REPRINTS OF RARE ARTICLES ON MOLLUSCA. --- FRANCIS ROBERT LATCHFORD'S "NOTES ON THE OTTAWA UNIONIDAE." -- Transactions of the Ottawa Field-Naturalists' Club, No. 3, pp. 48-57, Ottawa, 1882. Reprinted with permission of the Council of the Ottawa Field-Naturalists' Club.

FIFTH SOIRÉE

Friday, March 10, 1882. -- Notes on the Ottawa Unionidae. F. R. Latchford.

The family of lamellibranch mollusks known as the Unionidae is represented in every part of the world, but with a very irregular distribution. While only ten species are found in Europe, fewer still in Africa and about eighty in Asia and the Islands of the Pacific, over five hundred have been described from North America. More than a hundred of these occur in the drainage of the Ohio alone; and in Georgia, the Carolinas, Alabama, and the Southern and South-Western States in general, almost every stream has its peculiar forms. Towards the north and east the species become fewer and fewer, until only eleven are found in Massachusetts. In Canada a much greater number has been met with by Messrs. D'Urban, Bell, Billings and Whiteaves, including several species introduced from the Western States through the great lakes and other avenues of water communication. In a paper read before the Field-Naturalists' Club in 1880, Mr. Heron noted twelve species from the vicinity of Ottawa, but at least twice as many are to be met with here, within a radius of forty miles. The very low state of the water in 1881 afforded me for collecting specimens of the Unionidae

(page 49)

facilities of which I had ample leisure to avail myself during the midsummer vacations. I have in my spare time since then studied carefully these humble creatures; and, not content with my own determinations, have taken much pains to have the species collected identified by the best authorities. All have been checked or named by such eminent conchologists as Mr. Arthur F. Gray, of Danversport , Mass , Mr. Geo. W. Tryon, of the Academy of Sciences, Philadelphia, and Prof. J. F. Whiteaves, F. G. S., of the Geological Survey of Canada. I am therefore morally certain that, except perhaps in one or two instances, the shells which I found have been correctly determined.

The species met with belong to the genera Unio, Margaritana, and Anodonta. These are distinguished from one another more by the conformation of their shells than by any peculiarities of the animals themselves. Hence it is of the shells alone that most works on the Unionidae treat; and from this course it is not my intention to depart at present. The shell itself will always enable the student to distinguish one species from another. But the soft parts are by no means undeserving of attention. In species of the same group they are very much alike. In species of different groups, for instance in U.

rectus and U. occidens, they are so dissimilar that the least practised eye can perceive differences in their form and arrangement. In all cases they present the same admirable ordination of structure to purpose that we see elsewhere throughout the works of nature's God. Even the distribution of the Unionidae is provided for, by their young being for a time endowed with hooks by which they can attach themselves to contiguous objects, often a fish or a water-bird, and be transported far from their place of birth. In the winter and spring the young, having already well formed shells, are extruded from the branchial uterus of the females in hundreds of thousands and even millions. According to a computation made by Dr. Isaac Lea, of Philadelphia, who has during fifty years studied the Unionidae, and described almost half the species known, a large specimen of U. Multiplicatus, Lea, contained upward of three millions of embryonic young. Nearly all perish early in their free life, being devoured by fishes, crustaceans and the larvae of many kinds of insects. Few, accordingly, attain maturity, which is reached in from six to ten years. Their food consists of animalculae, which the water flowing in through the branchial orifice coveys to the mouth, at the same time that it supplies oxygen to the lamelliform gills.

Of the species found in the vicinity of Ottawa the first to be noticed belong to the genus Unio. Shells of this genus are readily distinguishable from those of the genera Margaritana and Anodonta, by their having both cardinal and lateral teeth. The genus, according to Jeffrys, was established by Phillippson in 1788, but it is generally attributed to Retz, who was chairman of the meeting at which Phillippson read his essay sistens Nova Testaceorum Genera.

Unio complanatus, Solander, is abundant in almost all our streams and lakes, and is subject to much variation in size and colouring. What may be regarded as the typical form is common in the Rideau everywhere and in the Ottawa above the Chaudière Falls. It is a moderately thin, brown, depressed, sub-rhomboidal shell, with a nacre of different and often of exceedingly beautiful shades of purple. The average dimensions of ten shells, five from each river, are as follows: length 3·5 in., height 1·7, diameter 0·8.

