

First record of Permian conodont "*Jinogondolella*" cf. *altaduensis* from the Midhnab Member, Khuff Formation, Saudi Arabia

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ABSTRACT

A single specimen of conodont is described for the first time from outcrops of the Khuff Formation in central Saudi Arabia. The specimen was recovered from 22 samples that were located in the maximum flooding intervals of the Khuff Formation and specifically processed for conodont research. The sample originated from the maximum flooding interval located at the lower part of the Midhnab Member of the Khuff Formation, at Jabal al Murayrah in the Ad Darma' quadrangle. The conodont occurs in reworked lithoclastic and bioclastic calcarenites, secondary sparitized, as a single broken and corroded specimen, which belongs to the genus *Mesogondolella* (*Jinogondolella*) and is tentatively conferred to the species "*Jinogondolella*" cf. *altaduensis*. The conodont is associated with broken pieces of fauna including bivalves, gastropods, echinoids, brachiopods and bryozoans, as well as foraminifers and dasycladacean algae. This genus is rarely encountered in the open-marine deposits of the Tethyan platforms, where it appeared preferentially in semi-restrictive (saline) basins. A Late Capitanian age is interpreted for some species of the genus *Jinogondolella* in America (Texas), China and Oman, but this age interpretation is not firmly established for the Midhnab Member of the Khuff Formation. Also due to the reworked nature of the horizon that yielded this conodont, the specimen is not considered to be age-indicative.

SAMPLE LOCATION AND STRATIGRAPHIC POSITION

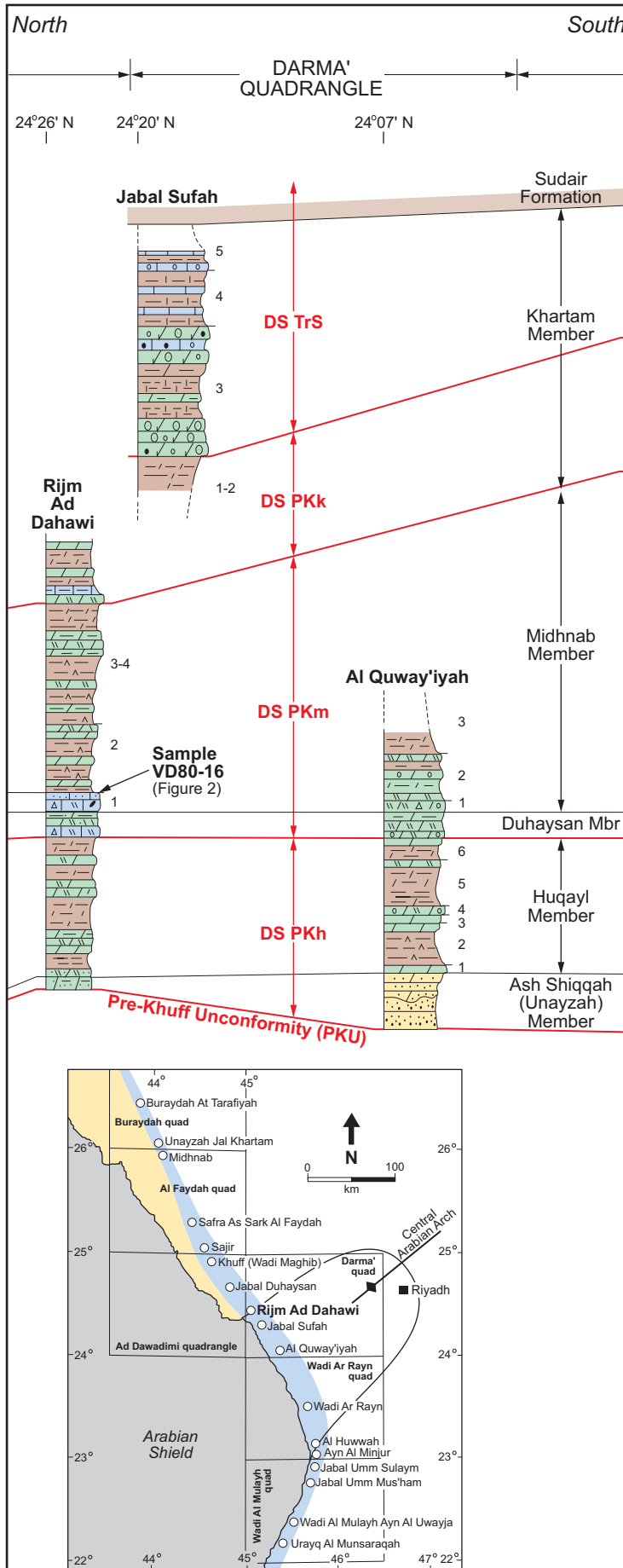
During the 1980s, while mapping the outcrops of central Saudi Arabia, a total of 36 samples were collected from a complete section of the Khuff Formation, but none yielded conodont fauna (D. Vaslet, written communication, 2005). This field work was mostly carried out in the Ad Dawadimi quadrangle (Delfour et al., 1982) and the Ad Darma' quadrangle (Manivit et al., 1985). More recently a second set of 22 samples were taken from the maximum flooding intervals of the Khuff Formation, and also processed for conodont research. This second effort yielded only one sample (VD 80-16) consisting of a single broken specimen of conodont. The stratigraphic position of the sample is from the lower part of the Midhnab Member of the Khuff Formation (Vaslet et al., 2005), at the Jabal al Murayrah, Rijm ad Dahawi section (24°26'50"N, 45°02'48"E) in the Ad Darma' quadrangle (Figure 1).

