

Article XX.—NOTICE AND DESCRIPTION OF NEW SPECIES AND A NEW GENUS OF PHYLLOCARIDÆ.

By R. P. WHITFIELD.

PLATES XII-XIV.

Mr. Edgar E. Teller and Mr. Charles E. Monroe, of Milwaukee, Wisconsin, have placed in my hands a collection of remains of Ceratiocaris-like Crustaceans, for determination and description, which they obtained near Waubeka, Wisconsin. The quarries in which these specimens were found are situated about one mile north of the village, near the Milwaukee River, and are described in Volume II of the Geological Survey of Wisconsin, where they are referred to the Lower Helderberg formation. The remains are found in the present bed of the quarry in a layer used for building-stone and flagging, and seem to be fairly numerous, judging from the number of fragments obtained.

In studying these fossils I find among them representatives of three distinct forms. One of these, and by far the most abundant, belongs to the genus *Ceratiocaris*, so far as the general form and features are concerned, while one other differs considerably in the form of the carapace and appears to belong to a distinct genus, for which I propose the name ENTOMOCARIS, from the resemblance of the carapace to that of an ostracode entomostracan, since it is strongly curved in front and behind on the dorsal margin, instead of being nearly or quite straight, as in *Ceratiocaris*. This renders it probable that there was a hiatus between the two sides of the carapace both in front and behind. The posterior margin was not truncated as in *Ceratiocaris*, but obtusely rounded, more as in *Colpocaris* M. & W., and *Rhinocaris* Clarke, indicating a bivalved carapace.

Entomocaris,¹ new genus.

Carapace ovate in outline, bivalvular, with a strong hiatus in front and rounded behind; hinge line straight for about half its length. Rostrum not

¹ἐντομός, cut up; καρίς, a shrimp.

known. Abdomen composed of fourteen or more segments, three or four of which may be naked. The post-abdomen bears three spines, the central one or telson, elongate and slender, and the lateral ones (*cercopods*) flattened and articulated to the caudal plate.

Entomocaris telleri, n. sp.

PLATE XII, FIG. 1, AND PLATE XIV, FIGS. 1, 2 AND 7.

Specimens of more than medium size, the only entire individual seen measuring about twenty-one centimeters in length by six and one-half centimeters dorso-ventrally across the carapace.

Carapace ovate in general outline, straightened on the middle portion of the dorsal margin and gibbously rounded on the ventral; widest a little behind the middle of the length; antero-dorsal margin rather strongly curved for three and one-half centimeters from the anterior end, which is marked by a narrow, sharp beak half a centimeter long; on the postero-dorsal margin the border is more abruptly rounded and margined by a narrow, thickened border which extends entirely around the ventral portion to the base of the anterior beak; surface marked by very fine, wavy striæ, much too fine and faint for representation on the figures.

Abdomen much elongated, composed of fourteen or more segments. The anterior ones within the limits of the carapace must have been quite short, but their outlines cannot be seen, and their presence and number are only shown by the indications of slender limbs (swimmerets) as seen pushing up the crust of the carapace which overlies them. Farther back the segments are more distinct. The terminal segment is long, about one-fourth longer than high. Surface of the body segments granulose, so far as can be seen by a good lens; no other marking being visible.

Telson moderately large; spine straight and slender, as long as the last four and a half body segments; thickened in the middle as it lies flattened on the rock, leaving a deep median depression in the matrix where removed. Lateral spines strong and thickened on the margins, the entire length not indicated on the stone, from the breakage of the surface.

The swimmerets seem to have been slender, judging from indications left on the specimen.

Mandibles very imperfectly represented. An indication of their existence is seen in the elevation of the crust of the carapace, but with considerable uncertainty. The mandibles shown on Plate XIV, Figs. 1 and 2, have been referred with some doubt to this species, principally on account of their greater strength and the difference in form from those preserved in the specimens of *Ceratiocaris monroei*. These are somewhat triangular, and are provided with five strong cusps of much the same form as those of the species just mentioned, but the manubrium is quite different in its detail, especially in the large triangular opening in the inner surface for the passage of the muscular parts.

