



First record of *Duvalia* ex. gr. *lata* (Cephalopoda, Coleoidea) from Mexico

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Abstract

Here we present the first record of the belemnite *Duvalia* ex. gr. *lata* (Cephalopoda, Coleoidea) from Mexico. The unique individual, a well-preserved rostrum, was discovered in Early Cretaceous strata of the Sierra de Parras close to Viesca in southwestern Coahuila. *Duvalia* ex. gr. *lata* was previously known from the Mediterranean Tethys. Our report extends the paleogeographic distribution of *Duvalia* to the western hemisphere and supports the hypothesis that the Hispanic Corridor was open during the Early Cretaceous, allowing for marine faunal exchange and migration between the Gulf of Mexico and the European Tethys.

Keywords: *Duvalia*, belemnite, Early Cretaceous, Mexico, Hispanic Corridor.

Resumen

Se reporta por primera vez el belemnite *Duvalia* ex. gr. *lata* (Cephalopoda, Coleoidea) en México. El único ejemplar, un rostro bien preservado, ha sido descubierto en capas del Cretácico Temprano de la Sierra de Parras, en las cercanías de Viesca, en el suroeste de Coahuila. Previamente, se conocía a *Duvalia* ex. gr. *lata* en el Tethys de la región mediterránea. Nuestro reporte extiende la distribución de *Duvalia* al hemisferio occidental y apoya la hipótesis de que el Corredor Hispánico permaneció abierto durante el Cretácico Temprano, lo cual permitió el intercambio de fauna marina y migraciones entre el Golfo de México y el Tethys europeo.

Palabras clave: *Duvalia*, belemnite, Cretácico Temprano, México, Corredor Hispánico.

1. Introduction

Reports on belemnites (Coleoidea, Cephalopoda) from Mexico are rather scarce. Only Albian, and to a lesser extent Aptian neohibolitid belemnites, are well known (Kellum, 1937; Seibertz and Buitrón, 1987; Spaeth, 1988; Seibertz and Spaeth, 1999, 2000, 2002, 2005, 2009). In addition, Late Jurassic belemnites are regularly mentioned (del Castillo and Aguilera, 1895; Burckhardt, 1930; Rogers *et al.*, 1956; Tardy, 1972; Hose, 1981; Seibertz and Spaeth, 1999, 2009) but generally lack specific identification. Neocomian belemnites appear to be nearly absent except for some *Hibolithes* (Seibertz and Spaeth, 1999, 2000; Angeles-Villeda, 2004). An overview of Mexican Jurassic

and Cretaceous belemnites was given by Seibertz and Spaeth (1999, 2000, 2008, 2009). All Early Cretaceous belemnites belong to the Mesohibolitidae, while the Duvaliidae, except for citations by Seibertz and Spaeth (2000, 2008), appear to be unknown in Mexico.

Here we report the first record of *Duvalia* ex. gr. *lata* from Mexico. The genus is well known and is also a common component in the Mediterranean and Indo-Pacific faunal Provinces from Bathonian to Aptian times (Late Jurassic – Early Cretaceous), but was hitherto rarely mentioned from the western hemisphere (Pugaczewska, 1961; Stevens, 1965; Combémoré, 1988, 1997; Mutterlose, 1992; Seibertz and Spaeth, 2008).

2. Material and preservation

The Mexican specimen is a well-preserved rostrum which was collected by one of the authors (J.F.V.) in marine sediments of the lower Tamaulipas Formation, a carbonate dominated sediment sequence of hemipelagic origin, in the southwestern part of the Sierra de Parras, about 30 km northeast of the village of Viesca in southwestern Coahuila (25°24.103' N – 102°32.290' E) (Figure 1). The precise layer of origin is not known, but associated ammonites such as *Olcostephanus*, would suggest an early Valanginian to early Hauterivian age. According to Imlay (1938, 1940) and Cantú-Chapa (2009, 2012), occurrences of *Olcostephanus* in Mexico are restricted to this stratigraphic interval. This interpretation is supported by the belemnite described herein. The Mexican specimen of *Duvalia* is related to the species-group of *Duvalia lata* (de Blainville, 1827), a taxon known from the late Berriasian and early Valanginian of the Mediterranean Tethys.

