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A NEW TETHYAN MIGRANT: *CRETACHLORODIUS ENCIENSIS* N. GEN., N. SP. (CRUSTACEA, DECAPODA), FROM THE MAASTRICHTIAN TYPE AREA

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ABSTRACT—A new genus and species of crab is described from the late Maastrichtian Meerssen Member of the Maastricht Formation at the type area of the Maastrichtian Stage, SE Netherlands. This new taxon could well be the ancestor of the xanthid *Prochlorodius-Chlorodiella* group and its occurrence provides additional evidence of a late Cretaceous radiation among the decapod crustaceans.

INTRODUCTION

DURING DEPOSITION of the upper part of the Maastricht Formation, a number of typically Tethyan organisms (e.g., rudistid bivalves) first appeared in the Maastrichtian type area. Among them, benthic foraminifera (Hofker, 1966; Villain, 1977) and ostracods (Bless, 1989; Deroo, 1966) are the best documented groups. A major immigration of Tethyan thermophilic foraminifera and ostracods is recorded between the top of the Emael Member and the base of the Nekum Chalk (Liebau, 1978; Bless, 1989; Bless et al., 1993) (Figure 1). This interval is characterized by a change in paleobathymetry from a quiet water, sublittoral setting (>20 meters of depth) to a phytal platform with high-energy conditions (depth fluctuating between 2 and 20 meters) (Liebau, 1978; Sprechmann, 1981). Parts of the Nekum and Meerssen Members are characterized by bryozoan-seagrass associations (Voigt, 1981). The occurrence of encrusting red algae, corals and rudistid bivalves indicates that water temperature was in excess of 20°C.

In 1987, Fraaye and Collins described a new calappid crab, *Prehepatus werneri,* whose occurrence seemed to correspond with an increasing Tethyan influence in the Maastrichtian type area. The genus *Prehepatus* Rathbun, 1935, was hitherto known only by five species, all from North America. That paper triggered a revival of decapod studies in the type Maastrichtian area. Almost all species decribed previously (Binkhorst, 1857, 1861; Bosquet, 1854; Forir, 1887a, 1887b, 1889; Noetling, 1881; Pelseneer, 1886) suffer from a lack of detailed stratigraphic data. A new xanthid crab recently has been described by Jagt et al. (1991) and ten new (two anomuran and eight brachyuran) taxa are described by Collins et al. (in press). The new decapod data provide indications for an immigration event at the base of the Meerssen Chalk (Figure 1).

TAXONOMY

Order DECAPODA Latreille, 1803
Infraorder BRACHYURA Latreille, 1803
Section BRACHYRHYNCHIA Borradaile, 1907
Superfamily XANTHOIDEA Dana, 1851
Family XANTHIDAE Dana, 1851
Genus CRETACHLORODIUS n. gen.

Diagnosis.—Carapace sub-hexagonal, twice as broad as long, with a pronounced postfrontal ridge, otherwise smooth; orbitofrontal margin about half the carapace width, long orbital margins with distinct fissures; anterolateral margin with tuberculation and indefinite lobation terminating in forwardly directed spines at the lateral angles.

Etymology.—Indicating a Cretaceous member of the *Prochlorodius-Chlorodiella* group.

Type species.—*Cretachlorodius enciensis* n. sp.

CRETACHLORODIUS ENCIENSIS new species
Figures 2.1–2.2

Diagnosis.—As for genus.

Material.—The holotype is the only specimen known; it is an almost complete carapace (width 25 mm, length 12 mm) found in a fine-grained bioclastic limestone, about three meters above the base of the late Maastrichtian Meerssen Member (Maastricht Formation) in the quarry ENCI, 2 km southwest from Maas-

