



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 palaeobiogeographic 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 poliquelidas 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 Fossilagerstätte of La Voulte-sur-Rhône but they remain still undescribed (Charbonnier, 2009). In the Late Jurassic, *Coleia* is only known from the Late Kimmeridgian Fossilagerstätten 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 Fossilagerstätten, which provided favourable environmental conditions for its preservation. Since such Fossilagerstätten 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* (Schlothheim),

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.

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 seafloor 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.

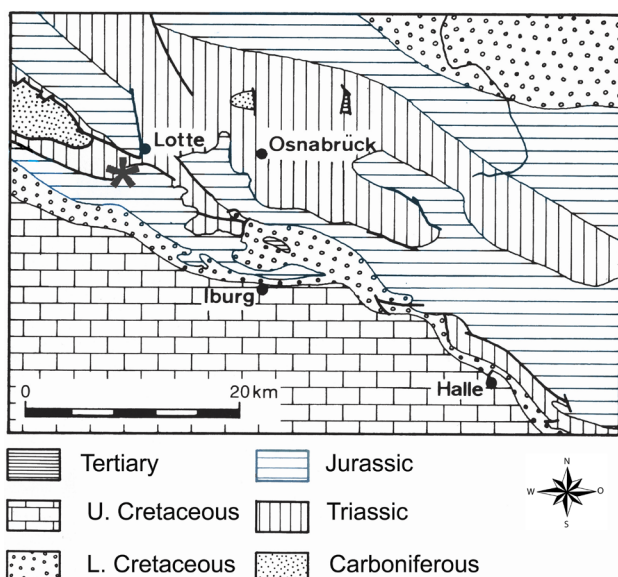


Figure 1. Geological map and provenance (asterisk) of the herein studied polychelid lobster in the vicinity of Osnabrück, Lower Saxony, northwestern Germany (modified from Wittler and Mutterlose, 1996).



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 brodiei* [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) pereopod 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 pereopods 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.

