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THE

# CANADIAN JOURNAL

OF

## INDUSTRY, SCIENCE, AND ART:

CONDUCTED BY THE

EDITING COMMITTEE OF THE CANADIAN INSTITUTE.

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NEW SERIES.

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**VOL. VIII.**



TORONTO:

PRINTED FOR THE CANADIAN INSTITUTE,  
BY LOVELL AND GIBSON, YONGE STREET.

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Amongst these, the most characteristic is the *Megalomus Canadensis*, usually found in the form of internal casts, as shewn in fig. 224.\*

As a general rule, the fossils in these beds are somewhat obscure, and not very abundant. The principal exposures of the formation occur on the River Speed in the vicinity of Guelph; at Elora, on the Irwine and Grand River, where it presents vertical cliffs over eighty feet in height; at Hespeler on a branch of the Great Western Railway; and lower down the Grand River, at Preston, Galt, and places in the township of Dumfries. At present, the Guelph formation can only be regarded as a provisional group, its strata appearing more or less to merge into the underlying Niagara beds, and in some localities, also, to offer a passage into the Onondaga deposits.

(To be Continued.)

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## ON THE TWO SPECIES OF ASTACUS FOUND IN UPPER CANADA.

BY T. J. COTTLE, ESQ.

*Read before the Canadian Institute, April, 1863.*

Of the fresh water *Lobsters* as restricted by M. Milne Edwards to the genus *Astacus*, that learned historian of the Crustacea, in his valuable monograph enumerates but five. Of these he gives one to Europe, two to the North East side of America, one to Chili, and one to Australia: since his book was published one has been added to the North West of this continent, under the name of *Oreganus*; and it is my intention to bring before the consideration of the Canadian Institute another, which I think, will form a new species indigenous to this Province, and which I propose naming (*fodiens*) as being appropriate to its habits. It is possible that it may have been already described, for the want of a good library of reference is a great impediment to the discrimination of species. I therefore feel a degree of diffidence in naming it.

The species described in the Natural History of the State of New York, as the only one belonging to it, is the *Astacus Bartonii*, and I

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\* This fossil is described in PART IV. as occurring in the Onondaga Group, the Guelph strata having been originally referred to that subdivision.



shall merely copy the description given in that book, as it is too well known to require further notice.

*Astacus Bartonii*, body with scattered punctures, rostrum mucronate concave elongated, suddenly attenuated, but with lateral angles rather than spines at the point of attenuation, no spines on the thorax; an acute triangular spine rather exceeding the rostrum in length articulated to the outer side of the base of the external antennæ, below the base of the spine on each side an oculiform tubercle, movable finger slightly shorter than its opposite, and a number of faveolæ or pits in such a regular series on both, as to produce the appearance of one or more elevated lines. Carpus with a deep furrow on its upper surface and one or more spines on its inner angle; shield with a transverse lunate furrow. The first segment of the middle caudal lamella, with one or two short spines on each side. Colour of the body and claws, greenish brown, tips of the rostrum of the hands and feet (and sexual appendices of the male) reddish; lighter beneath.

The other Canadian species, supposed to be undescribed may be thus characterised:—

*Astacus fodiens* (mihi) rostrum broad, short, triangular, acute, margined, concave throughout its length, edges smooth without spines. Carapace robust, rounded, much deeper than in *Astacus Bartonii*, plentifully marked with minute pits, granulated towards the stomachic region, not spinous. Claw stronger than in the preceding species, the movable finger with a strong tooth on the internal margin, external margin deeply denticulated, a well defined ridge along the whole length. Thumb with the internal margin less strongly toothed, smooth externally. Carpus with a strong spine on its inner margin and a deep furrow on its upper side, length 3 to 4 inches. Swamps and wet places common.

The author of the Natural History of the State of New York, and M. Edwards, both described an *Astacus* under the name of *affinis*, the former giving the habitat as the River Delaware, the latter as the rivulets of North America. Their two descriptions do not agree. In the first I see no resemblance to my *Astacus*, in the second a great deal: so much so, that I think we may, perhaps, both mean the same animal. M. Edwards gives, as his authority, Say's Crustacea of the United States, a work I have not been able to consult, but with which I should imagine the American author must be familiar. I shall quote both these descriptions that the members may compare them.