The conodont occurs in bioclastic and intraclastic wackestone calcarenite, secondary sparitized, including peloids, large intraclasts and bioclasts. Some intraclasts contain small foraminifers. The biofacies is quite diverse and consists of hydrozoans, punctuated and unpunctuated brachiopods, prismatic tests of bivalves, dasycladacean algae, echinoderms, and gastropods (Figure 2). The paleoenvironment is interpreted as an open-marine internal platform, and is placed within the maximum marine flooding interval of the whole Khuff Formation in the lower part of the Midhnab Member. According to Vaslet et al. (2005), this horizon (MFI PKm) may be correlated to the MFS P40 of Sharland et al. (2001, 2004).

CONODONT FAUNA

The single broken conodont specimen that was collected from the lower part of the Midhnab Member, belongs to the genus *Jinogondolella* (Plate 1). The specimen is quite corroded. Because of the (1) low, small cusp, transverse, formed by the fusion of the cusp and adjacent carinal denticle, (2) wide smooth furrows, and sharp anterior end of the micro-ornament with no clear serrations, (3) wide platform with fairly sharp anterior narrowing, short blade of moderate height, this species most closely

Khuff Formation outcrop, Saudi Arabia



resembles “*Jinogondolella*” cf. *altudaensis* (Kozur, 1992) of latest Capitanian age (Kozur, 1992; Wardlaw, 2000). The aberrant transverse denticle, typical for *J. shannoni* (Wardlaw), may occur in rare pathogenic forms of *Jinogondolella* from *J. aserrata* to *J. altudaensis*. One of the latter species, *Jinogondolella aserrata* was discovered in the Guadalupian part of the Khuff Formation in Oman (Angiolini et al., 1998).

Stratigraphic position: The latest Capitanian (late Guadalupian) age given by the “*Jinogondolella*” genus (Kozur, 1992; Mei and Wardlaw, 1994; Wardlaw, 2000) and the species described in Oman (Angiolini et al., 1998) is subject to caution for the lower Midhnaab Member of the Khuff Formation in central Saudi Arabia, for several reasons:

- (1) The biofacies encountered in this horizon appears to be highly reworked, small foraminifers having been described in the lithoclasts from thin sections.
- (2) The stratigraphic position of the lower Midhnaab Member occurs at least three depositional cycles above the Ash Shiqqah Member of the Khuff Formation. The Ash Shiqqah Member is correlated to the Khuff-D Anhydrite in Saudi Arabia (Vaslet et al., 2005), the Middle Anhydrite of the Khuff Formation in Oman (Al-Husseini and Matthews, 2005; Osterloff et al., 2004) and the Nar Member in the Zagros in Iran (Insalaco et al., 2006). The age of the evaporitic unit is interpreted as late Midian Stage by fusulinids (Insalaco et al., 2006).

Figure 1: Location map of the Rijm ad Dahawi section in Jabal Murayrah of the Ad Darma' quadrangle, central Saudi Arabia (modified after Vaslet et al., 2005).