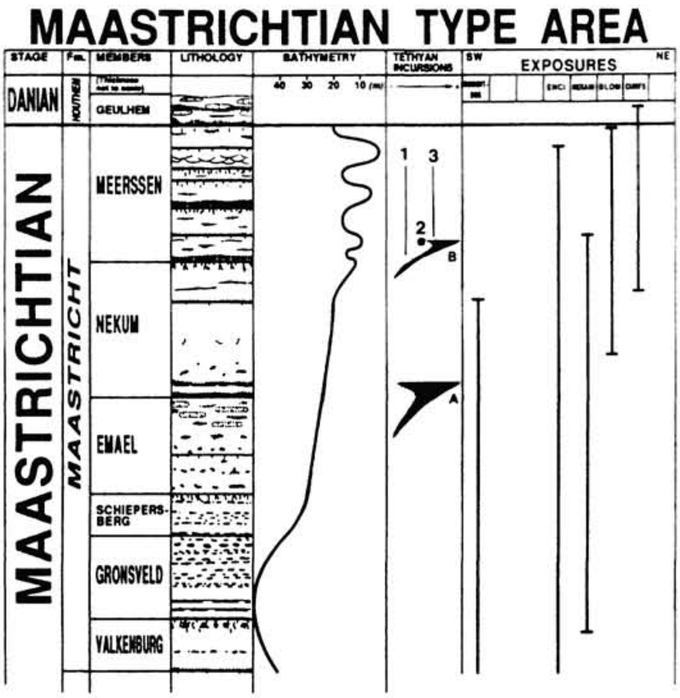

FIGURE 1—Composite lithostratigraphic log of the Maastrichtian type area. Five key sections, all quarries, including quarry ENCI, are indicated under exposures. A = immigration event of thermophilic benthic foraminifera and ostracoda, B = immigration event of Tethyan decapod crustaceans, 1 = range of *Xanthosia semiornata*, 2 = occurrence of *Cretachlorodius enciensis*, 3 = range of *Prehepatus werneri*.

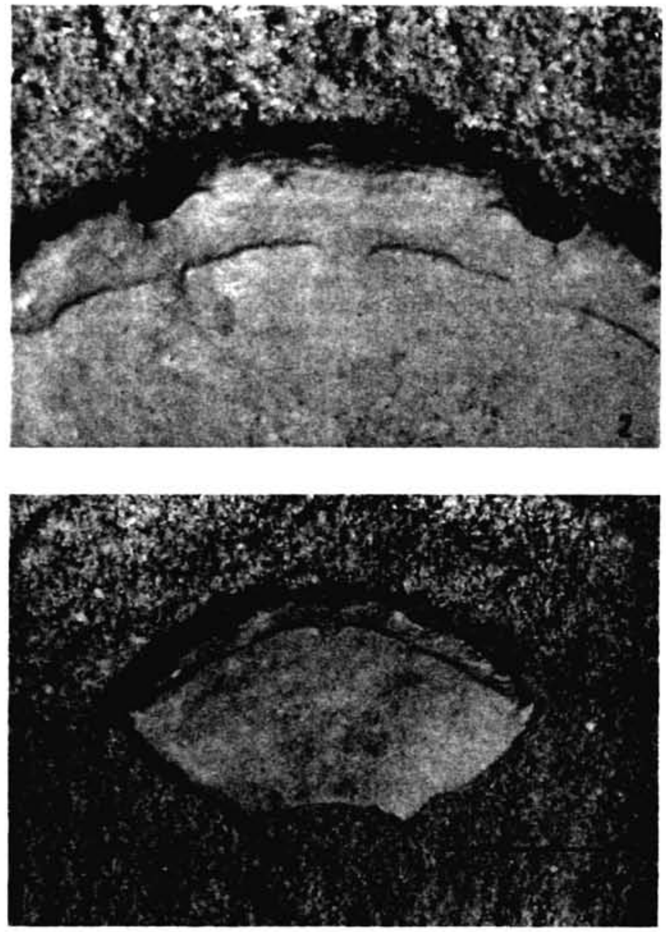

FIGURE 2.1–2—*Cretachlorodius enciensis* holotype, collection Geo Centrum Brabant (MAB k.0014), view of carapace outline (1) and details of orbitofrontal area, showing fine granulation, orbital fissures and postfrontal ridge (2). Bar scale is 1 cm.

tricht, The Netherlands. The specimen is deposited in the collections of Geo Centrum Brabant, Boxtel, The Netherlands (MAB k0014).

Description.—Carapace is sub-hexagonal in outline, twice as broad as long, widest about midlength. A pronounced, slightly lobate ridge extends from anterolateral angle transversely across entire carapace; ridge just posterior orbital furrows; interupted medially by broad, shallow emargination. Carapace is smooth, except for some granulation along anterolateral margin, kidney-like cardiac furrows, and two gastric pits.