3. Systematic paleontology

The specimen of *Duvalia* presented here is deposited in the Museo del Desierto, Saltillo, Coahuila, Mexico (CPC, Colección de Paleontología de Coahuila - storage number CPC-941).

Class Cephalopoda Cuvier, 1795
Subclass Coleoidea Bather, 1888
Order Belemnitida Zittel, 1895

Suborder Pachybelemnopseina Riegraf, 1998
Family Duvaliidae Pavlov, 1914
Genus *Duvalia* Bayle, 1878

Type species: *Belemnites dilatatus* de Blainville, 1827

Duvalia ex. gr. *lata* (de Blainville, 1827)
Figure 2a-f

3.1. Material

One rostrum (CPC-941).

3.2. Diagnosis

A medium-sized and laterally compressed rostrum with a dorsal alveolar groove. The apex is pointed and the alveolar area straight, with a shallow alveolus. The cross-section is rounded in the apical half of the rostrum but gradually becomes hexagonal and more laterally compressed towards the alveolar area.

3.3 Description

The rostrum is 41 mm long, up to 10.5 mm high and 7.2 mm wide. It is laterally compressed and presents a long and distinct dorsal groove. The apical region is pointed and the apex is incurved towards the dorsal side. Typically, as in most species that relate to *D. lata*, in lateral view, the dorsal side gently curves both into the apical as well as the

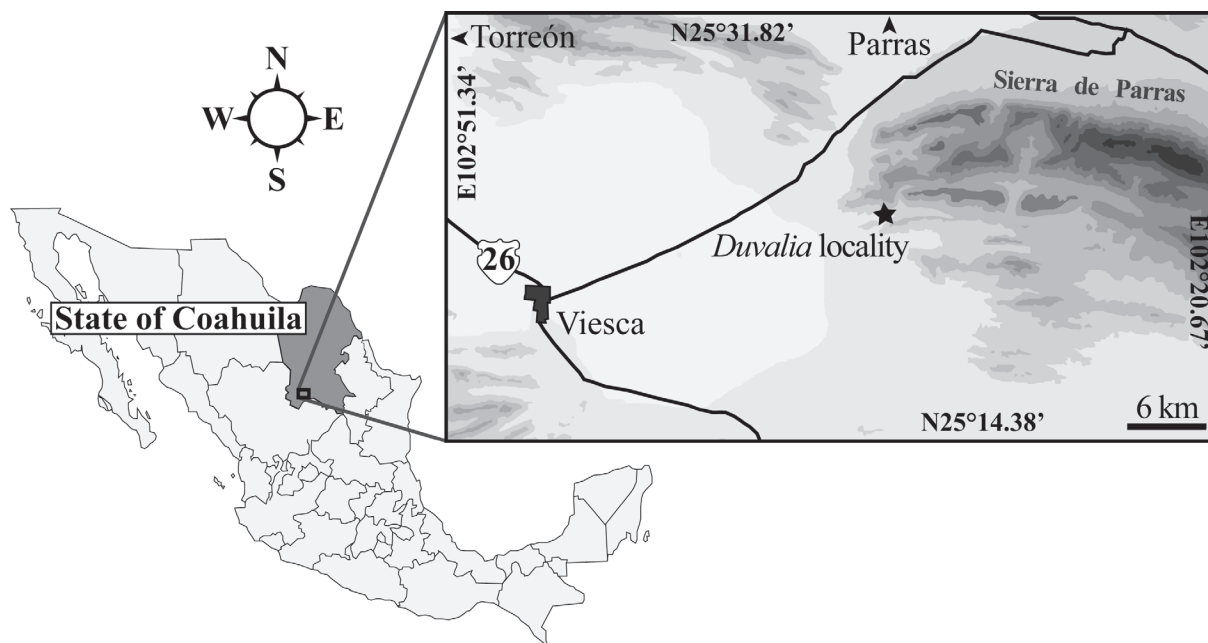


Figure 1. Map of Mexico with inset of northeastern Mexico. The fossil locality which yielded *Duvalia* ex. gr. *lata* is marked with a star. Base map of Mexico simplified after Instituto Nacional de Estadística y Geografía (INEGI, 2013)., Fotos y Mapas Virtuales, 2001, Interactive and Panoramic Maps of Mexico, Nuevo León State, Mexico map in 16 zoomable tiles or sections: California. Fotos y Mapas Virtuales, S.A. de C.V., 1 map, online: URL: <http://www.maps-of-mexico.com/nuevo-leon-state-mexico/nuevo-leon-state-mexico-map-main.shtml> (status 06/05/2013).

