. Missisaugi River, on the north shore of Lake Huron, Dr. R. Bell, 1860. Lake Erie, at Port Colborne, and Detroit River, near Windsor, Professor Macoun, 1885.

UNIO GIBBOSUS, Barnes. (?=U. dilatatus, Rafinesque.)

This species, which has long been known to be abundant

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in the St. Lawrence and Ottawa rivers, has recently been collected by Professor Macoun in Lake Erie, at Port Colborne, in the Grand River at Cayuga, and its two branches at Galt and Ayr, also in the Detroit River, at Windsor.

UNIO GRACILIS, Barnes. (?=U. fragilis, Rafinesque.)

Collected by Professor Macoun, in 1885, from Lake Erie, at Port Colborne, and the Grand River, at Cayuga; in 1890, at Port Dover, Ontario, and in 1894, in the River Thames, at Chatham.

UNIO LACHRYMOSUS, Lea. (Probably = U. quadrulus, Rafinesque.)

In Ontario, Professor Macoun collected specimens of this species in the Grand River at Cayuga, in 1885, and in the Thames River, at Chatham, in 1894.

In Manitoba it was found to be abundant in the Red River, by Dr. G. M. Dawson, in 1873, and Professor J. Fowler has presented to the museum of the Survey a specimen, which he collected at Emerson in 1887.

UNIO LIGAMENTINUS, Lamarck.

Grand River, at Caledonia, Ontario, J. Townsend, 1885, and at Cayuga, Professor Macoun, 1890. Thames River, at Chatham, Professor Macoun, 1894. Roseau River, Manitoba, Dr. G. M. Dawson, 1873, and Assiniboine River, at Millwood, J. B. Tyrrell, 1888.

UNIO LUTEOLUS, Lamarck.

Common almost everywhere in Canada east of the Rocky Mountains, though its exact range east of Ontario is a little uncertain, owing to its close resemblance to U. radiatus. Dr. Lea, in 1862, records it as occurring in Great Slave Lake, Lake Athabasca, and near the mouth of Moose River, Hudson's Bay. In Manitoba it was collected by Mr. J. B. Tyrrell, in 1887, from the Swan River;

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in 1888, from the Assiniboine, and in 1889, from the Red Deer River. It appears to be the only Unio in Lake Manitoba, where it was collected by the writer in 1888, and from the Fairford River. In Alberta, Mr. Tyrrell collected it, in 1885, in the Blind Man, Battle and Medicine Rivers.

UNIO NASUTUS, Say.

Two fine specimens of this species, from Toronto Bay, were presented to the museum of the Survey, by Mr. Latchford, in 1886, and since then numerous specimens of it were obtained by Professor Macoun (in 1894) at Rondeau, on Lake Erie.

UNIO NOVI-EBORACI, Lea. (Perhaps = U. iris, Lea.)

Grand River, at Cayuga, Professor Macoun, 1890; one perfect specimen. Thames River, at Chatham (two specimens) and Detroit River, below Sandwich (one specimen), Professor Macoun, 1894.

UNIO PHASEOLUS, Hildreth. (?= U. fasciolaris, Rafinesque.)

Detroit River, at Windsor (one specimen) and Lake Erie, at Port Colborne (two specimens), Professor Macoun, 1885. Lake Erie, at Kingsville, Ontario (one specimen), J. T. McQueen, 1890, and Thames River, at Chatham (one specimen), Professor Macoun, 1894.

UNIO PRESSUS, Lea.

Boulder River, one of the upper branches of the Attawapishkat River, west of James Bay (in lat. 52° 30' and long. 87° 30'), Dr. R. Bell, 1886; a perfect and fresh right valve. West branch of the Grand River, at Ayr, Ontario, Professor Macoun, 1894, a slightly distorted but living shell. This species has long been known to be common in the Rideau Canal and river, near Ottawa, where it was first noticed by the late E. Billings, about the year 1856 or 1857.

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UNIO PUSTULOSUS, Lea. (?= U. bullatus, Rafinesque.)

Grand River, Caledonia, Ontario, J. Townsend, 1885; one specimen. Thames River, at Chatham, Professor Macoun, 1894; two specimens.

UNIO RADIATUS (Gmelin), Lamarck.

No new localities are to be recorded for this common eastern species, which has long been known to range from Nova Scotia to at least as far to the westward as Ottawa.

UNIO RANGIANUS, Lea. (Perhaps a var. of U. perplexus, Lea.)

Lake Erie, at Kingsville, Ontario, J. T. McQueen, 1890; one perfect specimen of the shell of the female.

UNIO RECTUS, Lamarck.

Common in the St. Lawrence and Ottawa rivers, and in western Ontario. In Manitoba, it was collected by Dr. G. M. Dawson, in 1873, from the Roseau River, and by Mr. J. B. Tyrrell, in 1888, in the Assiniboine River at Millwood.

UNIO RUBIGINOSUS, Lea. (?= U. flavus, Rafinesque.)