This species differs from *Certiocaris monroei*, with which it is associated, principally in the form of the carapace, which is rounded posteriorly instead of being obliquely truncated, and has the dorsal line rounded in front of and behind the proportionally shorter hinge line. It also differs in the absence of the peculiar surface structure of the body segments and in the form of the lateral appendages of the tail, which are provided with thickened margins in this species, whereas those of the best preserved example of that species are flattened and smooth, or at most have an impressed line of minute punctures which may represent the bases of a row of fine setæ.

***Ceratiocaris monroei*, n. sp.**

PLATE XIII, FIGS. 1-5, AND PLATE XIV, FIGS. 3-8.

Specimens of moderately large size. Carapace of semielliptical form, about three-fifths as high as long; dorsal line very nearly straight, anterior extremity slightly beaked, posterior end obliquely truncated, longer below than above, with the truncation a little more than half the height; ventral margin irregularly rounded, more gibbous in the middle or just anterior to the middle of its length; margin thickened, forming a narrow flat border which extends from the rostrum in front to the posterior basal angle, which is rounded; surface of the crust very finely and evenly striated, the striæ passing obliquely downward and forward from the dorsal line and nearly parallel to the basal margin and again upward toward the anterior end. The striæ number from twelve to fifteen in the space of one millimeter; substance of the carapace very thin; ocular tubercle not positively observed.

Abdomen composed of about fourteen segments, those within the carapace short and slender, enlarging backward in both length and width until their width (or height) is more than half the dorso-ventral height of the carapace; four or more segments apparently exposed beyond the posterior margin of the carapace; the last segment long, twice or more than twice as long as that in front, and rapidly narrowed backward to the junction with the telson.

Telson long and slender, and when flattened from the side is seen to have been slightly recurved and probably somewhat triangular in section, but evidently marked by a thickened central rib which shows convex both on the substance and in the impression of the opposite side of the same individual. It is also armed with a thin, flattened, slightly recurved, lanceolate appendage or lateral spine (*cercopod*) on each side, articulated just behind the articulation of the caudal plate, and of about half or less than half the length of the central spine. These appendages are usually destitute of any ornamentation, but in

one or two cases show a line of fine punctures near the upper margin, while the central spine shows a row of minute punctures on each side, and in some cases rows of hair-like spines.

Mandibles rather large and strong, somewhat hatchet-shaped and armed with five or six protuberances near the masticating edge. The upper or outer surface appears to have been smooth and flat. On the inner face they are thickened near the margin for the teeth, and behind these an oval opening is seen which extends to near the posterior margin, probably for the passage of the motor ligament.

Surface of the abdominal rings marked by wavy lines toward the sides and below, and above the median line passing into a peculiar tessellated structure composed of zigzag lines and punctures.

Several of the specimens showing the abdominal segments retain portions of the swimming feet or imprints of them. None of them, however, are sufficiently well preserved to show an entire limb satisfactorily. There appears to have been one pair to each segment, and the limbs seem to have decreased slightly in length and thickness from the larger segments backward, and much more rapidly from the same point forward, as seen on several specimens. These limbs (*swimmerets*) appear to be composed of the three outer joints only, those nearer the body not being distinguishable. The outer joint seems to be flattened, and in one or more specimens appears to have been margined with fine setæ.

On two of the abdomens preserved, there is seen an impression running along the central line and extending from near the anterior end of the body backward, terminating just in front of the telson near the ventral margin. This I presume to have been the intestinal canal. In one of the specimens it is deeply and strongly marked, and appears as if it had been undulated by numerous constrictions; in another it looks as if transversely corrugated. If it is the imprint of the intestinal canal, it was probably distended with food when the animal died, since the impression left is quite strong.

This species differs from *C. maccoyana* and *C. aculeata* Hall, from the Water-lime formation of New York (Pal. N. Y., Vol. III, pp. 421*, 422*, Pl. 84, Figs. 1-6) in the shorter form of the carapace and in the entirely different proportions of the spines of the tail, the *cercopods* in that species being very nearly as long as the telson, while in this one they are only about half as long.