*Astacus affinis* of the New York work:—

Rostrum mucronate subcaniculate two spined, a spine behind each eye and a larger geminate one each side of the thorax, hand and thumb on the inner side, scabrous, length 3 by 3—River Delaware.

*Astacus affinis* of M. Milne Edwards. Rostrum short, nearly as broad as long, triangular and slightly toothed laterally. Carapace a little granular on the side of the stomachal region. Interior claws strong, carpus with a deep depression above, a large tooth within, and some tubercles below, hand rounded below; punctuated and tuberculated near the upper border. Fingers rather long and strong. Epistome short, widened without contraction or traverse groove, length 3 or 4 inches, inhabits rivers of North America.

The *Astacus fodiens*, is the first macrourous crustacean in which I have observed a burrowing habit, nor am I aware that this trait has been noticed by others. It is by no means unusual in some of the brachyura as in the genera *Ocypoda*, *Cardisoma*, &c., individuals of which so throng the sandy beaches and littoral marshes of the Antilles, but these crabs have strong legs, with the last joints armed with a hard sharp point well adapted for running and digging in the yielding sand. But not so with the delicate cheliferous legs of the slow-moving crawfish, which seem hardly able to bear its weight, apparently little fitted for tunneling its way through mud and clay: nevertheless, such is its destiny, for when the summer droughts have licked up the water on the surface of the swamps, where on the first arrival of spring this little crawfish had sported, it commences to seek by boring for the moisture of which it is deprived, and like an experienced well-digger, begins its work. The diameter of the hole is about an inch, and as it brings up the earth in its excavation it piles up the pellets round the circumference, till it forms a chimney the height of three or four inches. Should an explorer trace these holes downward, he will invariably find them terminating in water. In these burrows the animal lives during the whole of the dry season, deepening its hole as the receding water renders necessary during the night, as the freshly excavated wet earth lying round the entrance early in the morning testifies. I have never yet taken this species in streams or the *Astacus Bartonii* in swamps. I am unaware at what season of the year the intercourse between the sexes takes place, but I have found the eggs on the egg bearers in November, where they are carried during the whole winter and are hatched at the end of March or the beginning of



April. The young are then perfectly formed in every respect like the adults and undergo no metamorphosis, they remain attached to the parent till their first moult, which in some I kept in confinement did not take place till late in May, but I think it probably would have been earlier in a state of nature. The subject of the metamorphosis of the crustacea is one of great interest, and as yet of much uncertainty, though since the startling discovery of Thompson much has been done ; yet how can we account for it, that some crustaceans as the genus now under consideration are hatched perfect, while according to M. Coste, the young of the nearly allied *Palinuri* constitute the old genus *Phylopoma*, and some have even asserted that the still more closely allied *Homanus* undergo change ?

I was much surprised at the length of time required for incubation, being a fact I had not been aware of, but I find on the authority of M. Coste, that this habit is quite normal. He says "All the crustacea carry their eggs under their tail or some other part of the body where incubation takes place, this incubation is very generally slow, it does not take less than five or six months in Lobsters and *Palinuri*."

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## LIST OF PLANTS COLLECTED CHIEFLY IN THE IMMEDIATE NEIGHBOURHOOD OF LONDON, C. W.

BY W. SAUNDERS

A grateful acknowledgment is due Professor Hincks of University College, Toronto, for his unvarying kindness to the collector in determining a large number of the plants in the following list which, for want of time could not be named, while in a fresh condition. The Professor, from his extensive knowledge of the Flora of our country, has been enabled to determine with certainty from the dried specimens nearly all that have been submitted to him. There are, however, a few rare and interesting ones, which had not previously come under his observation, and which could not well be *positively* determined without fresh specimens. These will be found questioned, although in nearly every place the evidence furnished by the dry plant has been almost positive as to the entire correctness of the name given.