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## Short Note

# First report of penaeid (Crustacea, Decapoda, Penaeoidea) from the Lower Cretaceous (Albian) of the Tlayúa quarry, Tepexi de Rodríguez (Puebla, Central Mexico)

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### Abstract

The first penaeid from the Lower Cretaceous (Albian) of the Tlayúa quarry, Tepexi de Rodríguez (Puebla, Central Mexico) is here reported. The specimen has been tentatively assigned to the superfamily Penaeoidea Rafinesque-Schmaltz, 1815, for the lack of main diagnostic characters. Despite the incompleteness of the body, it is the second report of penaeid from the Lower Cretaceous of Mexico, increasing the scarce knowledge about the decapod assemblage of Tepexi de Rodríguez basin.

Keywords: Crustacea, Decapoda, Penaeoidea, Lower Cretaceous, Mexico.

### Resumen

*Se reporta el primer penéido del Cretácico Inferior (Albiano) de la cantera Tlayúa quarry, Tepexi de Rodríguez (Puebla, México). El espécimen ha sido tentativamente asignado a la superfamilia Penaeoidea Rafinesque-Schmaltz, 1815, dada la carencia de caracteres diagnósticos principales. A pesar de que el cuerpo se encuentra incompleto, se trata del segundo reporte de penéido del Cretácico Inferior de México, lo cual incrementa el escaso conocimiento que se tiene sobre la composición de decápodos de la cuenca de Tepexi de Rodríguez.*

*Palabras Clave: Crustacea, Decapoda, Penaeoidea, Cretácico Inferior, México.*

## 1. Introduction

The Tlayúa quarry near Tepexi de Rodríguez is a famous Albian fossiliferous locality in the Puebla State, Central Mexico (Figure 1). Fossils are diverse and well preserved in red lithographic limestones. Algae, fungi, plants, cnidarians, mollusks, annelids, arthropods, echinoderms, fishes, lizards, turtles, crocodiles, and pterosaurs have been reported from the Tlayúa Formation (see Applegate *et al.*, 2006, for

stratigraphy, paleoenvironment and floral/faunal updated list), considered as a Lagerstätten by Espinosa-Arrubarrena and Applegate (1995).

The Tlayúa Formation is a limestone sequence of 300 m, subdivided in Lower, Middle and Upper Members (Pantoja-Alor, 1992). The Middle Member (approximately 50 m thick) represents the most fossiliferous unit of finely laminated micritic limestone of yellow-brown color, with bedding planes defined by red hematitic layers. Belemnites