***Ceratiocaris poduriformis*, n. sp.**

PLATE XIV, FIG. 10.

Carapace unknown. Abdomen very small, sublinear and elongate-cylindrical; segments, of which only four are known, proportionally long and narrow, the

last one rather more than twice as long as thick, and very slightly tapering ; the second one as long as high, and the two in front higher than long ; articulating margins oblique.

Telson as long as two and a half of the body segments, counting from behind ; central spine slender and its appendages about half its length.

Surface, as seen on some of the crust preserved in the matrix, marked by slightly oblique, somewhat wavy striæ.

This specimen appeared so doubtful at first that I scarcely considered it as belonging to the genus, but on further examination I thought it might be an articulated rostrum of one of the species, if they really were provided with such an appendage. With this idea in mind I placed the specimen under a higher magnifying power to examine the crust, which is partly preserved in the matrix, when I found that there was a caudal appendage, mostly covered by adhering rock. This I subsequently uncovered to its entire length, revealing the articulated appendages and proving the specimen to be in fact a small *Ceratiocaris*. It can hardly be the young of either of the species with which it is associated, on account of the difference in the proportion of the length and height of the segments, and I have considered it a distinct species, as was originally suggested to me by Mr. Teller, the discoverer. The specific name applied will recall its resemblance to *Podura*, the 'skip-jack' or 'spring-tail.'

General Remarks.—The specimens of *Phyllocaridæ* found in the quarries mentioned at the beginning of this article are quite numerous, but consist mostly of the caudal spines and mandibles. A few imperfect bodies have been obtained, and also a few preserving more or less of the carapace. A single almost entire individual of *Entomocaris telleri* was obtained and is figured on Plate XII. It is also probable that some of the caudal spines and some of the mandibles found belong to that species, but it is quite impossible at the present time to decide with any degree of certainty to which of these species any of the detached fragments may have belonged. Among the mandibles there appear to be two quite different forms, one having a small oval or rounded opening on the under or inner surface, and the other presenting a much larger, subtriangular opening. The latter form is usually the larger and stronger, hence I have inferred that it may belong

to *E. telleri*, since the smaller, hatchet-shaped mandible with the round or oval foramen is often found connected with the examples of the carapaces of *C. monroei*.