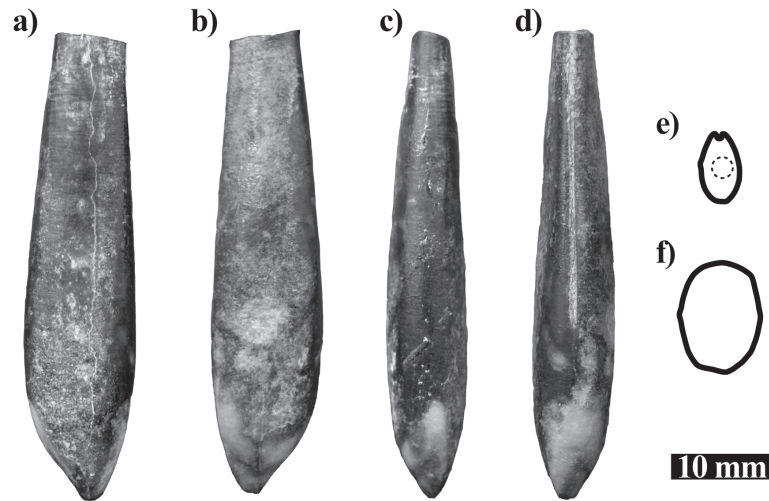


Figure 2. *Duvalia* ex. gr. *lata* (de Blainville, 1827) from the Lower Tamaulipas Formation at Viesca, northeast Mexico. a) Right lateral view. b) Left lateral view. c) Ventral view. d) Dorsal view. e) Cross-section at alveolar opening. Dashed line indicates position of the phragmocone. f) Cross-section at mid-part of rostrum.

alveolar side, while the ventral side incurves much more rapidly towards the apex. Laterally, the rostrum shows a faint ridge located in the middle of the flank, which gradually increases in strength towards the alveolar part. As a result, the laterally flattened cross-section becomes increasingly hexagonal towards the alveolar opening. The alveolus is shallow. In both dorsal and ventral outlines, the rostrum is fusiform.

3.4. Remarks

The subspecies *Duvalia lata constricta* Uhlig, 1902, from the latest Berriasian of Río Argos (Murcia, Spain), revised by Janssen (2003, pl. 6, figs. 12-13), resembles our specimen. Its guard has a comparable duvaliid outline and a dorsal groove with comparable structure. The apex is oriented towards the dorsal side and the lateral sides are parallel to convex. *Duvalia lata* de Blainville, 1827, from the Berriasian-lower Valanginian of Río Argos (Murcia, Spain) figured by Janssen (1997, p. 21-23, pl. 1, figs. 1-2) presents an alveolus which is deeper than in the Mexican specimen; the rostrum outline is more cylindrical and no characteristic constriction of the guard is present in the anterior part.

3.5. Occurrence

Duvalia ex. gr. *lata* is an important faunal element of the Mediterranean Tethys and ranges from late Tithonian-lowermost upper Valanginian as summarized by Janssen (1997) and Alsen and Mutterlose (2009).

The Mexican specimen was collected from the surface and likely weathered out of limestone and shale of the lower Tamaulipas Formation. The precise layer of origin is not known, but goethized inner whorls of ammonites collected at close distances to the belemnite rostrum are likely a result

from the same sediment layer. They include *Olcostephanus*, an early Valanginian to early Hauterivian ammonite genus (Imlay, 1938, 1940; Cantú-Chapa, 2009, 2012).

4. Discussion and conclusion

The Duvaliidae originated during the Bathonian (Middle Jurassic) in the central Tethys (Doyle *et al.*, 1994). During the Late Jurassic and Early Cretaceous, members of the family migrated southwards and reached Madagascar (Combémourel, 1988), and Antarctica (Mutterlose, 1986, 1988; Challinor and Hikuroa, 2007). *Duvalia hispanica* has been found by Seibertz (pers. com.) in Valanginian-Hauterivian strata of the Cape Verde Island Maio, which confirms a migration pathway of duvaliids along the southern border of the Hispanic Corridor westwards into Mexico. The paleobiogeographic distribution of the genus *Duvalia* was summarized by Mutterlose (1992) and is shown in Figure 3 (with additional data from Mutterlose and Wiedenroth, 2008; Alsen and Mutterlose, 2009; Janssen (pers. com.); Seibertz (pers. com.)).