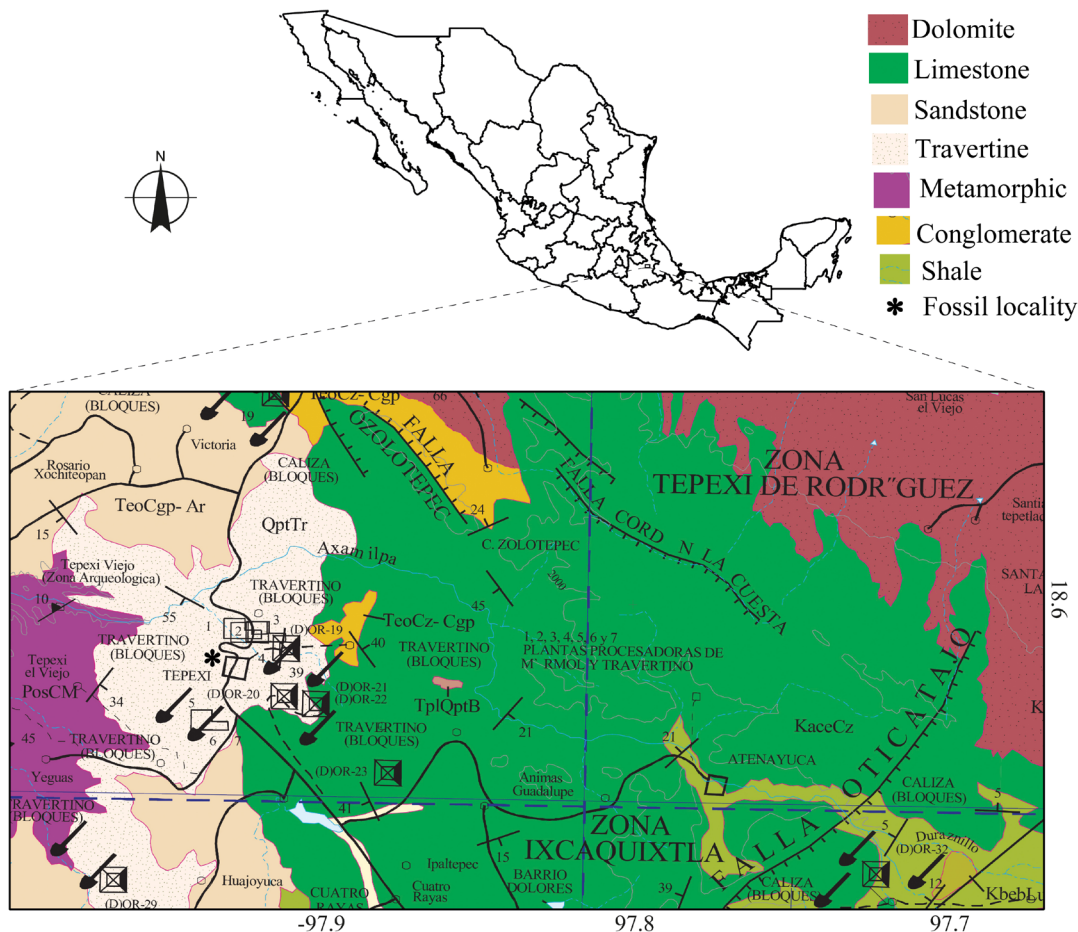


Figure 1. Location map of the fossiliferous locality in Puebla, Mexico.

and ammonites indicate a middle to late Albian age for this unit (Seibertz and Buitrón, 1987; Buitrón and Malpica-Cruz, 1987).

The original paleoenvironmental interpretation for the Tlayúa Formation was of a shallow, restricted lagoon with anaerobic conditions and cyclic periods of freshwater influence (Applegate, 1987; Espinosa-Arrubarrena and Applegate, 1995). An open marine basin has also been proposed by Kashiyama *et al.* (2004), who supposed that the sediments were dominated by storms and bottom waters had restricted circulation. Applegate *et al.* (2006) considered that this model does not explain the presence of shallow water elements such as algal mats, and the presence of freshwater and terrestrial elements such as insects, arachnids, and some reptiles. Feldmann *et al.* (1998) and Vega *et al.* (2005) discussed the paleoenvironmental significance of crustaceans to support the shallow lagoon model. A shallow nearshore environment has been confirmed by Suárez *et al.* (2009).

The typical red color of the fossiliferous limestone planes was interpreted as a result of authigenic hematite deposition, precipitated by decaying organic matter and trapped by algal mats (Espinosa-Arrubarrena and Applegate,

1995). Kashiyama *et al.* (2004) suggested, however, that the hematite was deposited secondarily during diagenesis. As observed by Espinosa-Arrubarrena and Applegate (1995), irregular topographic relief of fossils is completely covered by the hematite coat. Thus, the hypothesis for hematite being suspended in a shallow water column and its deposition propitiated by chemical reactions in turn of decomposing corpses and organic matter seems more reasonable.

## 2. Decapod crustaceans from the Tlayúa quarry

To date, only three decapod crustaceans are reported from this locality.

Feldmann *et al.* (1998) reported *Protaegla minuscula* Feldmann, Vega, Applegate and Bishop, 1998 (Aeglidae Dana, 1852) and *Tepexicarcinus tlayuaensis* Feldmann, Vega, Applegate and Bishop, 1998 (Dorippidae MacLeay, 1838). Later Vega *et al.* (2005), based on more complete specimens, made a review of decapod crustaceans from Tepexi, reporting *Pagurus* sp. as part of the crustacean assemblage.

Based on the data known to date, penaeid shrimps have

never been reported from this locality.

### 3. Material

One incomplete specimen in lateral view, lacking of the carapace and tail fan, preserved as a tiny imprint partially covered by hematite. The specimen has been tentatively assigned to the superfamily Penaeoidea Rafinesque-Schmaltz, 1815.

The study specimen is deposited in the paleontological collection of the Museo di Storia Naturale di Milano (MSNM).

Abbreviations – P1-P5: pereopods 1 to 5; s1-s6: pleonal somites 1 to 6.

### 4. Systematic Paleontology

Order Decapoda Latreille, 1802

Suborder Dendrobranchiata Bate, 1888

Superfamily Penaeoidea Rafinesque-Schmaltz, 1815

Family, genus and species indeterminate

Figure 2

**Material and measurements:** one incomplete specimen in lateral view (MSNM i27860 – body total length approximately 30 mm).

**Description:** Carapace. — Not preserved. Pleon. — Subrectangular pleonal s1-s5 dorsally rounded, subequal

in size; pleonal s6 longer than the previous ones; smooth s1-s6 terga and pleurae; telson not preserved. Cephalic appendages. — Not preserved. Thoracic appendages. — P1-P3 chelate, increasing in size; slender P1-P3 articles, with elongate carpus and merus and bearing thin minute chelae; very slender elongate P4-P5 articles; P4-P5 longer than P1-P3. Pleonal appendages. — Well-developed slender basal segment of pleopods with thin elongate flagella; uropodal exopod and endopod not preserved.

