

# JURACYCLUS POSIDONIAE N. GEN. AND SP., THE FIRST CYCLOID ARTHROPOD FROM THE JURASSIC

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## INTRODUCTION

THE CYCLOIDS represent an enigmatic arthropod group of probably crustacean affinity, occurring mostly in the younger Paleozoic, from the early Carboniferous up to the Late Triassic (Schram et al., 1997). Superficially, cycloids strikingly resemble crabs and were thought to have had a similar lifestyle, becoming extinct when crabs started to radiate. Recently, the existence of a Late Cretaceous cycloid, *Maastrichtiocaris rostratus* Fraaije et al., 2003, from the Maastrichtian of the Netherlands, proved that cycloids did not go extinct at the end of the Triassic as believed for a long time, but survived much longer, co-occurring with crabs. Due to obvious collecting bias and the incompleteness of the fossil record of arthropods with relatively delicate carapaces in general, neither Jurassic nor Early Cretaceous representatives have been reported hitherto. However, from the Lower Jurassic Posidonienschiefer ('Posidonia Shale') of southwestern Germany—famous for its excellent fossil preservation, not only of marine vertebrates and large crinoids living on driftwood, but also many other invertebrate groups (Riegraf et al., 1984; Urlichs et al., 1994)—now a single specimen of a cycloid is recorded and described herein. Although this record helps link the bias between the Triassic and the Late Cretaceous occurrences, the characters of the specimen differ strongly from those of other cycloids, thus requiring the erection of a new genus and species.

In Europe, cycloids are mainly known from the German Triassic (e.g., Meyer, 1838, 1844, 1847; Seebach, 1857; Bill, 1914; Müller, 1955; Trümpy, 1957; Linck, 1961; Meischner, 1963; Zorn, 1971; Oosterink, 1986), and from the Triassic of the Alps (Schafhäütl, 1863; Reuss, 1867; Trauth, 1918; Zorn, 1971), apart from the recently published record from the Late Cretaceous and the new specimen from the Early Jurassic. Cycloids often occur in shallow-marine neritic or somewhat restricted lagoonal habitats, such as the dolomitic facies of the Triassic Upper Muschelkalk (Trümpy, 1957; Linck, 1961; Alexandrowicz, 1973) or in the Permian 'Zechstein' dolomite (Schauoth, 1854). This is in strong contrast to some other cycloids that occur in deep-marine, drowned platform carbonates, such as the Triassic 'Hallstätter Kalke' facies (Trauth, 1918). Specimens from the Lower Triassic Buntsandstein of eastern France ('Grès à *Voltzia*') are sometimes exceptionally preserved with their appendices (Gall and Grauvogel, 1967), whereas in other fossiliferous sites of the Buntsandstein mostly only the carapace is preserved (Bill, 1914; Meischner, 1963; Busse and Horn, 1978). This famous Fossil Lagerstätte is interpreted to represent an estuarine environment with rapidly changing salinity conditions. Also the specimens of *Halicyne* Meyer, 1844 from the Triassic 'Lettenkeuper' of Germany occur in a brackish or even lacustrine environment (Müller, 1955). In the Carboniferous of Mazon Creek, Illinois, and in the Permian of Madagascar cycloids are preserved within carbonate concretions (Schram et al., 1997; Brambilla et al., 2002; Pasini and Garassino, 2003), sometimes also with their appendices.

## SYSTEMATIC PALEONTOLOGY

Class MAXILLIPODA Dahl, 1956  
Superfamily CYCLOIDEA Glaessner, 1928  
Family CYCLIDAE Packard, 1885  
Genus JURACYCLUS new genus

*Type Species.*—*Juracyclus posidoniae* n. gen. and sp., by monotypy.

*Diagnosis.*—As for the type species.

*Etymology.*—Referring to the occurrence of this cycloid in the Jurassic.

## JURACYCLUS POSIDONIAE new species

Figure 1.1

*Diagnosis.*—Medium-sized cycloid with oval carapace. Papillose ornamentation, most prominent on anterolateral regions, much finer on remaining parts of carapace. Blunt rostrum present, laterally surrounded by deep optic notches. Two longitudinal furrows running parallel on posterior part of carapace.

