



***Imocaris tuberculata*, n. gen., n. sp. (Crustacea: Decapoda)  
from the upper Mississippian Imo Formation, Arkansas**

**Frederick R. Schram**

*Department of Geology, San Diego Natural History Museum, San Diego, CA 92112 USA*

**Royal H. Mapes**

*Department of Geology, Ohio University, Athens, OH 45701 USA*

*Abstract.* A new genus and species of decapod crustacean is described from the Upper Mississippian Imo Formation, near Leslie, Arkansas. The exceptionally well-preserved specimen is a single carapace, associated with a molluscan dominated fauna including ammonoids, gastropods, and bivalves. *Imocaris tuberculata* serves to help fill the stratigraphic gap between the oldest decapod, *Palaeopalaemon newberryi* in the Upper Devonian of Ohio and Iowa, and the diverse Triassic decapod faunas of Europe.

INTRODUCTION

Schram et al. (1978) redescribed *Palaeopalaemon newberryi* Whitfield, 1880, and recognized it as the earliest decapod crustacean. However, until now, there has been a significant gap in the decapod fossil record from this Upper Devonian form to the better known Triassic decapods of central Europe (see e.g., Förster, 1967). The specimen described herein is a single well-preserved carapace from the Upper Mississippian-Chesterian (Naurian-Arnsbergian; ammonoid zone E<sub>2</sub>b-c) of Arkansas interpreted to be a decapod crustacean.

This specimen was collected from a road cut along Peyton Creek just south of the Van Buren Co. line, Arkansas, along U.S. Hwy. 65 approximately 6.4 km (4 mi) southeast of Leslie, Arkansas. The fossil was found as the result of washing and concentrating some 817 kgs of matrix from a 0.6 m (2 ft) concretionary shale layer approximately 32 m (105 ft) above the contact of the Imo Formation with the underlying Pitkin Formation (in the middle of "bed 21," of Sutherland and Manger 1977, fig. 1).

SYSTEMATIC PALEONTOLOGY

Order Decapoda Latreille, 1803  
Suborder Pleocyemata Burkenroad, 1963  
Infraorder Reptantia Boas, 1800  
Section Brachyura Latreille, 1803  
Subsection Dromiacea de Haan, 1833  
Genus *Imocaris* n. gen.

*Diagnosis.*—Carapace cylindrical, with subrectangular outline in both dorsal and lateral views. Surface tuberculate. Cervical and branchiocardiac grooves prominent. Rostrum small to non-existent. Antero-lateral margin with prominent denticles.

*Etymology.*—Named after the Imo Formation, gender feminine.

*Type species.*—*Imocaris tuberculata* n. sp.