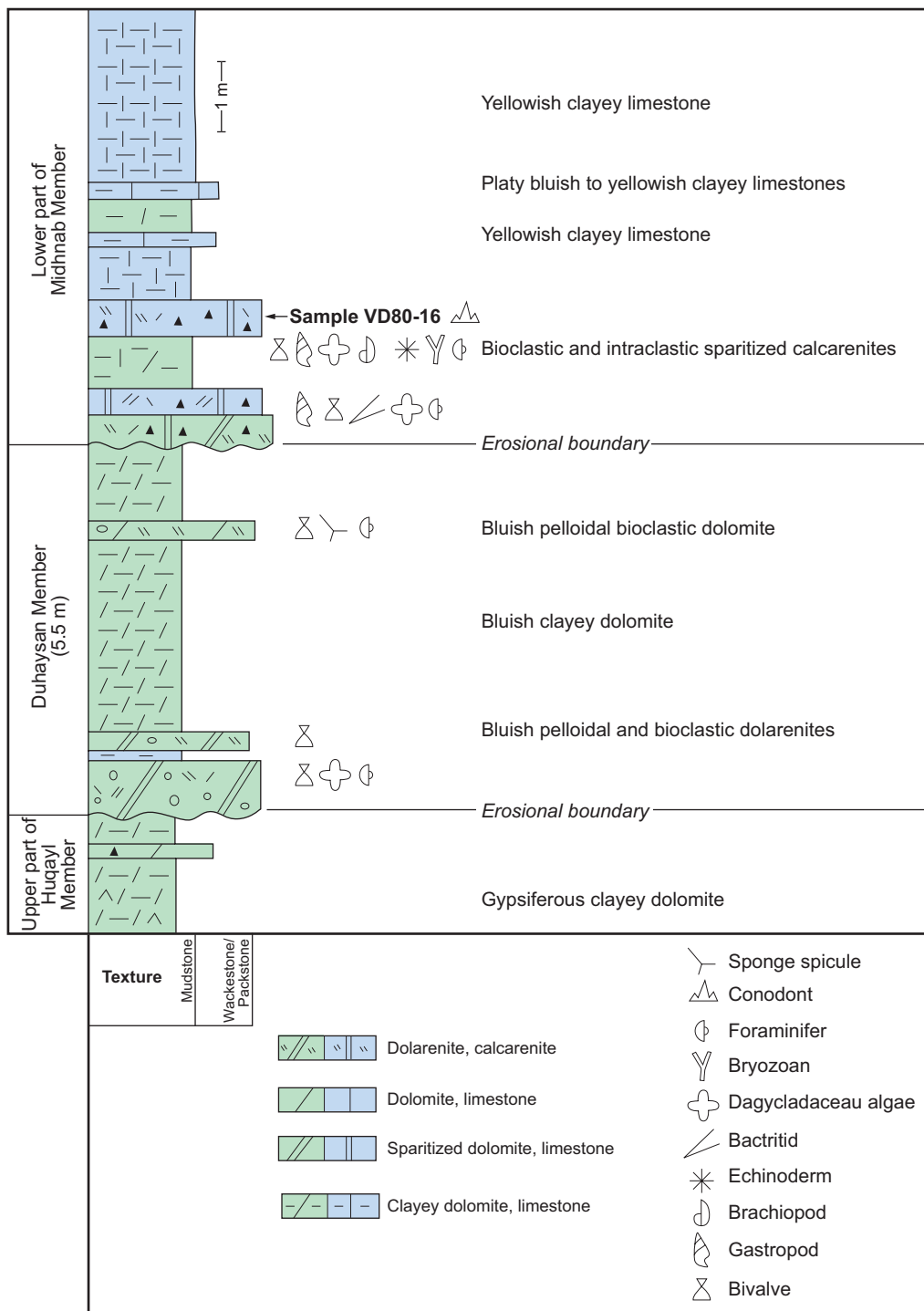


Figure 2: Detailed section of the Duhaysan Member and the lower part of the Midhnab Member in the Rijm ad Dahawi section (Jabal Murayrah). This section shows the location of the sample VD 80-16 in bioclastic and intraclastic calcarenites at the lower part of the Midhnab Member of the Khuff Formation.

Based on small foraminifers and regional considerations, a Late Permian (Changsinghian) age was proposed for the Midhnab Member (Vaslet et al., 2005; Vachard et al., 2005; Insalaco et al., 2006). However, the age of the conodont specimen appears to be late Capitanian. Moreover, ongoing Sr-isotope analysis on Midhnab brachiopod shells (L. Angiolini, personal communication, 2006) indicates that this member is late Capitanian or early Wuchiapingian. It is therefore possible that the Midhnab foraminifers (Vachard et al., 2005), which are dated as Dzhulfian-Dorashamian in age, may in fact be late Capitanian as this latter age correlates to the early Dzhulfian.