Orbitofrontal margin about half carapace width, front medially broadly emarginate and sulcate. Two fissures in finely ridged, subcircular orbital margins, orbits directed obliquely away from long axis. A short, distinct ridge midway between inner orbital angle and inner fissure runs parallel with front.

Anterolateral margin granulated, posteriorly tending to tuberculation and indefinite lobation. At lateral angles, postfrontal ridge terminates in prominent, forwardly directed spine with incipient spine behind. Posterolateral margin smooth and sinusoidal; distinct, narrow ridge bounding concave, posterior margin.

Etymology.—The specific name alludes to its occurrence in the ENCI quarry.

Remarks.—*Cretachlorodius enciensis* n. sp. exhibits a combination of morphological characters which suggests placement within the Xanthidae. The interfamilial relationships of this large family are complex, which holds particularly true for extinct genera for which further studies are required (Glaessner, 1969, p. R515).

In preliminary studies of several Recent genera of the Xanthidae, Guinot (1967, 1969) pointed out that, for example, a superficial resemblance in outline and ornamentation often masks a major phylogenetic gap.

The dorsal postfrontal ridge, broad orbitofrontal margin with a median depression, and the anterolateral spinose margin of the new genus resemble the xanthids *Prochlorodius* spp. and *Corallicarcinus spp.*, recorded from Eocene rocks of Hungary (Müller and Collins, 1991) (Figure 3); however, the former genus has a greater carapace length and the latter has more than one frontal ridge; both have more equal-sized anterolateral spines, a significantly broader orbitofrontal margin and lack fissures in the orbital margins. Miocene species of *Chlorodiella* Rathbun,

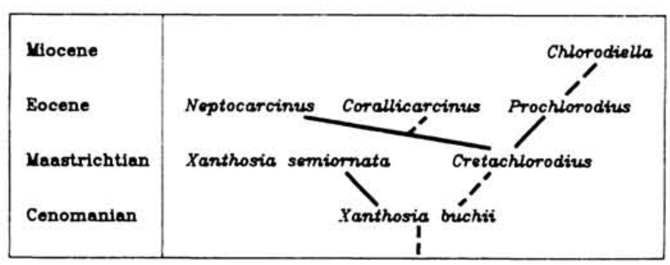

FIGURE 3—Possible evolutionary relationships of *Cretachlorodius* and related genera.

1897, and extant species of *Leptodius* (A. Milne Edwards, 1863), *Cataleptodius* Guinot, 1967 and *Gaudichaudia* Rathbun, 1930 differ in having distinct furrows, especially in the mesogastric region, and a multiple-lobed anterolateral margin.

Cretachlorodius enciensis n. sp. differs from the most closely resembling portunid, *Neptocarcinus* spp. in having a frontal ridge and lacking a distinct, lobed anterolateral margin. This resemblance could be only superficial (Müller and Collins, 1991) but more material and further studies are needed to clear this matter.

The genus most closely approaching *Cretachlorodius* in the Cretaceous is *Xanthosia* Bell, 1863. The new genus would appear to have originated from a species of Secretan's *Xanthosia* group 1 (Secretan, 1982, figure 2, p. 930). The general carapace outline and distinct median depression of the orbitofrontal margin of *Xanthosia buchii* (Reuss, 1845) suggests possible close affinities with an ancestor of *Cretachlorodius. X. buchii* is also the likely ancestor of *Xanthosia semiornata,* known from the same region (Jagt et al., 1991).

Bishop (1991) transferred the genus *Xanthosia* to the Portunidae based upon characteristics of the carapace and on the assumption that *Xanthosia occidentalis* had specialized paddle-like limbs. Until now no Cretaceous-age paddle-like fifth pereiopods have been found associated with a xanthid carapace; therefore the origin of the Portunidae remains unknown. Because of the apparent morphologic similarity of *Xanthosia* to the portunids an ancestral relationship seems quite possible (Wright and Collins, 1972). Glaessner (1969, 1980) and Bishop (1991) mentioned a possible polyphyletic origin of the swimming crabs.