*Description.*—Carapace flat, oval in outline, little longer than wide. Margin of carapace gentle, lacking interval. Short, indistinct, possibly pointed terminal ending of carapace. Surface covered with papillae, mostly larger in anterior part of carapace. Rostrum short, blunt, not overlapping anterior margin of carapace. Optic notches deep, V-shaped, positioned lateral to rostrum. Curved row of strong papillae running on bulge posterior to optic notch. Posterior to postoptic bulges a small area free of papillae. Anterolateral process with deep central groove and strongly papillose outer border. Another anterolateral bulge developed posterior to this process. Central ridge in posterior part of carapace shield bears randomly scattered minute papillae laterally surrounded by unsculptured furrows. These furrows do not reach terminal margin of carapace.

Appendices not preserved in specimen. When using ultraviolet illumination, no luminescence observed.

*Etymology.*—Referring to the provenance of the holotype, coming from the Posidonienschiefer ('Posidonia Shale').

*Type.*—Only holotype, SMNS 65488, from the former Neth quarry at Gomaringen near Tübingen, southwestern Germany, donated by G. Schweigel in 1982 and deposited in the Staatliches Museum für Naturkunde Stuttgart, Germany.

*Occurrence.*—Posidonienschiefer Formation ('Posidonia Shale'), 'Unterer Stein' Bed (for section and stratigraphy see Riegraf et al., 1984), early Toarcian, *Harporceras falciferum* Zone, Jurassic.

*Measurements.*—Length = 18.0 mm; width = 13.7 mm.

## DISCUSSION

In respect of its oval, shieldlike outline of the carapace with a short terminal tip, *Juracyclus posidoniae* n. gen. and sp. somewhat resembles the cycloid genus *Halicyne*, which is recorded from the Carboniferous to the end of the Triassic. In *Halicyne* the papillose ornamentation, if present, runs in very fine, almost parallel rows radiating from the center of the carapace. The carapace