In company with the typical form, I found near Skead's Mills, in 1880, a specimen of a small variety which is of considerable interest. Although presenting every appearance of maturity, it is only an inch in height by two and a half in length. For its size it is very thick and regularly inflated. I am informed that a similar variety occurs in some streams in Western New York.

A form almost as small is found in the cold and limpid waters of Meech's Lake. But it is a thin and not a thick shell; not inflated but depressed. Its colour is a very light brown.

(page 50)

About half a mile from Meech's Lake, on the creek through which it finds an outlet, are a few shallow ponds, with a bottom of coarse sand and gravel washed down from the surrounding hills. In the warmer water of these ponds, where food also must be more abundant, U. complanatus is three times as large as in the neighbouring lake. It differs moreover in being proportionately less depressed, and more equally rounded at both extremities. Its colour is a rich dark brown with a silken lustre, and, not unfrequently, a tinge of bright orange along the umbonial slope.

Near Kettle Island there occurs a form of much interest on account of the curious angular inflation. How extraordinary this is for a species whose most constant characteristic is its flatness, may be inferred from the fact that a representative specimen whose height is 1·6 in. measures 1.5 in. in diameter. The inflation is greatest near the dorsal margin behind the hinge-ligament.,

where a section of the shell would be an almost equilateral triangle with the base and the angles at the base slightly rounded. A specimen found by Mr. Poirier is 3 in. high, 4·9 long, and weighs 7 3/4 oz. Ten of the shells from Meech's Lake weigh only 3 oz.

At the same locality is found a still more remarkable variety and one of no little beauty. In some respects it resembles U. Raleighensis, Lea, from North Carolina, and in others U. turtuosus, Sowerby, from Maryland. It is like the former in shape and in the numerous prominent rays which diversify its surface; and like the latter in the strange peculiarity that its valves meet at the ventral margin not in a straight but in a sinuous line. A correspondent writes that under Dr. Lea's treatment it would be entitled to rank as a species. Whether a variety of U. complanatus or a distinct species, it is a most unique and interesting shell.

Unio gibbosus, Barnes, appears to be rare, having occurred to me only in the Ottawa near Gilmour's Mills and at Templeton, always in deep water. It is a brown, elongated shell, attenuated posteriorly, and with the dorsal margin regularly curved. It bears a slight resemblance to some forms of U. complanatus; but may always be distinguished by its heavier shell, the deeper purple of its nacre, and especially by the great thickness of the lamellar tooth in the right valve.

Unio ellipsis, Lea, is not uncommon on sand bars below Kettle Island, but does not seem to occur in the Rideau or in the Ottawa above this City. It differs from all other species here observed in having the beaks very near the anterior end of the shell, where the muscular impression is of great depth and the shell itself of great thickness. The cardinal teeth are paralled to the lateral teeth and not at a right or oblique angle to them as in our other species. The nacre of many specimens is beautifully iridescent, displaying the colours of the prism and rainbow, chastened, softened, and made perpetual.

Unio rectus, Lamarck, which is easily recognized by its dark colour and elongated form, is found in considerable numbers in the Rideau near Billings' Bridge, but is comparatively rare in the Ottawa. The ground colour of the epidermis, which at first sight appears black, proves on closer examination to be yellow, profusely rayed with broad lines of very dark green. Young shells occasionally have a purple nacre, but in mature specimens only a trace of this is seen along the lateral teeth and in the cavity of the beaks. In the Rideau it is not unusual to find U. rectus almost six inches in length, and I have observed it quite as large in the Ottawa near Arnprior. Though smaller in the Ottawa here, it compensates for its inferior size by its finer form. The mantle of the animal is fringed with long and delicate vibratile cilia more beautiful than the richest lace.

Unio radiatus, Lamarck, is common almost everywhere in the Ottawa above the Chaudière. At the foot of the rapids near Mechanicsville are a number of islets along whose shores may be seen large heaps of shells, of which this species constitutes no inconsiderable part. The muskrat lives chiefly on the Unionidae;

(page 51)

and these heaps are the remains of his nightly repasts. To the collector they should generally serve only to point out that living specimens occur in their immediate vicinity; still, by presenting to him larger suites from which to choose than he could possibly obtain by dredging, they may sometimes afford good and even rare shells. I have obtained from them some of my best specimens of U. radiatus. It seldom attains a greater length than three inches, and is a very flat, obovate shell, of a green, olive or reddish color, with numerous narrow rays.

