Boletín de la Sociedad Geológica Mexicana
ISSN: 1405-3322
sgm_editorial@geociencias.unam.mx
Sociedad Geológica Mexicana, A.C.
México

Schweigert, Günter; Wittler, Frank A.
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Boletín de la Sociedad Geológica Mexicana, vol. 65, núm. 2, 2013, pp. 219-223
Sociedad Geológica Mexicana, A.C.
Distrito Federal, México

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Volumen 65, núm. 2, 2013, p. 219-223

First record of a polychelid lobster (Crustacea: Decapoda: Coleiidae) from the Pliensbachian (Early Jurassic) of Germany

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Abstract

A single specimen of *Coleia brodiei* (Woodward, 1866) preserved in a limestone concretion is recorded from the early Pliensbachian Davoei Zone of north-western Germany. It represents the first record of polychelid lobsters from the Pliensbachian of Central Europe and expands the still poorly known palaebiogeographic distribution of this species, previously recorded only from England. This species inhabited littoral, soft-bottom environments in the Sub-boreal Jurassic Sea.

Keywords: Crustacea, palaeobiogeography, preservation, Jurassic, Germany, England.

Resumen

Se registra un ejemplar de Coleia brodiei (Woodward, 1866), preservado en una concreción de caliza de la Zona Davoei del Pliensbaquiano temprano del noroeste de Alemania. El ejemplar representa el primer registro de langostas poliquélidas del Pliensbachiano de Europa Central y extiende la aún poco conocida distribución paleogeográfica de esta especie, registrada previamente solo en Inglaterra. Esta especie habitó ambientes litorales de sedimento suave en el Mar Sub-boreal Jurásico.

Palabras Clave: Crustacea, paleobiografía, conservación, Jurásico, Alemania, Inglaterra.

1. Introduction

The polychelid lobster genus *Coleia* Broderip, 1835 is mainly recorded from Early Jurassic beds in England (Broderip, 1835; M'Coy, 1849; Woodward, 1866; Bate, 1884; Van Straelen, 1925; Woods, 1925; Collins, 2010), France (Renault, 1889), southern Germany (Beurlen, 1928), and eastern Russia (Tschernyshev, 1930). A new species based on a single specimen has been recently discovered in the Sinemurian of northeastern Germany (Schweigert and Ernst, 2012). The stratigraphically oldest record, however, comes from the Late Triassic (Carnian) of Japan (Karasawa *et al*., 2003a, b). In the Early Jurassic of the alpine Tethyan Realm, *Coleia* was rather diverse (Pinna, 1968; Teruzzi, 1990; Garassino and Gironi, 2006). Middle Jurassic representatives of true *Coleia* have only been illustrated and listed from the Fossillagerstätte of La Voulte-sur-Rhône but they remain still undescribed (Charbonnier, 2009). In the Late Jurassic, *Coleia* is only known from the Late Kimmeridgian Fossillagerstätten of Nusplingen and Schamhaupten in southern Germany (Schweigert and Dietl, 1999; Schweigert, 2000; Viohl and Zapp, 2006, 2007). The stratigraphically youngest records date from the Early Cretaceous (Albian) of Italy (Garassino *et al*., 2012) and possibly from India (Feistmantel, 1877). A critical overview on *Coleia* with comments on material which must be excluded from this genus has been recently provided by Schweigert and Ernst (2012). During the

most recent discoveries, the question arose on what factors may have hampered the knowledge of the fossil record of *Coleia*. Indeed, many of the known records come from Fossillagerstätten, which provided favourable environmental conditions for its preservation. Since such Fossillagerstätten are both regionally and stratigraphically limited, the further fossil record may become expanded only by some lucky findings over a long time of collecting. In the Pliensbachian of Germany (and neighbouring countries), remains of decapod crustaceans have been well-known for a long time (*e.g.* Oppel, 1853, 1862; Van Straelen, 1925; Beurlen, 1928, 1932; Förster, 1966; Mayer, 2011); however, not a single polychelid has been ever recorded among this material. The aim of this short note is to document the first polychelid lobster from the Pliensbachian of this area.

2. Material and preservation

The herein studied specimen (Fig. 2) was discovered by one of us (F.W.) in a small clay-pit near Velpe, *ca*. 15 km west of Osnabrück, Lower Saxony (Fig. 1). In this clay-pit ("Am Danebrock – Crashkurs-Bahn"), which is meanwhile re-filled, fossiliferous claystones with limestone concretions from the Upper Liassic were temporarily exposed. The locality and its fossil content was described by Wittler (1999), and Wittler and Roth (2003). The concretion containing *Coleia brodiei* comes from a claystone interval which could be dated into the early Pliensbachian Davoei Zone with the help of several coexisting age-diagnostic ammonites, which include the index species *Prodactylioceras davoei* (J. Sowerby), *Androgynoceras maculatum* (Young and Bird), *A. capricornus* (Schlotheim), and *Liparoceras cheltiense* (Murchison). The Jurassic claystones represent siliciclastic, well-oxygenated, soft-bottom environments. Other coexisting macrofossils are belemnite guards, bivalves, gastropods, nautiloids, echinoids, crinoids, shark teeth, and driftwood.

