NOTES ON SOME CRUSTACEANS FROM THE CHEMUNG
GROUP OF NEW YORK.

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I. A Singularly Ornamented Phyllocarid Genus, *Pephricaris*.

By the courtesy of Professor A. R. Crandall, of Alfred university, Alfred, N. Y., and the kindness of Mr. Charles Butts, of the same place, I have been permitted to study specimens of a new crustacean allied to *Echinocaris*, but noteworthy for the extravagant nature of its armature. Of these specimens, two in number, the more complete belongs to the museum of Alfred university and is a sculpture-cast of essentially the entire test, the valves of the carapace being expanded without distortion and the abdominal segments showing, in part, in the posterior hiatus of the carapace valves and thence normally protruding behind. The second specimen, the property of Mr. Butts, is only the echinate margin of one carapace valve.

The general aspect of the carapace is not unlike that of some species of *Echinocaris*, yet it is devoid of the curved sigmoid carina which characterizes typical species of that genus.

The carapace valves are broad, their margins curving rapidly outward for about one-half of their length, slowly recurving near the middle and thence more rapidly receding to the posterior extremity. The expanded valves lie with a moderately broad anterior or rostral cleft, but there is no evidence of a separate rostral plate. They are in contact just back of the apex of this cleft, but for only a short distance, as the underlying abdominal segments are partly exposed, a fact which may be due either to this being the normal attitude of the valves, or to casual separation of them, or again to a breaking of the edges of the cast which is not altogether clear at this place. The surface of each valve is divided into two convexities by an oblique depression beginning at the dorsal edge just back of the middle and extending backward with gentle obliquity. This groove does not reach the margin

FIGURE 1.

Pephricaris horripilata, Chemung sandstone, Alfred, N. Y.

of the valve. The anterior convexity is much the larger. Usually, in *Echinocaris*, there is a number of paired nodes and tubercles grouped about the cephalic extremity of the carapace, but in this fossil there is only a single pair, represented by two deep pits situated close upon the hinge and at the apex of the rostral cleft. It is possible that these are remains of ocular nodes, but their depth suggests the probability of their having been basal attachments of the larger legs. Behind these nodes begins an oblique and strong ridge, thickest and most elevated at the hinge, where the anterior edges of the ridges on the two valves meet. This ridge departs backward into the median groove, passes down its anterior slope, then, with a slight change of angle, along the groove and rises slightly on its opposite slope, terminating with the groove itself. The margin of the carapace is somewhat thickened and elevated.

Nowhere in *Echinocaris* do we find a carapace structure like this, even among the species of the Chemung group. The lateral curved carina is one of the constant characters of the genus and may even be duplicate in later species. The median sinus exists there, normally, only as a depression between nodes, and no species is so free of cephalic nodes as this.

As to the abdominal segments, we find that three and a portion of a fourth, protrude beyond the carapace; between the carapace-valves we make out traces of two or three others, estimating the entire number at seven. The posterior segments are unusually short and have short spinules at their post-lateral extremities; there may, also, have been such spinules elsewhere along the posterior edge as in *Echinocaris*, but such are not seen. The caudal plate is short and triangular, with a short telson and two long curved cercopods.

FIGURE 2.
Pephricaris horripilata, margin of
left valve.

The fossil bears a striking ornamentation or armature. The entire outer margins of the carapace valves carry a single row of broad, strong, erect and slightly recurving spines. These are shortest at their commencement on the anterior margin, gradually increase in size posteriorly, their greatest length being reached on the post-lateral curve, and thence to the posterior angle of the carapace they become shorter. The maximum length attained by these spines is not less than one-half of the greatest diameter of a carapace valve. That these processes are spinous extensions of the chitinous test substance, and not bundles of setæ, or of other nature, is shown by the aspect of the imprints they have left in the matrix, these being sharply defined

and clean-edged throughout their extent; and again by the presence of similar but straighter and more slender spines upon the final segment of the abdomen. Of the latter, two pairs are visible, the penultimate pairs appearing to be somewhat longer than the ultimate; there are traces also of a similar pair on the antepenultimate segment.