Unio luteolus, Lamarck, abounds in the Rideau Canal from the Sappers' Bridge upward, and is not uncommon in the Rideau River. Its color is from a yellowish green to a dark

olive, with distinct dark green rays. In shape it varies much more than in color. Some shells are so inflated as to be almost cylindrical; others so depressed that they cannot, when the beaks are eroded, be distinguished by any external character from U. radiatus. Having probably studied only the exterior of the two species, a western correspondent writes that they merge into one another in Toronto Bay. Now they cannot possibly be more alike in Lake Ontario than they are sometimes here; and however great their outward resemblance, I find that they always differ internally, especially in the form of the cardinal teeth. In U. radiatus these are short, erect, and triangular. In U. luteolus, they are long, curved, compressed and oblique.

Unio cariosus, Say, occurred to me near Black Bay, Eardley, Quebec, where I was searching for nodules and fossils in the Champlain Clays, which there form the north shore of the Lac des Chênes. It is a thin, small, ovate, inflated shell, of a yellowish color, with a few indistinct rays. Some specimens of an accompanying species of Leda, which lived when the clays were deposited in the post glacial period, would be taken for recent shells, so well have they preserved their thin, delicate epidermis and fragile teeth through the many thousand years that have elapsed since then.

Unio occidens, Lea, is quite abundant in the Ottawa, near the mouth of the Gatineau, and along the sandy shores of Kettle Island. Its shape is remarkably uniform, varying only with the sex. It is an ovate and very much inflated shell, with large prominent umbones and closely approximate recurved beaks. The females are more broadly inflated than the males and are of an almost triangular shape, on account of which peculiarities they are liable to be considered forms of U. ventricosus, Barnes.

For beauty and diversity of coloring, there is not probably found in the world a fresh water shell which surpasses the Unio occidens of the Ottawa River. When young it is of soft and varied shades of yellow, green and red, the primary spectral colors, and sometimes of all three together, producing an effect of chromatic harmony that a painter might study with advantage. Mature specimens are rich as an autumn landscape in tints of yellow-brown and olive-green. All - but especially the young shells - have a porcelain-like lustre, which is seen at its best, when on a sunny day they lie on the clean, white sand, with just enough water to cover them. Then they shine and glow like opals in the fluent light. Moreover, their changeful colours are so differently combined with rays, sometimes few and sometimes many, fine as a hair or broad almost as an iris leaf, that, among hundreds of specimens collected, no two were alike in every respect. Each is, accordingly, a unio, in the sense that Pliny tells us the word was coined to express - a unique production - "from the circumstance," he says, "that no two uniones - pearls - are ever found alike." The barbarians who found the pearls called them margaritae.

That U. occidens, under exactly the same conditions of life, should secrete in almost infinite variety so many different pigments is a fact which challenges attention.

Unio subovatus, Lea, which is found in the Rideau Canal and River and in the Des Chênes Lake, is chiefly remarkable for the large size to which it some-

(page 52)

times attains, a specimen from the canal beyond Hartwell's Locks measuring 5·5 in. in length, 3·4 in height, and 2·2 in diameter. It bears some resemblance in outline to U. occidens of which Say considered it only a variety. His opinion on this point is now held by very few; and I hardly think that anyone who compares the two as they here occur would care to pronounce them specifically identical. U. subovatus, is less inflated than U. occidens, and less

approximate at the beaks, while with respect to beauty there is no comparison between them.

On the valves of this and other large species in the Rideau River I have observed - besides the curious spiral follicle of the larva of a phryganaceous insect, Helicopsyche arenifera, which was first described as a mollusk of the genus Valvata - a small isopod crustacean, which is worthy of note as being probably the best living, though degenerate, representative of the trilobites that once abounded here on the low tidal flats of the Silurian seas. It is I think the species described by De Kay as Fluvicola Herrickii.