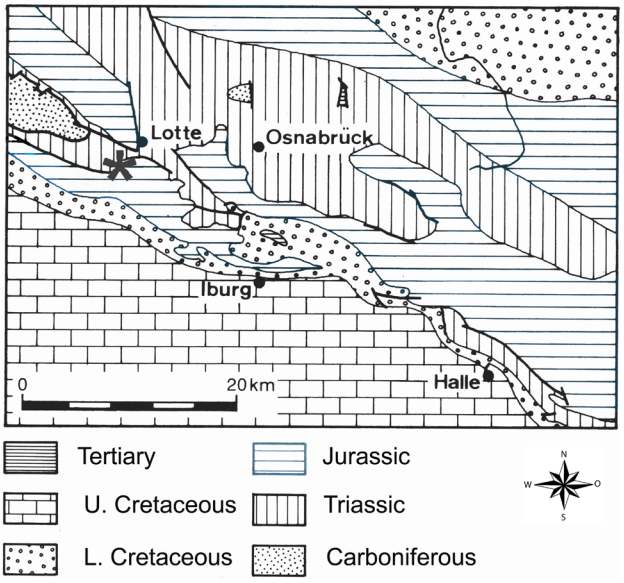

Figure 1. Geological map and provenance (asterisk) of the herein studied polychelid lobster in the vicinity of Osnabrück, Lower Saxony, northwestern Germany (modified from Wittler and Mutterlose, 1996).

The specimen was recently donated to the collection of the Staatliches Museum für Naturkunde Stuttgart, Germany, where it is housed under the catalogue number SMNS 70042.

As already outlined by Schweigert and Ernst (2012), either non-bioturbated, undisturbed conditions at the sea-floor or a very rapid burial and diagenesis are necessary to preserve delicate crustaceans such as polychelids. The latter possibility is mostly related to the formation of concretions. Several examples of polychelids preserved within concretions are recorded from the Lower Jurassic of Great Britain (*e.g.* Woods, 1925; Collins, 2010), the Middle Jurassic of La Voulte-sur-Rhône (*e.g.* Van Straelen, 1925; Charbonnier *et al*., 2010), and from the Early Cretaceous of northwestern Germany (Schweigert and Herd, 2010).

3. Systematic palaeontology

Order Decapoda Latreille, 1802
Infraorder Polychelida Scholtz and Richter, 1995
Superfamily Eryonoidea De Haan, 1841
Family Coleiidae Van Straelen, 1925
Genus *Coleia* Broderip, 1835

Type species: *Coleia antiqua* Broderip, 1835, originally monotypic.

Included species: See list of taxa in Schweitzer *et al*. (2010), excl. *Coleia incerta* Secretan, 1964 (= abdomen of *Linuparus* sp., cf. Charbonnier *et al*., 2012) and *Eryon edwardsi* Morière, 1864 (= subjective junior synonym of *Proeryon hartmanni* [von Meyer, 1836]); recently added: *Coleia appenninica* Garassino *et al*., 2012, *Coleia martinlutheri* Schweigert and Ernst, 2012.

Coleia brodiei (Woodward, 1866), Figs. 2-3.

1866 *Eryon brodiei*, spec. nov. Woodward, p. 498, pl. 24, fig. 2.

1877 *Eryon brodiei*, H. Woodward 1866. Woodward, p. 10.

1888 *Eryon brodiei*, H. Woodward 1866. Woodward, p. 433.

1925 *Coleia brodiei* (Woodward). Woods, p. 19-20, pl. 5, fig. 2, pl. 6, fig. 1.

1925 *Coleia brodiei* (Woodward, 1866). Van Straelen, p. 139-140.

1929 *Coleia brodiei* Woodward, 1866. Glaessner, p. 125.

1930 *Coleia brodiei* Woodward. Tschernyshev, p. 107.

2003b *Coleia brodiei* (Woodward, 1866). Karasawa *et al*., p. 358.

Figure 2. *Coleia brodiei* (Woodward, 1866), SMNS 70042, early Pliensbachian, Davoei Zone, former temporary clay-pit "Am Danebrock – Crashkurs-Bahn" in Westercappeln-Velpe near Osnabrück, Lower Saxony, Germany. Scale bar equals 10 mm.

Figure 3. *Coleia brodiei* (Woodward, 1866), Bath Royal Literary and Scientific Institution, catalogue number M3537 (Charles Moore coll.). Lower Lias (?early Pliensbachian, Davoei Zone), Mickleton Tunnel, Gloucestershire, United Kingdom. Scale bar equals 10 mm.

2010 *Coleia brodei* [sic] (Woodward). Collins, p. 296, pl. 53, fig. 4.

2010 *Coleia brodiei* (Woodward, 1866). Schweitzer *et al.*, p. 43.