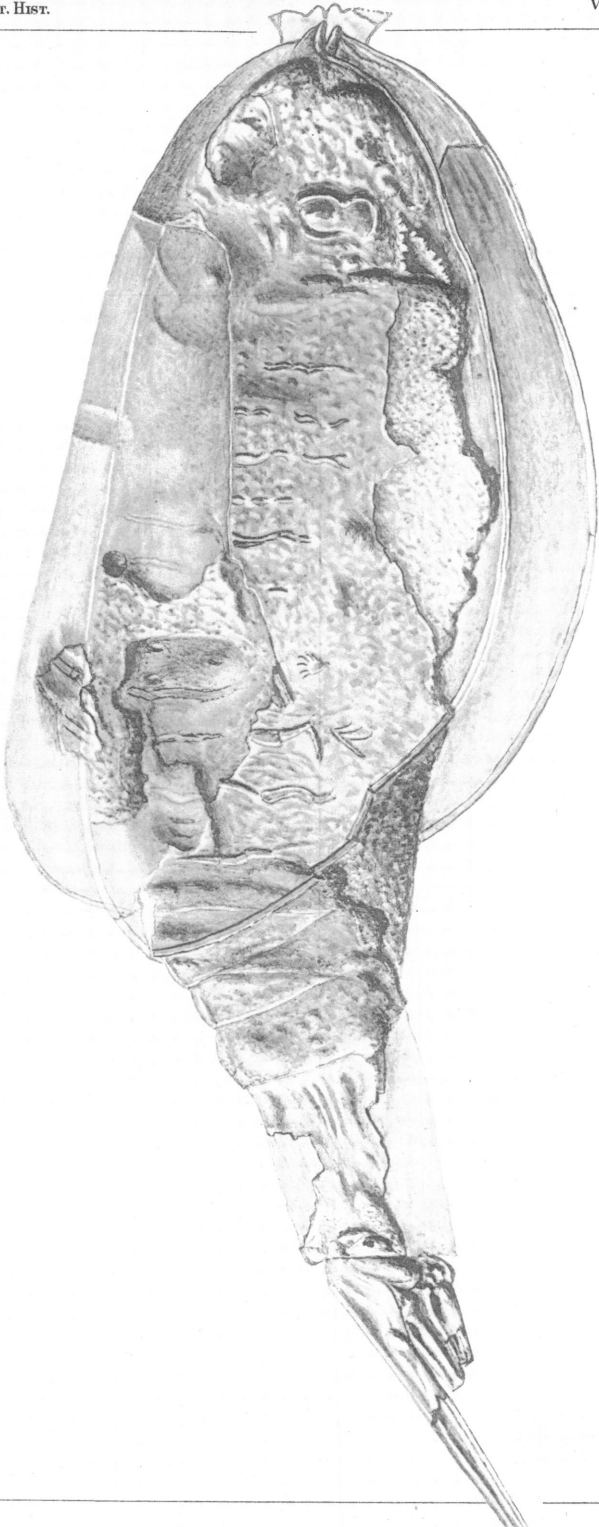
The same difficulty arises in trying to determine to which of the species the detached caudal spines belong. The articulated appendages of the telson of *Entomocaris telleri*, however, have a thickened margin, while those found actually attached to the other species have not. This feature will be found something of a guide in placing them. Of the third species, *Ceratiocaris poduriformis*, there has been found only one specimen, that figured, and its counterpart, and it is probably a rare form.

Much credit is due to Mr. Teller and to Mr. Monroe for their care in collecting the many fragments of these obscure forms; and also for their great liberality in presenting to the American Museum of Natural History all the type specimens figured in this paper.

EXPLANATION OF PLATE XII.

Entomocaris telleri.

The figure is the only nearly entire individual observed, and is of natural size. It shows the right and left sides of the carapace a little displaced vertically, but preserving the outlines almost entire, the outer half having the posterior margin slightly faulted so as to throw it about a third of an inch out of line with the upper impression, which is the continuation of it, while the inner half is concealed over the same region by the overlying abdomen. The remains of the swimming feet are seen scattered along beneath the crust of the carapace, and show through its surface. The projecting outline in front of the carapace represents a thin film of crust which probably does not pertain to the animal, unless it may be a part of the mandibles.



EXPLANATION OF PLATE XIII.

Ceratiocaris monroei.

Fig. 1.—View of part of the carapace showing all but the anterior outline, and preserving much of the crust. The abdomen is seen, also preserving the test over the greater portion of its surface, and some indications of slender, bifurcating limbs to seven of the segments within the carapace. The caudal plate and spines shown in the figure may belong to the same individual, but they are on a lower layer of the shaly rock.

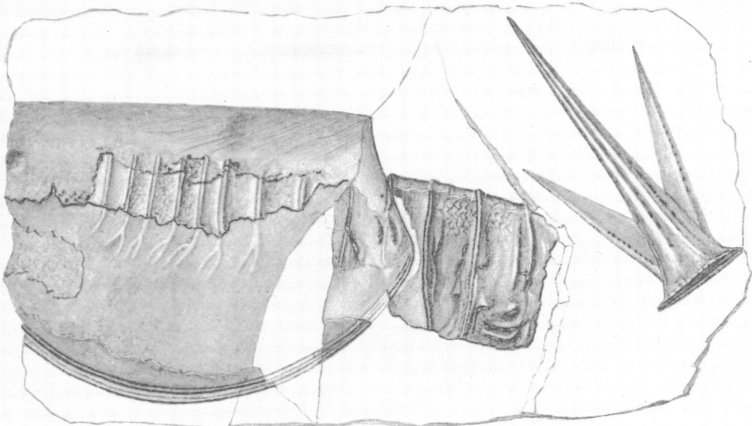
Fig. 2.—An abdomen with fourteen joints and the telson and spines, also a fragment of the border of the carapace and mandible. The depressed line along the abdomen is supposed to represent the intestinal canal.