**Discussion:** The lack of the carapace makes difficult to observe the main morphological characters used to establish the systematic position of the studied specimen. However, the P1-P3 chelate and s2 pleura not overlapping those of pleonal s1 and s3 could suggest its assignment to the superfamily Penaeoidea Rafinesque-Schmaltz, 1815. Despite the incompleteness of the body, the study specimen represents the second record of penaeidean from the Lower Cretaceous (Albian) of Mexico, after the report of *Aeger hidalguensis* Feldmann, Vega, Martínez-Lopez, González-Rodríguez, González-León and Fernández-Barajas, 2007, from the Muhi quarry in Hidalgo State (Feldmann *et al.*, 2007). The P1-P3 structure and the long swimming pleopods probably indicate pseudonectonic forms, and points to a detritus feeding style-life.

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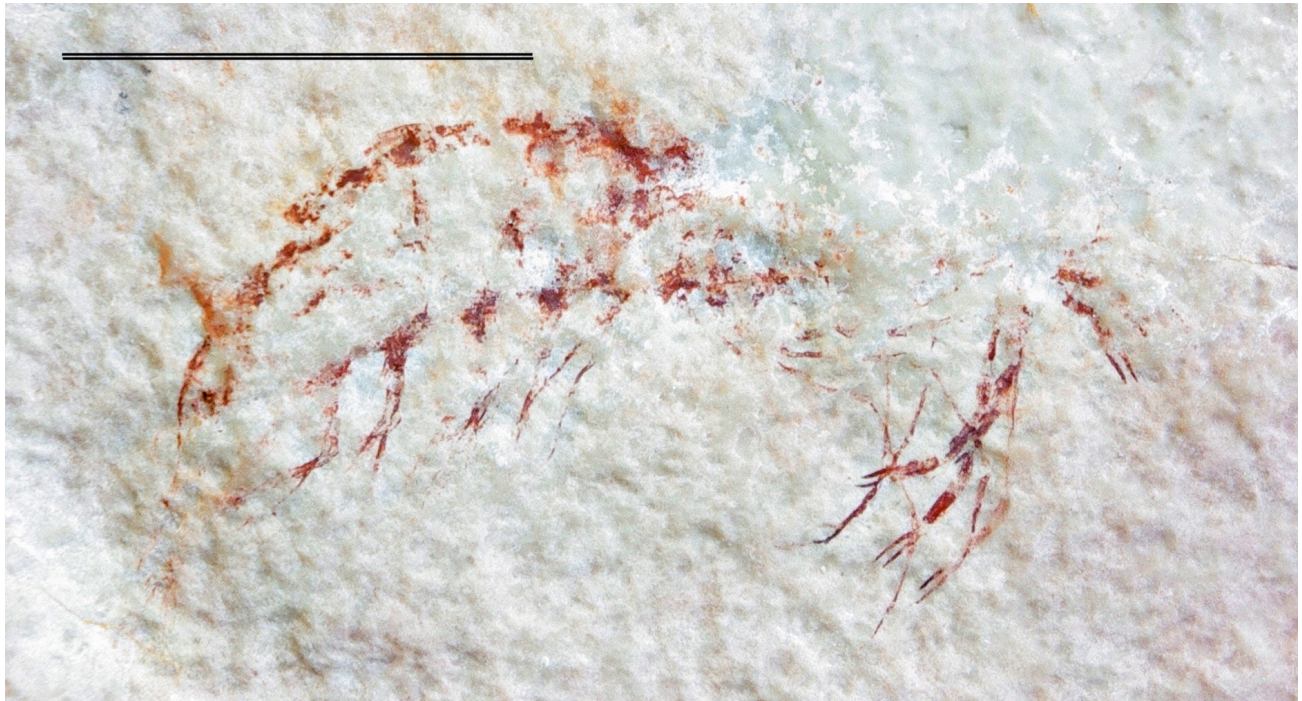


Figure 2. Indeterminate penaeid, MSNM i27860. Scale bar: 20 mm.