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References

- Bate, C.S., 1884, *Archaeoastacus (Eryon) willemoesii*, a new genus and species of Eryonidae: Geological Magazine, 1, 307-310.
- Beurlen, K., 1928, Die Decapoden des Schwäbischen Jura mit Ausnahme der aus den oberjurassischen Plattenkalken stammenden: Palaeontographica, 70, 115-278.
- Beurlen, K., 1931, Die Besiedelung der Tiefsee: Natur und Museum, 61, 269-279.
- Beurlen, K., 1932, Brachyurenreste aus dem Lias von Bornholm mit Beiträgen zur Phylogenie und Systematik der Brachyuren: Paläontologische Zeitschrift, 14, 52-66.
- Broderip, W.J., 1835, Description of some fossil Crustacea and Radiata: Proceedings of the Geological Society of London, 2(41), 201-202.
- Charbonnier, S., 2009, Un environnement bathyal au Jurassique: le Lagerstätte de La Voulte: Mémoires du Muséum national d'Histoire naturelle, 199, 264 p.
- Charbonnier, S., Garassino, A., Pasini, G., 2012, Revision of Mesozoic decapod crustaceans from Madagascar: Geodiversitas, 34(2), 313-357.
- Charbonnier, S., Vannier, J., Hantzpergue, P., Gaillard, C., 2010, Ecological significance of the arthropod fauna from the Jurassic (Callovian) La Voulte Lagerstätte: Acta Palaeontologica Polonica, 55, 11-132.
- Collins, J.S.H., 2010, Arthropods (excluding insects and ostracods), in Lord, A.R., Davis, P.G., (eds.), Fossils from the Lower Lias of the Dorset Coast: London, The Palaeontological Society, 290-297.
- De Haan, W., 1833-1850, Crustacea, in Siebold, P.F. de, (ed.), Fauna Japonica sive descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava Imperium tenent, suscepto, annis 1823-1830 collegit, nous, observationibus et adumbrationibus, illustravit: Lugdunum Batavorum, Arnz, ix-xvi, i-xxxi, vii-xvii, 243 p.
- Dera, G., Neige, P., Dommergues, J.-L., Brayard, A., 2011, Ammonite paleobiogeography during the Pliensbachian-Toarcian crisis (Early Jurassic) reflecting paleoclimate, eustasy, and extinctions: Global and Planetary Change, 78, 92-105.
- Feistmantel, O., 1877, Note on "Eryon comp. barrovensis" McCoy from the Sripennatur Group near Madras: Records of the Geological Survey of India, 10(4), 193-196.
- Förster, R., 1966, Über die Erymiden, eine alte, konservative Familie der mesozoischen Dekapoden: Palaeontographica, Abteilung A, 125, 61-175.
- Galil, B.S., 2000, Crustacea Decapoda: Review of the genera and species of the family Polychelidae Wood-Mason, 1874, in Crosnier, A., (ed.), Résultats des Campagnes Musorstom, 21, Mémoires du Musée national d'Histoire naturelle, 184, 285-387.
- Garassino, A., Gironi, B., 2006, *Coleia boboi* n. sp. (Crustacea, Decapoda, Eryonoidea) from the Late Triassic (Rhaetian) of Monte Verzegnis (Udine, NE Italy): Atti della Società italiana di Scienze naturali e del Museo Civico di Storia naturale di Milano, 147(1), 93-102.
- Garassino, A., Pini, G.A., Pasini, G., 2012, First report of a polychelid lobster (Crustacea, Decapoda, Coleiidae) from the Early Cretaceous of Italy: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 263, 47-55.
- Glaessner, M.F., 1929, Fossilium Catalogus, I. Animalia, 41, Crustacea decapoda: Berlin, W. Junk, 464 p.
- Glaessner, M.F., 1965, Vorkommen fossiler Dekapoden (Crustacea) in Fisch-Schiefern: Senckenbergian Lethaea, 46a, 111-122.
- Karasawa, H., Takahashi, F., Doi, E., Ishida, H., 2003a, First record of *Coleia Broderip* (Crustacea, Decapoda, Coleiidae) from the Upper Triassic of Japan: Contributions to Zoology, 72(2/3), 153-155.
- Karasawa, H., Takahashi, F., Doi, E., Ishida, H., 2003b, First notice of the family Coleiidae Van Straelen (Crustacea: Decapoda: Eryonoidea) from the Upper Triassic of Japan: Paleontological Research, 7(4), 357-362.
- Latreille, P.A., 1802-1803, Histoire naturelle, générale et particulière, des Crustacés et des Insectes, 3: Paris, Dufart, 468 p.
- Mayer, W.K., 2011, Der Numismalmersmergel im nordöstlichen Albvorland: Jahreshefte der Gesellschaft für Naturkunde in Württemberg, 167, 73-110.
- M'Coy, F., 1849, On the classification of some British fossil Crustacea with notices of new forms in the University Collection at Cambridge: Annals and Magazine of Natural history, series 2, 4, 161-179, 330-335.
- Morière, M., 1864, Note sur les Crustacées fossiles des terrain jurassiques du Calvados: Bulletin de la Société Linnéenne de Normandie, 8, 89-96 pp.
- Oppel, A., 1853, Über den Mittleren Lias in Schwaben: Stuttgart, Ebner und Seubert Verlag, 92 p.
- Oppel, A., 1862, Über jurassische Crustaceen: Palaeontologische Mitteilungen aus dem Museum des königlich Bayerischen Staates, 1, 1-120.
- Pinna, G., 1968, Gli Eryonidei della nuova fauna sinemuriana a crostacei decapodi di Osteno in Lombardia: Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano, 107, 93-134.
- Renault, C., 1889, Note sur une Eryonidee nouvelle trouvée à St. Honorine-la-Guillaume (Orne) dans le grès liasique: Bulletin de la Société Linnéenne de Normandie, séries 4, 2, 13-19.
- Scholtz, G., Richter, S., 1995, Phylogenetic systematics of the reptantian Decapoda (Crustacea, Malacostraca): Zoological Journal of the Linnean Society, 113, 289-328.
- Schweigert, G., 2000, News about Jurassic eryonid decapods (Coleiidae, Eryonidae) from Southern Germany, in 1st Workshop on Mesozoic and Tertiary Decapod Crustaceans, Montecchio Maggiore: Studi e Ricerche, 63-65.