2012 *Coleia brodiei* (Woodward, 1866). Schweigert and Ernst, p. 39.

Occurrence: The holotype, an almost complete carapace embedded in a limestone concretion, housed in the British Museum (Natural History) with catalogue no. NHM 33814, and recently photographically re-illustrated by Collins (2010, p. 53, fig. 4), comes from the Lower Lias of Lyme Regis (Dorset coast). The holotype and additional specimens from Lyme Regis provide no further information about their precise horizon within the Lower Lias (Woods, 1925; Collins, 2010). Further material comes from the Lower Lias of Gloucestershire, United Kingdom (Fig. 3). Collins (2010) indicated the age of the material from Gloucestershire as Pliensbachian (Davoei Zone, possibly Capricornus Subzone). The new record (Fig. 2) comes from the early Pliensbachian (Davoei Zone) of northwestern Germany.

Description: See Woods (1925, p. 19-20). The sole specimen from Germany (Fig. 2) consists of an incompletely preserved specimen embedded in a limestone concretion. It consists of some parts of the carapace mostly lacking its lateral margins and four of the abdominal tergites. The preserved total length of the specimen – measured in its symmetry axis – is 73 mm. The estimated original length of the specimen was *ca*. 95 mm. The maximum width of the carapace can be easily reconstructed to *ca*. 36 mm due to the preservation of a marked marginal spine at the posterior end of the postcervical incision.

The apparent loss of lateral and anterior parts of the carapace must have occurred prior to the forming of the concretion, because the preserved outline of the shell is irregular, probably due to decay or predation activity of scavengers. Appendages are not discernible, except the remains of a chela (?of P2) in front of the preserved left side of the carapace, and the poor remains of a short article of another (?5th) pereiopod on the right side of the specimen. Shell is mostly preserved showing a pustulose ornamentation. The carapace is strongly subdivided into a shorter anterior part, distally ending in a very broad and prominent, strongly curved cervical groove, and a larger posterior part bearing a well-developed median line. The area of the cervical groove is ornamented with very fine and densely-spaced pits. Postcervical groove is weak and short. Median line is laterally accompanied by trapezoidal, branchial carinae. The latter bears one line of tubercles, as well as the postorbital carinae do. In contrast to the specimen from Gloucestershire (Fig. 3), the ornamentation of the abdominal tergites in the dorsal midline is better preserved, showing a partly serrate median crest. On the anterior end of this crest in tergite 2 a small knob is developed. Abdominal pleurae are not discernible except of poor remains on the left side of tergite 1. Width of proximal tergite 1 measures *ca*. 23 mm, while distal tergite 4 measures *ca*. 20 mm.

Comparisons: *Coleia brodiei* (Woodward, 1866) is morphologically rather close to the type species of *Coleia*, *C. antiqua* Broderip, 1835 and to *C. martinlutheri* Schweigert and Ernst, 2012. In the absence of pereiopods or the complete outline of the carapace, as it is in the present specimen, it seems difficult to make comparisons among species. However, the shape of the cervical groove and the neighbouring mesogastric area are utterly diagnostic, and thus, the assignment of the new specimen to *C. brodiei* is beyond any doubt.

4. Conclusions

The record of a species of *Coleia*, previously only known from Great Britain and now also recorded from northwestern Germany, clearly indicates a wider palaeobiogeographical distribution, at least during the same time interval in the early Pliensbachian. This is not surprising since other

invertebrates such as ammonoids – which, in contrast to polychelid lobsters, are nektonic or nektobenthic – show a strong faunal mixing between these areas during the early Pliensbachian (*cf*. Dera *et al.*, 2011, fig. 5). Like in Great Britain, the new occurrence of *C. brodiei* (Woodward, 1866) in northwestern Germany lies within an epicontinental basin within the Sub-boreal Realm, and surely not in bathyal environments, where their modern relatives live (*e.g*. Galil, 2000). Therefore, a remarkable change of their environmental requirements could have occurred in this group of lobsters, as Beurlen (1931) and Glaessner (1965) have suggested. On the other hand, we know little about Mesozoic bathyal macrofaunas; to date, only the Callovian Lagerstätte of La Voulte-sur-Rhône is recognized (or at least interpreted) as being deposited in a bathyal environment (Charbonnier, 2009; Charbonnier *et al*., 2010). This could mean that polychelid lobsters inhabited both bathyal and littoral environments during the Mesozoic.

The sampling and study of fossil-bearing concretions in claystones and marls may further expand the fossil record of polychelids.

Acknowledgements

We would like to express our thanks to Matt Williams (Bath), who kindly provided photographs of a nicely preserved specimen of *Coleia brodiei* for comparison and to Jaqueline Bollinger (Munich) for facilitating crustacean literature. Alessandro Garassino (Milan) and Francisco J. Vega (Mexico) carefully reviewed the manuscript. The latter is also thanked for translating the abstract into Spanish.

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Manuscript received: October 15, 2012.
Corrected manuscript received: October 21, 2012.
Manuscript accepted: October 22, 2012.