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## References

- Applegate, S.P., 1987, A preliminary study of the Tlayúa Quarry near Tepexi de Rodríguez, Puebla: *Revista de la Sociedad Mexicana de Paleontología*, 1, 40-45.
- Applegate, S.P., Espinosa-Arrubarrena, L., Alvarado-Ortega, J., Mouloud, B., 2006, Revision of Recent Investigations in the Tlayúa Quarry, in Vega F., Nyborg T.G., Perrilliat M.C., Montellano-Ballesteros M., Cevallos-Ferriz S.R.S., Quiroz-Barroso, S. (eds.), *Studies on Mexican Paleontology, Topics in Geobiology*, 24, 265-291.
- Bate, C.S., 1888, Report on the Crustacea Macrura collected by H.M.S. Challenger during the Years 1873-76, in Murray, J., *Zoology, Wyville Thomson. C. & J. Murray, Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-76 Under the Command of Captain George S. Nares, R.N., F.R.S., and the Late Captain Frank Tourle Thomson, R.N.*, 24, 1-942.
- Buitrón, B.E., Malpica-Cruz, V.M., 1987, Tepexi de Rodríguez, Puebla, una localidad fosilífera famosa de México: Primer Congreso Nacional de Paleontología, Sociedad Mexicana de Paleontología, México, D.F. Field trip guidebook, 24 p.
- Dana, J.D., 1852, Parts I and II, Crustacea. U.S. Exploring expedition during the Years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U.S.N., 13, 1-1618.
- Espinosa-Arrubarrena, L., Applegate, S.P., 1995, A possible model for the paleoecology of the vertebrate bearing beds in the Tlayúa quarries, near Tepexi de Rodríguez, Puebla, México, in Arratia, G., and Viohl, G. (eds.), *Mesozoic Fishes-Systematics and Paleoecology*, 539-550, Verlag Dr. Friedrich Pfeil. München.
- Feldmann, R.M., Vega, F.J., Applegate, S.P., Bishop, G.A., 1998, Early Cretaceous arthropods from the Tlayúa Formation at Tepexi de Rodríguez, Puebla, Mexico: *Journal of Paleontology*, 72, 79-90.
- Feldmann, R.M., Vega, F.J., Martínez-López, L., González-Rodríguez, K., González-León, O., Del Rosario Fernández-Barajas, M., 2007, Crustacea from the Muhi quarry (Albian-Cenomanian), and review of Aptian Mecochiridae (Astacidea) from Mexico: *Annals of Carnegie Museum*, 76(3), 145-156.
- Kashiyama, Y., Fastovsky, D.E., Rutherford, S., King, J., Montellaro, M., 2004, Genesis of a locality of exceptional fossil preservation: palaeoenvironments of Tepexi de Rodríguez (mid-Cretaceous, Puebla, Mexico): *Cretaceous Research*, 25, 153-177.
- Latreille, P.A., 1802, *Histoire naturelle, générale et particulière, des Crustacés et des Insectes. Ouvrage faisant suite aux Œuvres de Leclerc de Buffon, et partie du Cours complet d'Histoire naturelle rédigé par C.S. Sonnini, membre de plusieurs Sociétés savantes*, 5, 1-407, 6, 1-391.
- McLeay, W.S., 1838, On the brachyurous decapod Crustacea brought from the Cape by Dr. Smith, in Smith, A., *Illustrations of the Zoology of South Africa; Consisting Chiefly of Figures and Descriptions of the Objects of National History Collected During an Expedition into the Interior of South Africa, in the Years 1834, 1835, and 1836; Fitted out by "The Cape of Good Hope Association for Exploring Central Africa": Together with a Summary of African Zoology, and an Inquiry into the Geographical Ranges of Species in that Quarter of the Globe: Invertebratae*, 53-71.
- Pantoja-Alor, J., 1992, Geología y paleoambiente de la cantera Tlayúa, Tepexi de Rodríguez, Estado de Puebla: Universidad Nacional Autónoma de México, Instituto de Geología, *Revista*, 2, 112-131.
- Rafinesque-Schmaltz, C.S., 1815, *Analyse de la nature ou tableau de l'univers et des corps organisés*: Palermo, 224 pp.
- Seibertz, E., Buitrón, B.E., 1987, Paleontología y Estratigrafía de los Neohibolites del Albiano de Tepexi de Rodríguez, Estado de Puebla (Cretácico Medio, Mexico): *Revista de la Sociedad Mexicana de Paleontología*, 1, 285-299.
- Suarez, M.B., González, L.A., Ludvigson, G.A., Vega, F.J., Alvarado-Ortega, J., 2009, Isotopic composition of tropical paleo-precipitation during the Albian: Early meteoric diagenesis at the Tlayúa fossil locality, Puebla, Mexico: *Geological Society of America, Bulletin*, 121(11-12), 331-389.
- Vega, F. J., Bruce, N. L., Serrano, M.L., Perrilliat, M. C., 2005, A review of the Lower Cretaceous (Tlayúa Formation: Albian) Crustacea from Tepexi de Rodríguez, Puebla, Central México: *Bulletin of the Mizunami Fossil Museum*, 32, 25-30.

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