- Schweigert, G., Dietl, G., 1999, Neubeschreibung von *Eryon longipes* O. Fraas (Crustacea, Decapoda, Eryonidea) aus dem Nusplinger Plattenkalk (Ober-Kimmeridgium, Schwäbische Alb): Stuttgarter Beiträge zur Naturkunde, Serie B, 274, 1-19.
- Schweigert, G., Ernst, W., 2012, First record of a polychelid lobster (Crustacea: Decapoda: Coleiidae) from the Sinemurian (Early Jurassic) of Germany: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 263, 35-42.
- Schweigert, G., Herd, K.J., 2010, Ein Vielscherer aus der Unterkreide: Fossilien, 2010(4), 212-217.
- Schweitzer, C.E., Feldmann, R.M., Garassino, A., Karasawa, H., Schweigert, G., 2010, Systematic list of fossil crustacean species: Leiden and Boston (Brill), Crustaceana Monographs, 10, I-VI + 222 p.
- Secretan, S., 1964, Les crustacés décapodes du Jurassique supérieur et du Crétacé de Madagascar: Mémoires du Muséum national d'Histoire naturelle, Paris, nouvelle série C (Sciences de la Terre), 14, 1-226.
- Teruzzi, G., 1990, The genus *Coleia* Broderip, 1835 (Crustacea, Decapoda) in the Sinemurian of Osteno in Lombardy: Atti della Società italiana di Scienze naturali e del Museo Civico di Storia naturale di Milano, 131, 85-104.
- Tschernyshev, B.V., 1930, Novie Eryonidae s. r. Viluia. [New Eryonidae from Vilui River]: Izvestija Vsesojuznoe geologo-razueabchinooe upavlenie, 49(3), 375-384, [In Russian]
- Van Straelen, V., 1925, Contributions à l'étude des crustacés décapodes de la période Jurassique: Mémoires de l'Académie Royale Belgique, 2ème série, 7(1), 1-462.
- Viohl, G., Zapp, M., 2006, Die Fossil-Lagerstätte Schamhaupten (oberstes Kimmeridgium, Südliche Frankenalb, Bayern): Archaeopteryx, 24, 27-78.
- Viohl, G., Zapp, M., 2007, Schamhaupten, an outstanding Fossil-Lagerstätte in a silicified Plattenkalk around the Kimmeridgian-Tithonian boundary (Southern Franconian Alb, Bavaria): Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 245, 127-142.
- von Meyer, H., 1836, Beiträge zu *Eryon*, einem Geschlechte fossiler langschwänziger Krebse: Nova Acta Physio-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum, 18(1), 272-284.
- Wittler, F.A., 1999, Zur regionalen Herkunft pliensbachzeitlicher Gesteine (Jura, Lias) im Münsterländer Hauptkiessandzug (Münsterland, NW-Deutschland): Der Geschiebesammler, 32, 115-161.
- Wittler, F., Mutterlose, J., 1996, Litho- und Biostratigraphie der Tongrube Spieker bei Osnabrück: Geologie und Paläontologie in Westfalen, 45, 29-39.
- Wittler, F.A., Roth, R., 2003, Fauna und Biostratigraphie im Lias gamma/delta Grenzbereich südwestlich Lotte bei Osnabrück (Jura, NW-Deutschland): Arbeitskreis für Paläontologie Hannover, 31, 143-30.
- Woods, H., 1925, A monograph of the fossil macrourous Crustacea of England: Memoirs of the Palaeontological Society, 77, 17-40.
- Woodward, H., 1866, Notes on the species of the genus *Eryon* Desmarest, from the Lias and Oolite of England and Bavaria: Proceedings of the Geological Society, 22, 494-502.
- Woodward, H., 1877, A Catalogue of British Fossil Crustacea, with their synonyms and the range in time of each genus and order: London, Taylor and Francis, XII + 155 p.
- Woodward, H., 1888, On *Eryon antiquus*, Broderip, sp., from the Lower Lias, Lyme-Regis, Dorset: Geological Magazine, 5(10), 433-441.

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