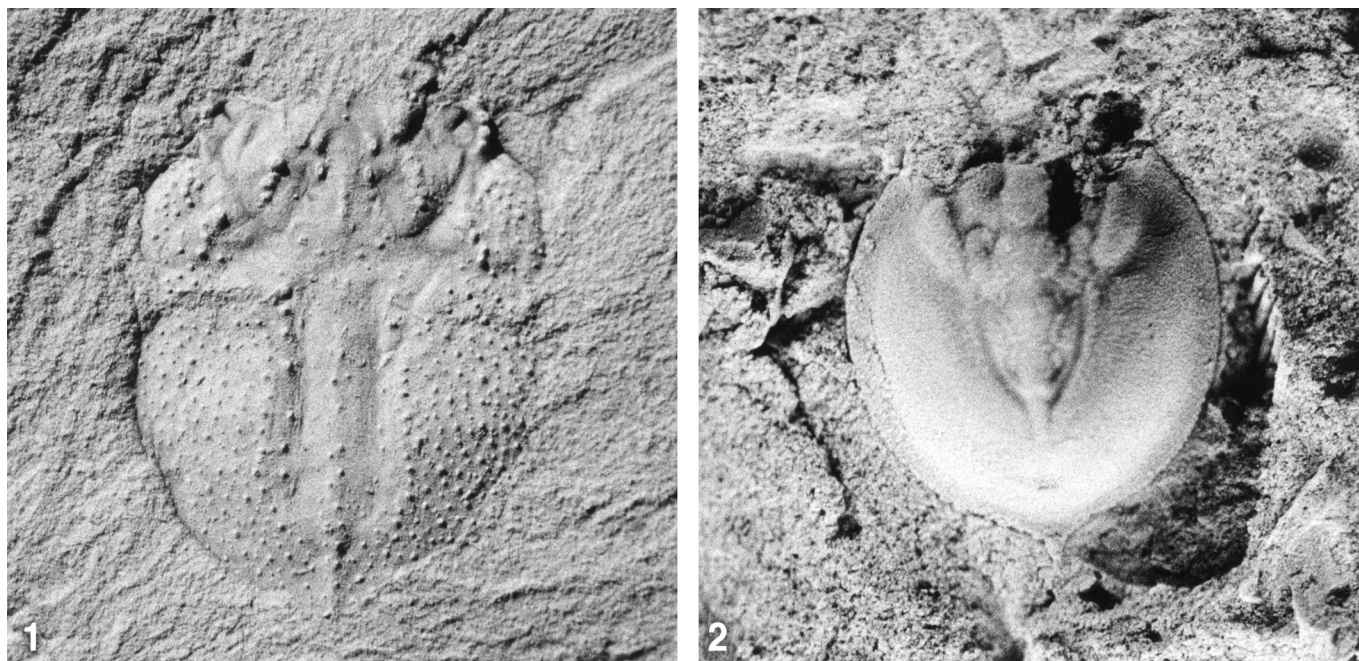


FIGURE 1—1, *Juracyclus posidoniae* n. gen. and sp., SMNS 65488, holotype. Lower Jurassic, Posidonienschiefer Formation ('Posidonia Shale'), 'Unterer Stein' bed, *Harporceras falciferum* Zone, Gomaringen near Tübingen, southwestern Germany. Magnification,  $\times 4$ . 2, *Halicyne agnota* (Meyer, 1838), SMNS 22152, holotype, Middle Triassic, Muschelkalk, 'Trigonodusdolomit,' Rottenmünster near Rottweil, southwestern Germany, for comparison. Magnification,  $\times 4$ .

itself is more helmet-shaped in *Halicyne* (Fig. 1.2) than in *Juracyclus* n. gen. Another comparable Triassic genus of cycloids, *Carcinaspides* Glaessner, 1969, which is monotypically based on *Carcinaspis pustulosus* Schafhäütl, 1863, exhibits very coarse pustules and a lobulate margin of the carapace. Thus, no closer affinities exist with *Juracyclus*. In the position of the ocular notch, the development of a blunt rostrum, and the strongly ornamented anteromarginal region of the carapace, *Juracyclus* appears to be more closely related to *Maastrichtiocaris* Fraaije et al., 2003, from the Late Cretaceous. From the latter, however, *Juracyclus* differs by the presence of a posterior median ridge surrounded by the two prominent longitudinal furrows, apart from its much larger size, a flattened margin, and a terminal tip. Because of the lack of both ventral aspects, and appendices in the present knowledge of *Juracyclus*, a detailed cladistic analysis is impossible.

**Environment.**—The fossil content of the finding horizon of *Juracyclus posidoniae* is rather poorly known since the rock is very hard and fossils difficult to extract. In contrast to the normally compressed preservation in the bituminous mudstones of the Posidonienschiefer, the finely laminated, calcareous 'Unterer Stein' bed often yields fossils with three-dimensional preservation. Among these fossils there are some arthropods. The low-diversity decapod crustacean fauna of the Posidonienschiefer in general has been listed by Schweigert et al. (2003). Within the 'Unterer Stein' bed, the eryonid decapod *Coleia sinuata* Beurlen, 1928 occurs, in addition to some indeterminable natants. Remarkably, this bed is the only horizon within the whole formation in southwestern Germany and adjacent Switzerland that has also yielded fossil insects, mostly dragonflies (Ansorge, 1999; Etter and Kuhn, 2000). Apart from these very few terrestrial components, the bulk of the fauna of the stratum under consideration here, e.g., ammonites, belemnites, fishes, and reptiles, is marine and pelagic (Riegraf et al., 1984). *Juracyclus posidoniae* represents the first record of a cycloid coming from marine bituminous laminites. The fact that the single specimen is a molt, however, indicates

that the place of burial might not necessarily be identical with its life habitat. Nothing definitive is known about the mode of life of cycloids. Gall and Grauvogel (1967) suggested a benthic, predatory lifestyle of the Triassic *Halicyne* whereas Müller (1955) tentatively supposed a parasitic lifestyle, having lived on fishes. The latter interpretation would be in accordance with the abundance of fishes and other nektonic vertebrates in the finding horizon, where benthic organisms are almost lacking. Schram et al. (1997) suggested that the frequent association of many Paleozoic cycloids with plant material might reflect a herbivorous or detritus eating habit.

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