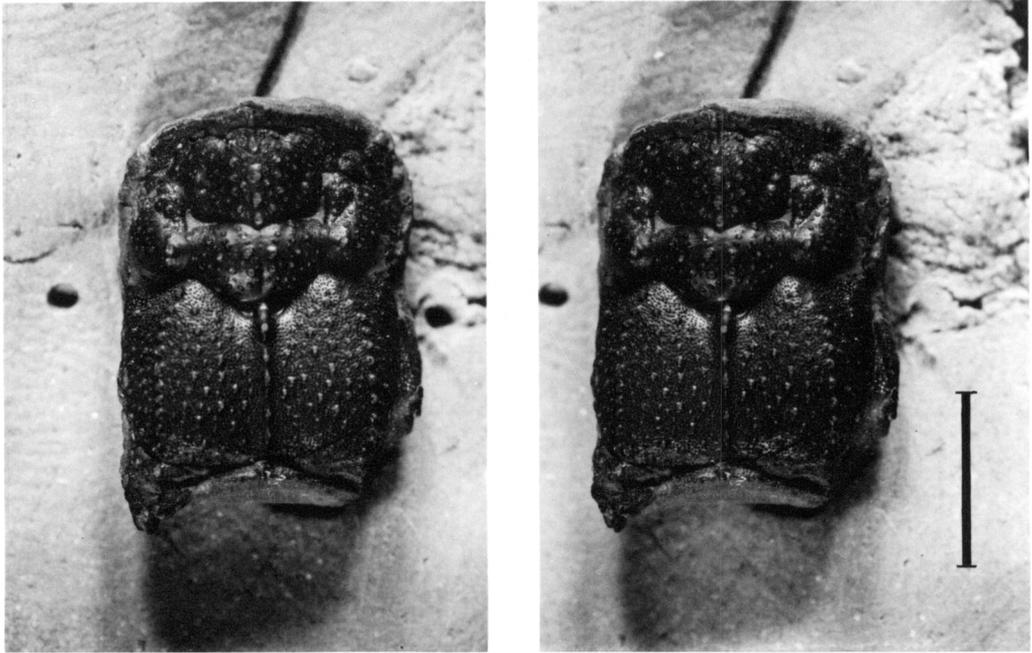


FIGURE 1. *Imocaris tuberculata* n. sp., holotype SDSNH 25139, stereo pair, scale = 5 mm.

*Imocaris tuberculata* n. sp.

Figure 1

*Diagnosis.*—Because there is but one species, the diagnosis is the same as that of the genus.

*Holotype.*—SDSNH 25139 (Fig. 1).

*Locality.*—SDSNH loc. 3191; NE  $\frac{1}{4}$ , sec. 11, T.13N., R.15W.; along road cut in U.S. Hwy. 65, south of Van Buren Co. line, Arkansas, on Peyton Creek.

*Stratum.*—Imo Formation, Chesterian, Upper Mississippian.

*Etymology.*—After the tuberculate nature of the carapace.

*Description.*—Anterior margin of carapace straight, without orbits, with only slight suggestion of rostrum. Lateral margin anterior of branchiocardiac groove with at least 5 prominent denticles, and posterior of branchiocardiac groove marked by submarginal furrow. Posterior margins slightly concave, with faint submarginal furrow. Prominent, deep cervical and branchiocardiac grooves, cervical grooves extend laterally from mid-line and turn anteriorly as short antennar grooves, branchiocardiac grooves continuous laterally with prominent inferior grooves. Carapace surface tuberculate. Mid-dorsal line marked by row of 4 large tubercles between rostral area and cervical groove, by slight groove between the cervical and branchiocardiac grooves, and by clear ridge surmounted by row of 5 (?6) tubercles between branchiocardiac groove and posterior margin. Pair of tubercle rows located laterally between branchiocardiac groove and posterior margin about  $\frac{1}{2}$ -way between median ridge and lateral margins, forming planes at which curvature of posterior carapace surface changes from horizontal to more vertical orientation. Carapace mid-line length—11 mm, approximate lateral margin length—12 mm, width—9.5 mm.

*Remarks.*—The fossil preserves an excellent view of the dorsal surface of the carapace. Attempts at preparation of the underside and margins of the specimen, however, seem to indicate that only the carapace is fossilized, i.e., no ventral thoracic structures appear to be present.

## DISCUSSION

The higher taxonomic affinity of any Paleozoic decapod is of interest because of the understanding it might lend to elucidating the sequence of events in the early radiation of Decapoda. Paleozoic decapods have been rare and widely scattered geographically. The type specimens of the supposed Permian decapod carapaces from Sicily, *Palaeopemphix* Gemmellaro, 1890, have been lost and, thus, their suggested decapod versus cumacean affinities can never be verified. The Devonian *Palaeopalaemon newberryi*, preserved in great detail, possesses several features in a combination of both astacidean and palinuran reptants (Schram et al. 1978); and, in addition, Felgenhauer and Abele (1983) have noted a characteristic natatian feature in that form as well, viz., the large scaphocerite. Bachmeyer and Malzahn (1983) have recorded from the Upper Permian Zechstein of Germany a free decapod cheliped (given the name *Erymastacus ? hoerstgenensis*), as well as leg and carapace fragments attributed to decapods in the stomach contents of the chimaeriform fish *Janassa bituminosa*. The fragmentary nature of the Zechstein fossils, however, makes them difficult to compare to the other known Paleozoic decapod whole body fossils. Finally, little can be said about the Soviet Permian form *Protoclytiopsis antiqua* Birshtein, 1958, except that it appears to be taxonomically close to a large, reptant, glypheoid type (Schram 1980).