Plate 1

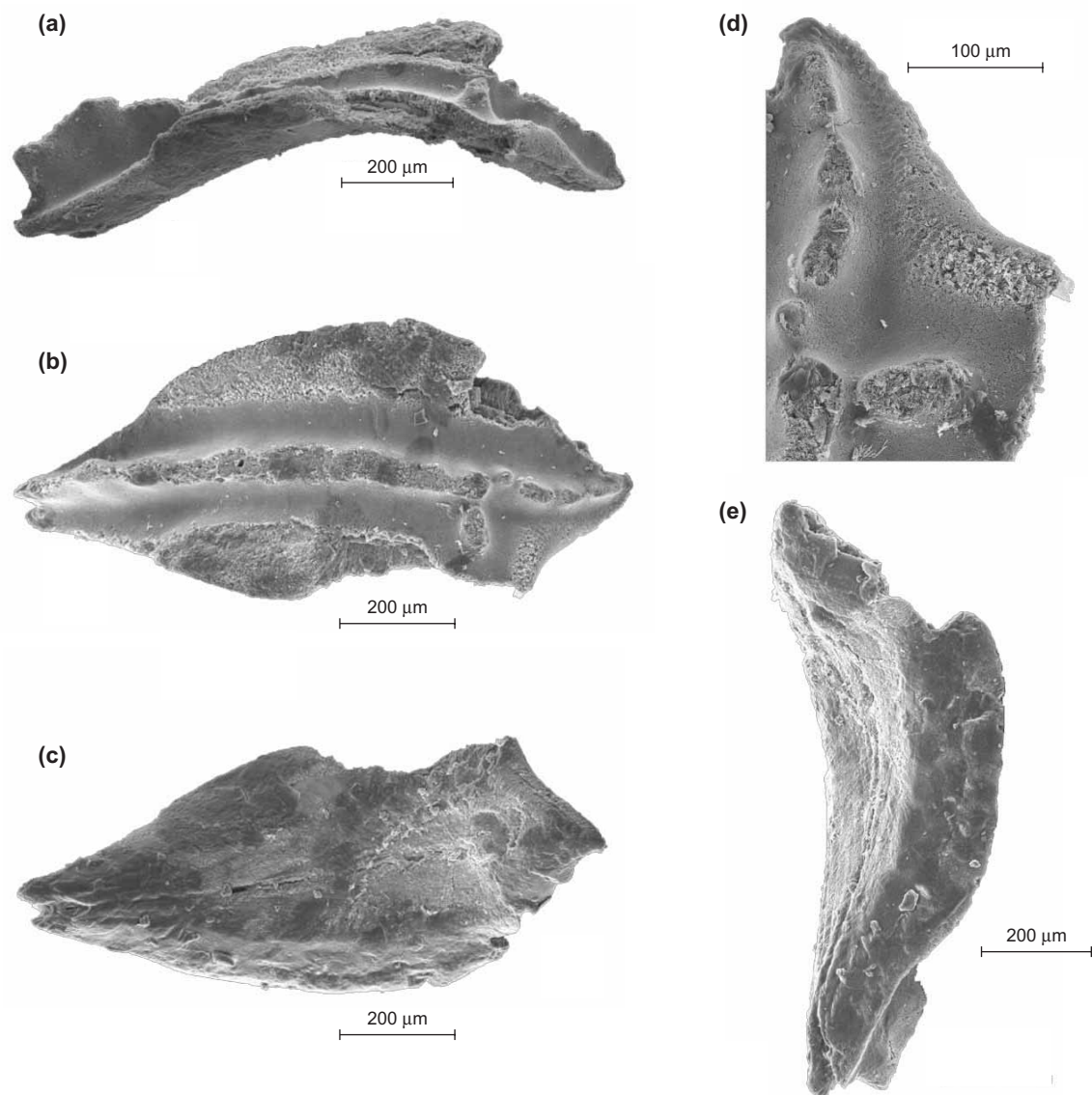


Plate 1: Conodont specimen from the Midhnab Member of the Khuff Formation.

1.a: "*Jinogondolella*" *altudaensis* (Kozur, 1992), lateral view, sample VD 80-16.

1.b: "*Jinogondolella*" *altudaensis* (Kozur, 1992), upper view, sample VD 80-16.

1.c: "*Jinogondolella*" *altudaensis* (Kozur, 1992), lower view, sample VD 80-16.

1.d: "*Jinogondolella*" *altudaensis* (Kozur, 1992), magnification of the posterior end, sample VD 80-16.

1.e: "*Jinogondolella*" *altudaensis* (Kozur, 1992), oblique/lower view, sample VD 80-16.

The discovery of the first specimen of conodont in the Khuff Formation of central Saudi Arabia provides a clue to the biofacies characterization of this Late Permian south Tethyan platform. Its stratigraphic position within the maximum flooding interval, although highly reworked, of the Khuff Formation is encouraging for looking for more conodont fauna, and possibly establishing a conodont stratigraphic scale for the late Middle and Late Permian of the Arabia Peninsula in the future.

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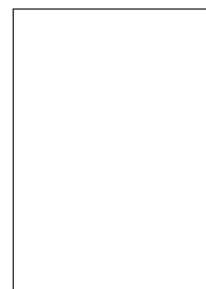
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