Unio alatus, Say., was found here by Mr. Heron in 1880, and was recorded from this vicinity twenty years ago, by Mr. Whiteaves in a valuable paper published in the Canadian Naturalist. There are a few specimens in the museum of the Ottawa Literary and Scientific Society, which were probably collected by the late E. Billings, the palaeontologist. As I have not met with it on my many excursions, I think it must be rare, or at least restricted to a small area. It is the only species found here in which the wing rises higher than the right line of the hinge margin. It occurs from Georgia to Vermont and westward to Nebraska and Manitoba. Certain other species as U. spinosus, Lea., and U. Shepardianus, Lea, are confined within narrow limits to one stream.

Unio gracilis, Barnes, is another winged species which has not, till now, I believe, been recorded from any locality in Canada east of the Welland Canal. It is not at all common, Mr. Poirier and myself having found only five or six specimens during the summer. These were collected on sand bars near Kettle Island. It is an exceedingly thin and fragile, depressed, sub-triangular shell, of a greenish yellow color. The hinge margin is straight and prolonged into a large wing, uniting the two valves. It may be distinguished from U. alatus, by its greater fragility, lighter color, both inside and out, and by its differently formed wing.

Unio pressus, Lea, was found by Mr. Tyrrell, of the Geological Survey, in the Rideau near the Rifle Range. Only one specimen was met with, and that he has with great kindness presented to me. It is but little more than two inches in length, very much flattened, and the hinge margin is straight with a slight alated projection. The beaks are finely undulated. Its form, its internal and external color, together with the shape of its cardinal teeth, seem to connect it with the margaritanae.

Unio Canadensis, Lea, was originally described from the St. Lawrence near Montreal. Both Mr. Tryon and Mr. A. F. Gray have referred to this species some shells which I collected in Nepean Bay. Mr. Gray writes: "It seems to agree well with the characters of U. Canadensis, and with Dr. Lea's figure. From these data, and without a typical shell with which to compare it, I am justified, I think, in referring it to that species." Mr. Tryon says: "I regard a shell which you sent me from Nepean Bay as the true U. Canadensis." It appears to be rare, only a few specimens having been found. It is of an oval shape and dark olive colour, with indistinct rays.

Unio borealis, A. F. Gray, is a new species. It occurs in the Ottawa, from the mouth of Brigham's Creek to Templeton, and probably much farther down. Although common, it is very seldom met with in good condition.

I first submitted this shell to Mr. Tryon, but the only specimens I had to send were so badly eroded that they could not be determined. A second lot,

(page 53)

little if any better, led him to think it doubtfully referable to U. luteolus,* from some

forms of which the females are not easily distinguishable. Three out of four shells sent to a conchologist in Cincinnati were referred to U. radiatus, while the remaining one was considered a specimen of U. luteolus. The shells were really not in a condition to admit of being properly determined. Not until October of the past year did I succeed in collecting specimens which had the undulations of the beaks well preserved. I was led to go out so late in the season by a letter from Mr. A. F. Gray, relating to the shell in question, of which I had sent him specimens a short time previously. He regarded as correct my views that it differed essentially from both U. luteolus and U. radiatus, but thought that further study and comparisons might prove it to possess affinities with some other described species, and expressed a wish to see a large series of the best shells I could obtain. On my next holiday I went down the river to Duck Island and collected a number of male and female shells, including a few in fine condition. I despatched these to Mr. Gray on the day following, but heard nothing more about them, until February 28th, when I received the pleasing, though not unexpected information that the shell was undoubtedly a new species. The names U. bellus and U. borealis were suggested as appropriate. The latter seems the more fitting, and the species shall accordingly be known as Unio borealis, A. F. Gray. A description, promised at my request, has not yet been received, and I do not wish to describe the shell to-night, lest I should in any way interfere with the priority of my friend's description. The right of naming U. borealis belongs, to Mr. Gray, as he was the first to recognize its specific distinctness from any described unio.

[Mr. Gray's description was received some time after the reading of my paper and is here given in full:

UNIO BOREALIS, - A. F. GRAY.