Our specimen thus provides the first record of *Duvalia* ex. gr. *lata* in Mexico, which extends the paleogeographic distribution of this species to the western hemisphere. Our result supports the interpretation of an Early Cretaceous faunal connection between the Mediterranean Tethys and the Gulf of Mexico region. This migratory pathway, known as the Hispanic Corridor, has been postulated by Damborenea (2000) and Aberhan (2001). The latter is demonstrated by conspecific occurrences of ammonites (*e.g.* Fözy, 2004; Barragán and Maurasse, 2008; Cantú Chapa, 2009), belemnites (*e.g.* Seibertz and Spaeth, 2008), calpionellids (*e.g.* Trejo, 1960; Adatte *et al.*, 1994, 1996), and other taxa on both sides of the North Atlantic. The occurrence of

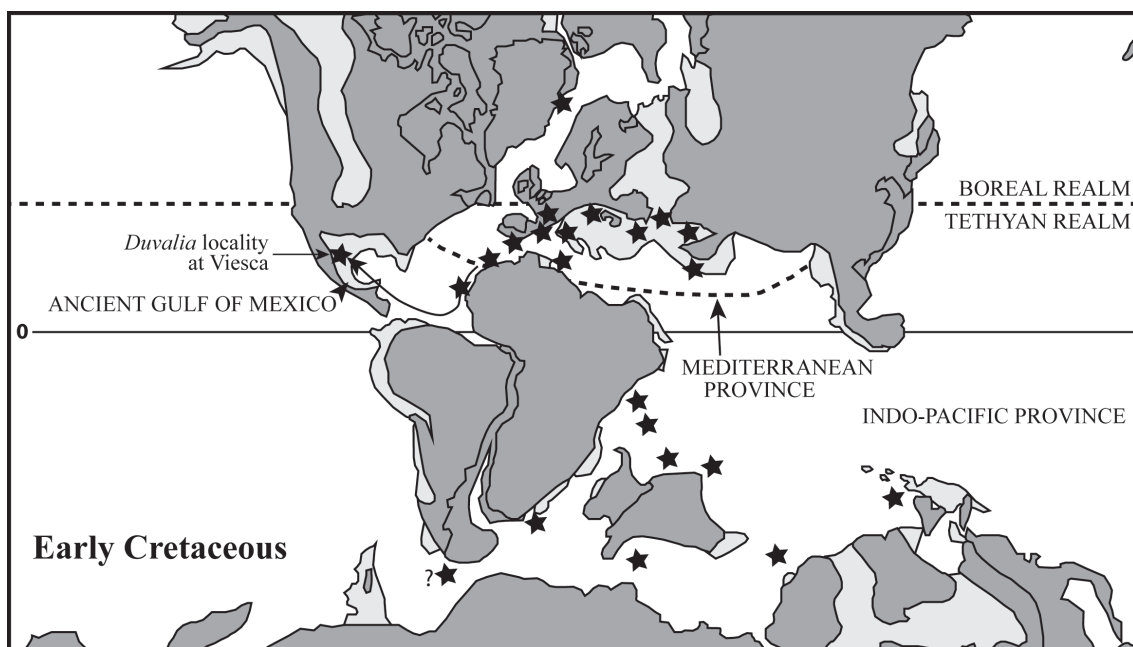


Figure 3. Paleobiogeography of *Duvalia* during the Early Cretaceous (Berriasian–Barremian). Fossil localities are marked with an asterisk (distribution summarized after Mutterlose, 1992; Mutterlose and Wiedenroth, 2008; Alsen and Mutterlose, 2009; Janssen pers. com.; Seibertz pers. com.). Plate tectonic configuration simplified after Barron et al. (1981). The arrow indicates a possible migration path between the Mediterranean Tethys Province and the Gulf of Mexico region.

Duvalia ex. gr. *lata* gives additional evidence to support this faunal exchange during the Early Valanginian.

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