This description presents all the known characters of this peculiar crustacean. Its essential structure is nearest to *Echinocaris* and yet not in harmony with that genus, and its extravagant decoration emphasizes that generic difference. For this reason the generic term *Pephricaris* is adopted for the fossil, and the species may be known as *Pephricaris horripilata*.

Both specimens of the species were found in loose blocks of compact Chemung sandstone at Alfred, N. Y. Neither shows associated fossils.

II. The Chemung Trilobite, *Bronteus senescens*, Clarke.

In the Report of the New York State Geologist for 1888, the writer described the trilobite above named.* The single specimen upon which the description then published was based, was but a very imperfect fragment of a pygidium and the only justification for drawing attention to the fossil was the extreme rarity of all trilobites in the Chemung faunas. At the date of that writing the presence in the Chemung of the species *Phacops rana*, Green, common in the Hamilton rocks beneath, and not of infrequent occurrence in the Ithaca fauna immediately below the Chemung formation, was suspected, and had been announced. Later evidence has not confirmed this statement, and we know to-day only two described species of trilobites from this fauna; the *Cyphaspis levis*, Hall (sp.), the original and only known specimen being a cephalon, and *Bronteus senescens*. The presence of the genus *Homalonotus* is shown by a fragment from the higher beds in Alleghany county. Since the description of *Bronteus senescens*, founded on a specimen from the lower Chemung strata in the town of Prattsburgh, Steuben county, additional material has been obtained which sets forth the characters of the species in its entirety and also shows that from the fragment previously figured and the restored outline at that time given to the pygidium, it might prove difficult to recognize the species when at its best. A restatement of the characters of the fossil drawn from our amplified knowledge of it, will therefore serve to clearly define the value of this species.

* The Genus *Bronteus* in the Chemung Rocks of New York, *op. cit.*, Figure 1; also published in Forty-second Annual Report Trustees State Museum, pp. 403-405.

Soon after the publication of the article above cited, the writer located the horizon at which this fossil occurs, on Bardeen's farm in the northern part of the town of Prattsburgh, finding here several nearly entire pygidia. This horizon is well characterized by the constant association of this trilobite with the crinoid *Arthracantha depressa*; a species recently described by Wachsmuth and Springer from specimens collected at this locality where its spinous plates are very common. It is the zone of *Rhynchonella* (*Pugnax*) *pugnax*, Sow., and is an eastward extension of this zone from its somewhat more prolific manifestation at High Point, in the town of Naples. More recently two essentially entire specimens of the trilobite have been obtained from higher strata of the Chemung group, near Avoca, Steuben county, through the agency of Mr. Clifton J. Sarle, both excellently preserved though lacking a few details, but presenting us with a really striking exemplification of the late continuance of this genus.

Figures of these specimens are here given and the description of the characters of the species is as follows:

FIGURES 3 and 4. *Bronteus senescens*; two nearly entire individuals from the Chemung group, near Avoca, N. Y.

GENERAL PROPORTIONS. The outline of both of these extended individuals is quite regularly ovo-elliptical, the shorter curve being at the posterior extremity. In length the larger measures 54 mm., the smaller, 46 mm., while the greatest width of the animal is about one-half this dimension in both cases. The specimens have been subjected to slight, if any, vertical compression though the heads are somewhat askew; the lines of the margin may, therefore, be regarded as normal.