Shell smooth, broken only by numerous ridges of growth; obovate, very much inflated in the female form, the male more compressed, very inequilateral, obtusely angulated behind and rounded before, the basal or ventral margin rounded, beaks badly eroded and but slightly raised; ligament thick, moderately long and dark brown; umbonal slope flattened, and but slightly carinated; epidermis variable, some specimens dark olivaceous brown with broad obscure rays of dark green, others yellowish green with numerous fine rays of a brighter green, cardinal teeth rather large, somewhat compressed and corrugate; lateral teeth thick, slightly curved, and with crenulate margins; anterior cicatrices distinct, that of the adductor muscle very deeply impressed; dorsal cicatrices posterior to the centre of the cavity of the beaks; posterior cicatrices confluent and but slightly impressed; cavity of the shell deep and rounded; cavity of the beaks obtusely rounded and deep; substance of shell very thick, thickest before; nacre usually white, occasionally rosy, and sometimes a beautiful pink, and beautifully iridescent.

Transverse diameter, 3·15 inches; altitude, 1·95 inches; lateral diameter, 1·65 inches. These measures are from a large female. A male shell measures: transverse diameter 3·15 inches; altitude, 1·90 inches; lateral diameter, 1·35 inches.

For this beautiful shell, and the privilege of describing it, I am indebted to Mr. F. R. Latchford, from whom I received quite a large series of this Unio, which belongs to the group of which Unio luteolus of Lamarck may be considered the type. It differs from that species in being shorter transversely, in having a much thicker shell and having the beaks badly eroded. In its outline it bears a

(page 54)

close resemblance to Unio radiatus, Lam., but is more inflated and has a heavier shell. It

[After the above was written, I sent some young specimens of U. borealis, A. F. Gray, to Mr. Tryon, and they have convinced him, he informs me, that the species is new.

occurs in the Ottawa River at Duck Island; it has also been found in Leamy's Lake, near Hull, in the Province of Quebec.

The variety with pink nacre has a bright orange-brown epidermis with fine rays of dark green.

A young specimen is more elongated transversely, has perfect umbones which show four well developed folds, and has a rugose posterior slope similar to Margaritana rugosa, Barnes.

The soft parts have not been preserved; in consequence, their arrangement cannot be described.

GENUS MARGARITANA, Schumacher.

The shell of this genus differs from that of Unio in having no lateral teeth. These, however, are not always entirely wanting in M. margaritifera, the celebrated pearl mussel of Great Britain and the North Atlantic and Pacific border regions of America. From the interior continental basin it is absent; and although common eastward in Quebec, it has not yet been found in this vicinity. How even a mollusk may affect the destinies of a nation may be inferred from the statement of Seutonius, that it was the hope of obtaining pearls from M. margaritifera which led to the invasion of Britain by Julius Caesar.

Margaritana marginata, Say, occurs sparsely in the Rideau and Ottawa in rapid water, which, indeed, is the favourite habitat of our other species also. It is small, seldom of greater length than two and a half inches, moderately thin and transversely wedge shaped. In colour it ranges from a dusky green to a deep brown, with indistinct dark rays. The shells found here are much inferior in size and colouring to specimens of the same species received from the Mohawk River, New York.

Margaritana undulata, Say, is rare in the Rideau and is not common in the Ottawa, where the least unproductive locality that I know of is above the Little Chaudière along both shores of the river. In Meech's Creek it is quite plentiful, especially near the abandoned rubber factory. It is smaller than M. marginata, proportionately more inflated, brighter in colour, often so bright as to be really beautiful. The distant concentric and prominent waves on the umbones from which it derives its specific name, are seldom apparent except in young shells. Many old specimens are as thick and strong anteriorly as a U. ellipsis of the same size, while towards the posterior margin they are as thin and fragile as the most delicate anodonta; and thus, as well as by having cardinal and no lateral teeth, M. undulata unites in itself two of the most distinctive characters of the genera between which, in the plan of creation, Margaritana has been assigned its place.

Margaritana rugosa, Barnes, the largest we have of the genus, is abundant at many points along the Rideau, but is quite rare in the Ottawa. As found in the former stream it resembles the typical U. complanatus in shape but is of a greener colour, and may, moreover, be easily distinguished from that shell both by the wrinkles which are situated along the post lateral margin up to the hinge ligament, and, of course, by the absence of lateral teeth. A shorter truncated form is occasionally met with in the same river.