Several characters mark *Imocaris tuberculata* as unusual, viz., the cylindrical form and rectangular proportions of the carapace, the presence of only a branchiocardiac groove posterior to the cervical (or alternatively a fusion of the post-cervical and branchiocardiac grooves), the lack of orbits, and the small or absent rostrum. Unfortunately, the lack of preservation of any eyes, antennae, mouthparts, thoracopods, and abdomen makes a definitive higher taxonomic assignment difficult.

Quite unexpectedly, the closest analogs to the derived features of *Imocaris tuberculata* listed above are to be found among the dromiacean brachyurans. These living forms tend to possess markedly cylindrical and somewhat subrectangular carapaces, strong cervical and branchiocardiac grooves, absent or poorly developed orbits, frequently weakly developed rostra, and (in at least the prosopids, some dynomenids, and the homoloids) prominent carapace sculpturing. The assignment of *Imocaris* to the dromiaceans on the basis of this single specimen considerably extends the range of that taxon back from the Lower Jurassic into the middle of the Carboniferous.

The recognition of *Imocaris* as a decapod begins to fulfill the expectations of Schram et al. (1978) that an extensive Paleozoic radiation of Decapoda is to be discovered in upper Paleozoic strata.

## ACKNOWLEDGMENTS

This research is supported in part by NSF grant BSR 82-12335 (FRS) and a grant from the Ohio University Research Council (RHM).

## LITERATURE CITED

- Bachmeyer, F., and E. Malzahn. 1983. Der erste Nachweis eines decapoden Krebses im niederrheinischen Kupferschiefer. *Annalen des Naturhistorischen Museums in Wien*. 85/A:99-106.
- Birshtein, Ya. A. 1958. Drevneishii predsta vitel otryada desyatinogikh rakoobraznykh, *Protoclytiopsis antiqua*, in Permakikh otlozhenii zapadnoi Sibiri. *Doklady Akademii Nauk SSSR* 122:477-480.
- Felgenhauer, B. E., and L. G. Abele. 1983. Phylogenetic relationships among shrimp-like decapods. *Crustacean Issues* 1:291-311.
- Förster, R. 1967. Die reptanten Dekapoden der Trias. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen* 128:136-194.
- Gemmellaro, G. G. 1890. Crostacei dei calcari con Fusulina della Valle del Fiume Sosio, nella provincia di Palermo in Sicilia. *Società Italiana di Scienze Naturali, Memorie* (3)8:1-40.
- Schram, F. R. 1980. Notes on miscellaneous crustaceans from the Late Paleozoic of the Soviet Union. *Journal of Paleontology* 54:542-547.
- , R. M. Feldmann, and M. J. Copeland. 1978. The Late Devonian Palaeopalaemonidae and the earliest decapod crustaceans. *Journal of Paleontology* 52:1375-1387.
- Sutherland, P. K., and W. L. Manger. 1977. Upper Chesterian-Morrowan Stratigraphy and the

Mississippian-Pennsylvanian Boundary in Northeastern Oklahoma and Northwestern Arkansas. Oklahoma Geological Survey Guidebook 18. University of Oklahoma, Norman.

Whitfield, R. P. 1880. Notice of new forms of fossil crustaceans from the Upper Devonian rocks of Ohio, with description of new genera and species. *American Journal of Science* (3)19: 33-42.