In Ontario this shell has been collected by

Professor Macoun, in 1890, in the Grand River at Cayuga, and in 1894, in the Thames River, at Chatham. In Manitoba, it was found by Dr. G. M. Dawson, in 1873, in the Red and Roseau Rivers, and by Dr. R. Bell, in 1883, in Lake Winnipeg, between Fort Alexander and Elk Island.

UNIO SUBROTUNDUS, Lea.

Grand River, Caledonia, J. Townsend, 1885, one specimen, which "approaches U. ebenus" (C. T. Simpson). Port Dover, Lake Erie, a specimen "which approaches U. solidus, Lea," (C. T. Simpson), and Rondeau, Lake Erie, one specimen, Professor Macoun, 1894.

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UNIO TRIANGULARIS, Barnes. (? = U. triqueter, Rafinesque.)

Collected by Professor Macoun, in 1885, at Port Colborne, Ontario, and in 1894, at Rondeau and in the Thames River at Chatham.

UNIO TRIGONUS, Lea. (? = U. undatus, Barnes.)

Port Dover, Lake Erie, Professor Macoun, 1890, two perfect but worn specimens, which were identified with this species by Mr. Simpson.

UNIO UNDULATUS, Barnes. (? = U. costatus, Rafinesque.)

Ontario. Sable River, at Thedford, Mr. Bissell, 1883, per Dr. H. Ami. Grand River, Caledonia, J. Townsend, 1885. Lake Erie, at Port Colborne, and Detroit River, at Windsor, Professor Macoun, 1885. Grand River, at Cayuga, Professor Macoun, 1890, and Thames River, at Chatham, Professor Macoun, 1894.

Manitoba. Black River, Lake Winnipeg, Dr. R. Bell, 1883, two specimens, with the umbonal regions much eroded. Emerson, Professor J. Fowler, one specimen of a small form which approaches U. plicatus (Le Sueur, MS. S.) Say.

UNIO VENTRICOSUS, Barnes. (U. occidens, Lea, female, and U. subovatus, Lea, male: ?=U. cardium, Rafinesque.)

Common in the St. Lawrence and Ottawa rivers and throughout Ontario. In Manitoba it has been collected in the Red and Roseau Rivers by Dr. G. M. Dawson, in 1873, and at Lake Winnipeg, between Fort Alexander and Elk Island, by Dr. R. Bell, in 1883.

OTTAWA, November 30th, 1894.

"ADDITIONAL NOTES ON RECENT CANADIAN UNIONIDAE."
(From the Canadian Record of Science, vol. 6, No. 6, pp. 365-366, 1895).

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UNIO CANADENSIS, Lea.

In a letter to the writer, dated June 18th, 1895, Mr. Simpson says, "I think there can be little doubt, from examining the type of U. Canadensis, that it is a somewhat injured specimen of the male of U. ventricosus, Barnes.

Mr. Bryant Walker, of Detroit, informs the writer that he has, in his cabinet, specimens of each of the following species, from the Detroit River:

MARGARITANA HILDRETHIANA, Lea.

Main channel of the Detroit River off Belle Isle, collected by the Michigan Fish Commission in 1895.

UNIO LEIBII, Lea.

Detroit River, at the upper end of Fighting Island, collected by Mr. Walker in 1873 or 1874, and identified by the late Dr. James Lewis.

UNIO MULTIRADIATUS, Lea.

Same locality, collector and date as for the preceding species; also, Thames River, Ontario, from the collection of the late Dr. George A. Lathrop.

UNIO SULCATUS, Lea. (=U. perplexus, var. perobliquus, Conrad. Types from the Detroit River, and Wabash R., Indiana.)

Collected by Mr. Walker in the Detroit River at the upper end of Fighting Island, in 1873 or 1874; at the

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upper end of Belle Isle in 1894; and in the same river, at the locality first mentioned, by the Michigan Fish Commission, in 1895.

UNIO VERRUCOSUS, Barnes.

Main channel of the Detroit River off Belle Isle, collected by the Michigan Fish Commission in 1895, and Detroit River opposite Grassy Island, collected by Mr. Walker in 1895.

Mr. Walker also states that he has, in his collection, twenty-six species of Unionidae from the Detroit River and Lake St. Clair, viz., Anodonta Benedictii, A Footiana, A. fragilis and A. subcylindracea; Margaritana deltoidea, M. Hildrethiana, M. marginata, and M rugosa; Unio alatus, U. circulus, U. coccineus, U. ellipsis, U. gibbosus, U. gracilis, U. Leibii, U. luteolus U. multiradiatus, U. nasutus, N. Uovi-Eboraci, U. phaseolus, U. pressus, U. Rangianus, U. rectus, U. triangularis, U. ventricosus and U. verrucosus.

OTTAWA, July 9th, 1895.

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NAUTILUS

VOLUMES 3-75 AND ITS PREDECESSOR THE

CONCHOLOGISTS' EXCHANGE

VOLUMES 1 AND 2

COMPILED BY

AURÈLE LA ROCQUE

COLUMBUS, OHIO
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