I observed a few large and exceedingly fine specimens of this margaritana at the Chats Rapids, where I found them in a mixed company of unionesand anodontae, thirty three in number by actual count, which were living together in apparent harmony in an open space between the rocks but little if any more than a square foot in extent. They were green in colour, and had the characteristic wrinkles prominently developed. One shell exhibited in a marked degree the strange deformity that its

valves did not meet in a straight line, but, an inch or more from the posterior end, were bent sharply aside about forty degrees. I have noticed a few less striking instances of similar distortion in the same

(page 55)

species from the Rideau. They are probably due to injuries received when young through coming into violent contact with a rock or pebble. To such a mishap the young of this species must often be exposed in the rapid water they frequent.

GENUS ANODONTA, Bruguières.

The transition from Margaritana to Anodonta is by no means abrupt: nihil in natura per saltum. It is made easy by a shell found here, which was first described by Say, and placed by him in the former genus - or rather in the genus corresponding to it that he had instituted, alasmodonta, - but which is at present universally referred to the latter. This species is now known as Anodonta edentula, Say. Although its name as it now stands expresses what may be called the reduplication of toothlessness, the shell is slightly exceptional to the best marked character of the genus - the absence of both cardinal and lateral teeth.

Anodonta edentula, Say, like its relatives the margaritanae, is to be found in water flowing rapidly over a rocky bottom. The best localities along the Ottawa that I have met with are the Little Chaudière and Chats Rapids. A capital place for collecting it and seven or eight other species of the Unionidae is the snye, as the lumbermen call it, between Mason's Mill and the opposite island. It is a comparatively thick shell, generally of a dark olive colour; but when the rays are few or narrow, the ground tint, a light brown, predominates. In the left valve of many specimens there is a short though well defined cardinal tooth with a small notch in it analogous to the deep cleft in the primary tooth of the left valve of Unio and Margaritana.

In the narrowest and most rapid parts of Meech's Creek, and not in the ponds into which it often expands, or the lake from which it flows, there occurs a fine form of this shell which appears to be identical with the variety of A. edentula described by DeKay, and called by him, after the river in New York in which it is found, A. Unadilla. It is more inflated than the A. edentula from the Ottawa, often very much larger and of a lighter colour.

Anodonta undulata, Say, is found in the Rideau near Billings' Bridge, and in the Ottawa at Kettle Island. It resembles the preceding species so much that many have thought the two identical. A. undulata is however a thinner shell more obscurely rayed and more angularly inflated. Additional and far more distinctive characters are revealed by the microscopic examination of the young of both species. Botanists, as Mr Fletcher told us two years ago, cannot always by the leaves and blossoms alone distinguish Drosera longifolia from Drosera rotundifolia, but their minute seeds present characteristics which place the specific distinctness of the parent plants beyond all doubt. So also with the embryonic young of these two species of Anodonta. I have not examined them myself; but Dr. Lea's figures show that they differ in outline, and that while the hooks of A. edentula end in three points, those of A. undulata end in one.

Anodonta subcylindracea, Lea, which I have met with only at the Chats, is one of the most widely distributed shells of the genus, extending hence through the middle and western states as far south as Louisiana. Our shell in its ordinary form is identical with Dr. Lea's type. It is small, thin, inflated, almost elliptical in outline, and olive green in colour, with indistinct rays. Old shells are generally abnormal. They are so constricted along the basal margin

opposite the hinge, and so much elongated that instead of being elliptical they are kidney shaped. This reniform appearance is observable in old shells of many species of the Unionidae, U. complanatus, for instance, and notably M. margaritifera. An examination of the lines of growth will show that after a certain age the shell does not increase symmetrically. It grows rapidly in the direction of the umbonial slope, slowly in front, and scarcely at all opposite the hinge. The change produced in this way in the form of shells is very remarkable.

Anodonta Benedictii, Lea, occurs in several localities near the city, but nowhere in great numbers. I have found it at the Chats, and in a small lake on

(page 56)

Meech's Creek. Mr. Fletcher collected a few fine specimens of the typical form in the Ottawa near the outlet of Leamy's Lake. It is a trapezoidal, slightly compressed, horn-coloured shell. The dorsal margin is nearly straight and is extended behind, where it forms a well marked wing.