Fig. 3.—View of another specimen showing part of a carapace, mandible, body segments and telson, with remains of swimmerets.

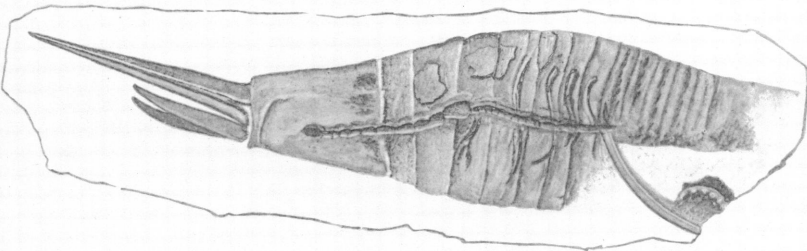
Fig. 4.—View of a fragment of a carapace showing the anterior rostral sinus. The carapace is folded on one side of the center, shortening the front side so as to make the two parts appear quite unequal.

Fig. 5.—An imperfect mandible in which the masticating tubercles have been broken. Enlarged two diameters.

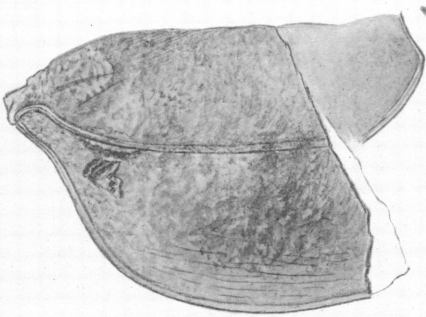
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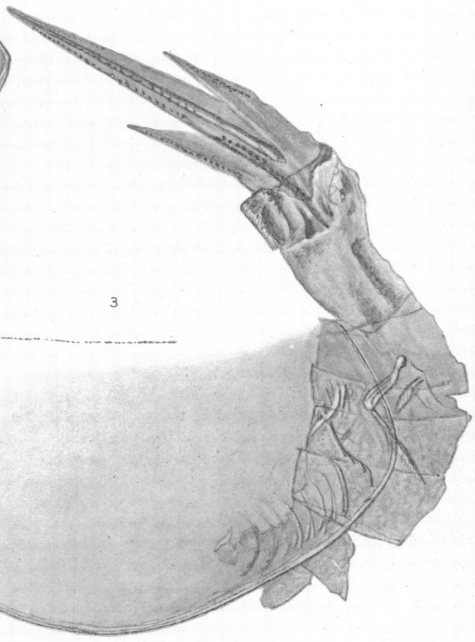
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EXPLANATION OF PLATE XIV.

Entomocaris telleri?

Fig. 1.—View of a left mandible supposed to belong to this species. The manubrium has been ruptured and distorted. Enlarged two diameters.

Fig. 2.—View of a nearly entire right mandible. Enlarged two diameters.

Ceratiocaris monroei.

Fig. 3.—View of a right mandible showing the prevailing form seen. Enlarged two diameters.

Fig. 4.—View of the outer face of a form of mandible seldom found. Natural size.

Fig. 5.—View of an abdomen showing fifteen segments, with the imprint of several of the swimmerets and of what may have been the intestinal canal. Little of the crust is preserved, but the matrix preserves the imprint of the peculiar markings of the surface very distinctly.

Fig. 6.—Caudal plate and telson with the appendages flattened laterally, and showing the articulation very perfectly.

Fig. 7.—View of another specimen flattened obliquely and showing pointed margins to the last body segment.

Fig. 8.—Enlargement of the zigzag surface ornamentation of the body segments.

Entomocaris telleri?

Fig. 9.—View of the terminal segment and caudal plate and spines which may belong to this species.

Ceratiocaris poduriformis.

Fig. 10.—View of the imprint of the type specimen, which retains part of the crust. Natural size.