CEPHALON. The head is short and subsemilunar in outline, the posterior margin being quite direct. Its length is slightly more than one-half its width. The genal angles are somewhat produced into short and broad spines. The margin is elevated, while the border of the head is broadly concave, rising on its proximal limb to a genal ridge. The eyes are small, well back on the cheeks and moderately elevated, the surface between the palpebrum and the dorsal furrows being notably convex. The *facial sutures* are normal. The *glabella* is elongate and clavate, its width at the anterior extremity where it reaches but does not overhang the margin, being twice that just in front of the occipital ring. In contour it is depressed convex, though its elevated median portion attains greater elevation than any other part of the cephalon. The dorsal furrows are deep and narrow; starting from the posterior margin they approach each other rather abruptly; the curve changes at the level of the posterior part of the eyes and thence forward the furrows diverge outward rather gradually, broadly recurving near the anterior margin. The lateral furrows are short but distinct, the first and third pairs being most clearly defined, a median pair making but a gentle depression upon the surface, while the occipital groove is broad and shallow.

The occipital ring is likewise broad and distinct, but its prolongation to the cheeks is narrower and much more faint.

In one of the specimens the removal of the part of the glabella has exposed a portion of an elongate *hypostome* with an oval central depression, surrounded by a narrow regular groove and bordered by a narrow flattened margin.

THORAX with the normal number of ten segments. The axis is very broad, having fully one-third the entire width of the thorax, and its margins curve outward, approaching each other posteriorly. On the axis the segments are moderately broad and flat, distinctly elevated along the median line with general longitudinal depressions on the lateral slopes and a slight anterior bend at the sides. On the pleuræ, the segments are narrow and soon become free of each other, tapering rapidly to slender, recurved, acute extremities.

PYGIDIUM semielliptical, flabelliform; length and width about equal. Axis very short, extending for not more than one-fifth or one-sixth of the plate; triangular, elevated medially and with an obscure central lobe and depressed lateral slopes. The pleuræ are broad, flat, separated by sharply defined flat grooves. They broaden rapidly outward and finally become merged into the grooves near the periphery of the plate, so that the margin of the latter is smooth. These ribs are fifteen in number; the median rib being

somewhat broader than the rest and, in the larger specimen, showing a tendency to division along its distal portion. The margin of the pygidium is without evidence of spines. In general contour this plate is broadly depressed within the slightly elevated periphery, convex over the central region and again sharply depressed about the axis.

ORNAMENTATION. The entire test is pretty uniformly pustulose, the pustules varying somewhat in size and being coarsest on the glabella and the ribs of the pygidium. About the enfolded margins of the cephalon and pygidium the surface is marked by the usual incised inosculating lines.

OBSERVATIONS. This species is noteworthy not alone for the rarity of all trilobites at this horizon. It is, in all probability, the latest representative of the genus, making its appearance in this later division of Devonian time, subsequent to the first intrusion of *Spirifer disjunctus* and long after the only observed occurrence in this country of *Clymenia*. It appertains to a fauna which, considered in its local relations and in correlation with faunas of other countries, characterizes the final stages of the Devonian, and in these we have no other record of the occurrence of *Bronteus*. In this late survivor of the genus, therefore, we may expect to find structural traits indicative of, or in harmony with its late appearance. We observe that between the earlier (upper Silurian and early Devonian) and the later Devonian representatives of this genus there are contrasts in the form of the glabella, the outline of the pygidium and the nature of its ribs. Thus, the glabella (or we should rather say the cranidium, as the distinction depends on the varying distance between the facial sutures) is very wide anteriorly, the dorsal furrows being highly concave within the ocular nodes (compare *B. palifer*, Beyr., Lower Devonian, Zittel's figure, Grundzüge der Paläontologie, p. 473, fig. 1,279a; Katzer's figure, Geologie von Böhmen, p. 1,023, fig. 498-4; *B. campanifer*, Beyr., lower Devonian, Beyrich's figure, Einige böhmische Trilobiten, Plate, fig. 6; *B. Partschi*, Barr., upper Silurian, Katzer's copy of Barrande's figure, *op. cit.*, p. 937, fig. 377-2; *B. viator*, Barr., lower Devonian, Novak's figure in Katzer, *op. cit.*, p. 1,036, fig. 548-1; *B. acamas*, Hall, Niagara group, Twentieth Annual Report New York State Cab. of Natural History, Pl. II, fig. 19; *B. lunatus*, Billings, Trenton limestone, Geology of Canada, p. 188, fig. 187, and Clarke's figure, Geological Survey of Minnesota, Vol. III, Part 2, p. 725, fig. 43). In all of these and numerous other recorded examples the feature referred to is strongly manifested. If on the other hand, we turn to species of the middle Devonian, the narrowing of the glabella and the interval between the facial sutures becomes evident (see *B. flabellifer*, Goldfuss,