Anodonta Lewisii, Lea, occurred to me in the Mississippi at Almonte, where it appears to be abundant. It has a much smaller wing than A. Benedictii, which it resembles, is more elongated, and somewhat less inflated. The beaks in perfect specimens have sharp prominent tubercles, which are arranged in a manner characteristic of the species.

Anodonta implicata, Say, is a species of which only a single living specimen has been obtained. It was found in a deep pool near the upper end of the old Chats Canal, after a search of an hour's duration, which I was led to engage in by seeing on the shore a few broken valves of an anodonta not previously met with. It is a large, thick, olive-brown, elongated, cylindrical shell, with a salmon-coloured nacre.

Anodonta Footiana, Lea, is not uncommon at the Chats. It is a thin, inflated, oblong, brownish species, obscurely radiated, and tinged with yellow posteriorly. A darker and less elongated form from Meech's Creek is said to be "identical with shells determined by Dr. Lea as his A. Footiana," which are now in Mr. Gray's cabinet.

Anodonta lacustris, Lea, inhabits lakes in the County of Ottawa. It is brown when aged, but young shells are greenish yellow. The tubercles on the beaks are arranged in close, concentric waves. Every specimen found in September, 1881, in a small lake in Masham, was infested by hundreds of mites, probably of the species found in U. luteolus and A. fluviatilis in the Rideau Canal. The same lake, which is about thirty miles from Ottawa, contains a plant, Eriocaulon septangulare, not recorded in the "Flora Ottawaensis" of Mr. Fletcher.

Anodonta fragilis, Lamarck, is common in Meech's Lake, near the outlet. It is an elongated, thin, depressed shell of a yellowish colour, with a straight dorsal margin, and pearly iridescent nacre. That the form regarded as lacustris is distinct from this appears to me somewhat doubtful.

Anodonta fluviatilis, Dillwyn, occurs in great numbers in McKay's Lake, New Edinburgh, and in the Rideau Canal; but is rare in the Ottawa, where it is found only in bays in which there is little or no current. In colour it ranges from a bright grass green to an olive-brown, with concentric yellow bands, and innumerable narrow, obscure rays. Sometimes it attains a length of six inches, but is generally about a third smaller. Its large size and brilliant colouring conspire to make it the finest Anodonta we have.

Repeated microscopic examinations of the young of this shell lead me to believe that the only observations which I find published on the

young of the Unionidae are not altogether correct. In his "Descriptions of the embryonic forms of thirty-eight species of the Unionidae," Dr. Lea, says: "The base in all the species always presented the anterior and the posterior margins equal, which is not the case with any of the species when fully grown. That is, if a perpendicular line be raised from the middle of the basal margin to the middle of the dorsal line, the right and the left divisions will be exactly symmetrical." Now, I thought that precisely the contrary was evident when the young of A. fluviatilis were observed under a high power; and Mr. Tyrrell and Mr. Fletcher, whose attention was called to the matter, thought so too. Dr. Lea, however, to whom I sent some of the young, wrote that on carefully examining them, he failed to notice the asymmetrical difference which I described. The venerable patron of the Unionidae, now in his ninety-first year, kindly presented me at the same time with the work previously referred to on "Embryonic Forms," and with several other of his valuable publications. Here was observation opposed to observation. To ascertain whether I was right or wrong, I made use of the fine solar microscope of the College of Ottawa, which gives a magnification of two thousand diameters.

(page 57)

As the outline of shell after shell was cast upon the screen, each was observed to be decidedly asymmetrical and unequally curved on the sides. The young of U. luteolus and U. borealis proved also to be inequilateral; and I have little doubt that the same want of symmetry obtains in the young of almost all other species. It seems, therefore, that Dr. Lea was mistaken in describing and figuring as symmetrical the embryonic forms of many species of the Unionidae.

With A. fluviatilis closes the record of the species so far observed here. Extended as it is, for a place so distant from the metropolis of the Unionidae in the Ohio Valley, it does not in my opinion include all the forms that occur in this vicinity. A. plana, Lea, and A. Ferussaciana, Lea, probably occur here; and when the numerous lakes and streams around our city are more diligently searched, they will, I feel confident, furnish very material additions to the present list of the Ottawa Unionidae.

NOTE

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