Ecology.—The genus *Prochlorodius* Müller and Collins, 1991, was first recorded from late Eocene coral-bearing limestones of Hungary, and species of *Chlorodiella* Rathbun, 1897, are known from the Miocene of Hungary (Müller, 1984) and Java (Glaessner, 1969) and from the Pleistocene of Taiwan (Hu, 1981, 1983). Extant representatives of the latter genus inhabit the tropical waters of the Indo-West-Pacific, and the Caribbean. Fossil species of *Chlorodiella* from Hungary invariably are found in reefal or coral-bearing layers (Müller, 1984. This biotope matches that of *Cretachlorodius* in the presumed (sub) tropical seagrass-reefal communities of the late Maastrichtian Meerssen Member (Liebau, 1978; Voigt, 1981).

Today the locomotory method whereby crabs use jellyfish as a transport medium is known from several swimming crab genera in various seas. Morton (1989) recorded 12 crabs clinging to a jellyfish; their carapace width varied between 6 mm and 61 mm. The temporary association of crab and jellyfish probably promotes the survival of the crabs, but, just as importantly, also increases the distribution potential of these crabs.

The bioclastic limestones of the Meerssen Member in the Maastrichtian type area are characterized by an alternation of fining-upwards cycles. The majority of the fossil decapods are found on the basal bedding planes of the basis of the dm–m thick sequences. The coarse-grained base of the cycles is characterized by hummocky- and trough-cross stratification, indicating erosion, transport and redeposition by (storm) waves (Zijlstra, 1994). The fine-grained top of the cycles are homogeneously mixed by bioturbation and often capped by a hardground. The occurrence of the single, delicate carapace of *Cretachlorodius enciensis* in the homogeneous, fine-grained limestone is noticeably different from the occurrences of the majority of the other species from the type region. The completeness of the uneroded carapace suggest that the specimen was not transported over a significant distance. Hundreds of decapod specimens consisting mostly of fragments of both carapaces and chelae have been collected over the past five years from these rocks. In spite of the intensive collecting no other specimens of *Cretachlorodius enciensis* have been found whereas its closest congener, *Xanthosia semiornata,* is known from a dozen more or less complete carapaces and many fragments. An interpretation of *Cretachlorodius enciensis* being a drifted, Tethyan jellyfish-hitchhicker could explain the single, atypical occurrence.

CONCLUSIONS

Cretachlorodius enciensis seems to have an important evolutionary position and is a late, but not last (Fraaye, in prep.) representative of a diverse and abundant latest Cretaceous decapod crustacean fauna of the type Maastrichtian area. Similar to the Antarctic region (Feldmann et al., 1993), the Maastrichtian type area seems to have been an important site of origin of new taxa in the latest Cretaceous.

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THE OLDEST RECORD OF *LOPHORANINA* (DECAPODA: RANINIDAE) FROM THE LATE CRETACEOUS OF CHIAPAS, SOUTHEASTERN MEXICO

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ABSTRACT—The description of *Lophoranina precocious* new species from the Late Cretaceous (early Maastrichtian) Ocozocuautla Formation, Chiapas, México, represents the first occurrence of *Lophoranina* in pre-Eocene strata. The discovery provides documentation that the evolutionary development of terraced lines in the genus trended from relatively few, undivided, symmetrical terraces to more numerous, divided, asymmetrical terraces, and that the overall carapace surface developed a lower relief and became more uniform through time. Terraced lines that appear to be nodose, in most cases, were probably spinose. The morphology of the dorsal carapace seems to support affinities of the Raninidae with the Homolidae.

INTRODUCTION

THE OCOZOCUAUTLA Formation is a sequence of carbonate platform sediment deposited during Late Cretaceous time in southeastern México. The main outcrop areas of the Ocozocuautla Formation are in the central portion of Chiapas, around the capital city, Tuxtla Gutiérrez (Figure 1). Locality A is approximately 4 km southeast of Tuxtla Gutiérrez, at latitude 16°44′36″N, and longitude 93°02′12″W, Chiapa de Corzo County, Chiapas (Figure 1). Specimens 1621 and 1703 were found by accident, while Mr. José Montesinos was excavating the foundation for his house. Locality B is 22 km southwest of Tuxtla Gutiérrez, and 5 km southeast of Ocozocuautla, at latitude 16°45′56″N, and longitude 93°22′12″W, Ocozocuautla County (Figure 1). The specimen collected here, 1702, appears to have been transported from a nearby outcrop of the Ocozocuautla Formation. The fauna of the Ocozocuautla Formation includes, and is best known for, gastropods and rudists of large size (Müllerried, 1934).

The record of raninid crabs in México is very poor. Those described from México include a piece of carpus referred to