System. Uebersicht, Pl. VI, fig. 3; *B. meridionalis*, Trom. and Grasset, Barrois's figure, Calc. à Polypiers de Cabrières, Plate I, figure 2a; *B. thysanopeltis*, var. *Waldschmidtii*, v. Koenen, Waldschmidt's figure, Zeitschr. d. d. Geol. Gesellsch., Vol. XXXVII, Pl. XXXVIII, fig. 2; *B. senescens*, etc., etc.). This feature appears to be one which, irrespective of other variations in structure, has gradually passed through the change noted, and it is, naturally, to be observed that lower Devonian faunas embrace species, some with the wide, some with narrower glabella, while thereafter, the earlier type of glabella has disappeared.

With reference to the characters of the pygidium in this genus it may be remarked that the only really useful, tenable subdivision of the group is founded upon the presence of spinules upon the pygidial margin. This is *Thysanopeltis*, one of the names introduced by Corda and designed by its author to include species of this character; it has proven to possess a definite stratigraphic value. In matter of outline there is considerable variation, from the subsemicircular shape in the earliest species like *B. lunatus*, Bill., of the Trenton, *B. laticauda*, Wahlenberg, of the lower Silurian of Sweden, and *B. hibernicus*, Portlock, of the Caradoc, to the elongate-elliptical curve presented by the species of the Devonian. In this feature *B. senescens* is extreme, surpassing the elongate, narrowing tail-plate of *B. Kielcensis*, Gürich, of the lower upper Devonian (Cuboides horizon) of Poland. Corda (Prodrom einer Monographie der böhm. Trilobiten, pp. 58, 59, 1847), attempted a further division of the genus on the basis of the simplicity or duplication of the median rib of the pygidium, proposing for such species as show a bifurcation, the name *Dicranactis*, and for those in which it is simple, *Holomeris*. It has long been evident, and is shown in the species in hand, that the duplication of this rib is of such minor significance that it can be regarded only as an individual character and we can not safely infer values from this trait.

Barrande observed (Système Silurien, Vol. I, p. 840) that a division of the species of *Bronteus* might be founded upon the number of ribs on the pygidium, which are either six, seven or eight on either side of the median rib. By far the greater number of species possess seven ribs, while six such ribs are present only in the earliest species, *e. g.*, *B. lunatus*, *B. hibernicus*, *B. laticauda*. Herein *B. senescens*, having seven ribs, perpetuates the structure of the normal representatives of the genus.

The definite time value of the subgenus *Thysanopeltis* has been set forth by Barrois, Kayser, Frech and other writers. The only representative of this division yet known in American faunas is the species *B. tullius*, from the

Tully limestone (Cuboides horizon) of New York. Though the group is well represented in lower Devonian horizons, there is no record of its perdurance beyond the Cuboides horizon, and we notice that in this late representative of *Thysanopeltis* the marginal spines are minute and hair-like. Within the limitations of this group we find the glabella passing through variations in dimensions quite similar to those which characterize the genus as a whole.

Bronteus senescens is devoid of marginal spines and reproduces the characters of the normal middle Devonian type. We look upon this species, therefore, as distinctly progressed in the character of its glabella and pygidium and as having escaped entanglement with the early Devonian divergence into *Thysanopeltis*; a survival, with appropriate time modifications, of the proper expression of the genus.