

AN AMMONOID-CALIBRATED TETHYAN CONODONT TIME SCALE OF THE LATE UPPER TRIASSIC

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A refined conodont biochronology is presented for the late Middle Norian to the top of the Triassic of Tethyan pelagic sequences between the Alps and Timor. This conodont scale is intercalibrated with ammonoid zones of the Rhaetian and Norian stage and respective substages. Ammonoid-controlled early to middle Norian pelagic sequences are rather rare and in the Hallstatt facies often condensed (Austria, Oman, Timor) and incomplete or synsedimentary disturbed (Slovakia). A well documented and expanded conodont record from Austria, Turkey, Oman and Timor starts in the late Middle Norian *Halorites macer* Z. where at the base epigondolellids with still large platforms resembling *Epigondolella abneptis* (HUCKRIEDE) occur. In the upper part of this zone a rapid evolution takes place towards smaller forms with reduced platform leading to *Epigondolella vrielyncki* KOZUR and, in the very top of the *macer* Z. to bidentate forms. Those resemble *Epigondolella bidentata* but are distinguished by a higher posterior carina and more distal located "platform". The *macer* Z. is further recognizable by two very distinct epigondolellids with in lateral view a wall-like carina with an abrupt, step-wise posterior drop in front of the main denticle. Originally united in *Epigondolella slovakensis* KOZUR, they have been recently splitted in *E. slovakensis* (=s. str.) and *E. praeslovakensis* KOZUR, MASSET and MOIX on the basis of differences in the outline of the posterior keel. Both species appear together at the base of the *macer* Z. in Timor but may differ in their total range as *E. praeslovakensis* may be restricted to this zone whereas *E. slovakensis* ranges up to the lower Rhaetian, but is a rare and sporadic companion in pelagic faunas.

The Upper Norian *Sagenites quinquepunctatus* Z. is characterized by *Epigondolella bidentata* MOSHER and sporadically *E. englandi* ORCHARD, further accompanied by *E. mosheri* KOZUR in the upper half of this zone. The very top of the *quinquepunctatus* Z. is coeval to a conodont interval defined by the co-occurrence of *E. bidentata*, rare *Misikella hernsteini* MOSTLER and/or *Oncodella paucidentata* MOSTLER.

The Norian-Rhaetian boundary (NRB) has now been defined as the FAD of *M. posthernsteini* and is in ammonoid controlled sections (Austria, Oman) also recognized by a distinct frequency increase of *M. hernsteini* on the expense of *E. bidentata*. A first and short interval in the lower *Paracochloceras suessi* Z. shows still common epigondolellas of late Norian type together with *M. hernsteini*, rare *M. posthernsteini* and single *M. koessenensis* which appear

around the NRB. Platform decrease and size reduction in *E. bidentata* during the upper *P. suessi* Z. leads to a predominance of small platform-less parvigondolellid forms in many pelagic sequences including the Hallstatt facies. Those forms have been named *Parvigondolella andrusovi* KOZUR & MOCK or *Parvigondolella lata* KOZUR & MOCK and are described as diagnostic for a time interval younger than that of *E. bidentata*. They are here called as *E. bidentata* juv. and co-occur in *E. bidentata* favourable facies throughout the *suessi*-Z. together.

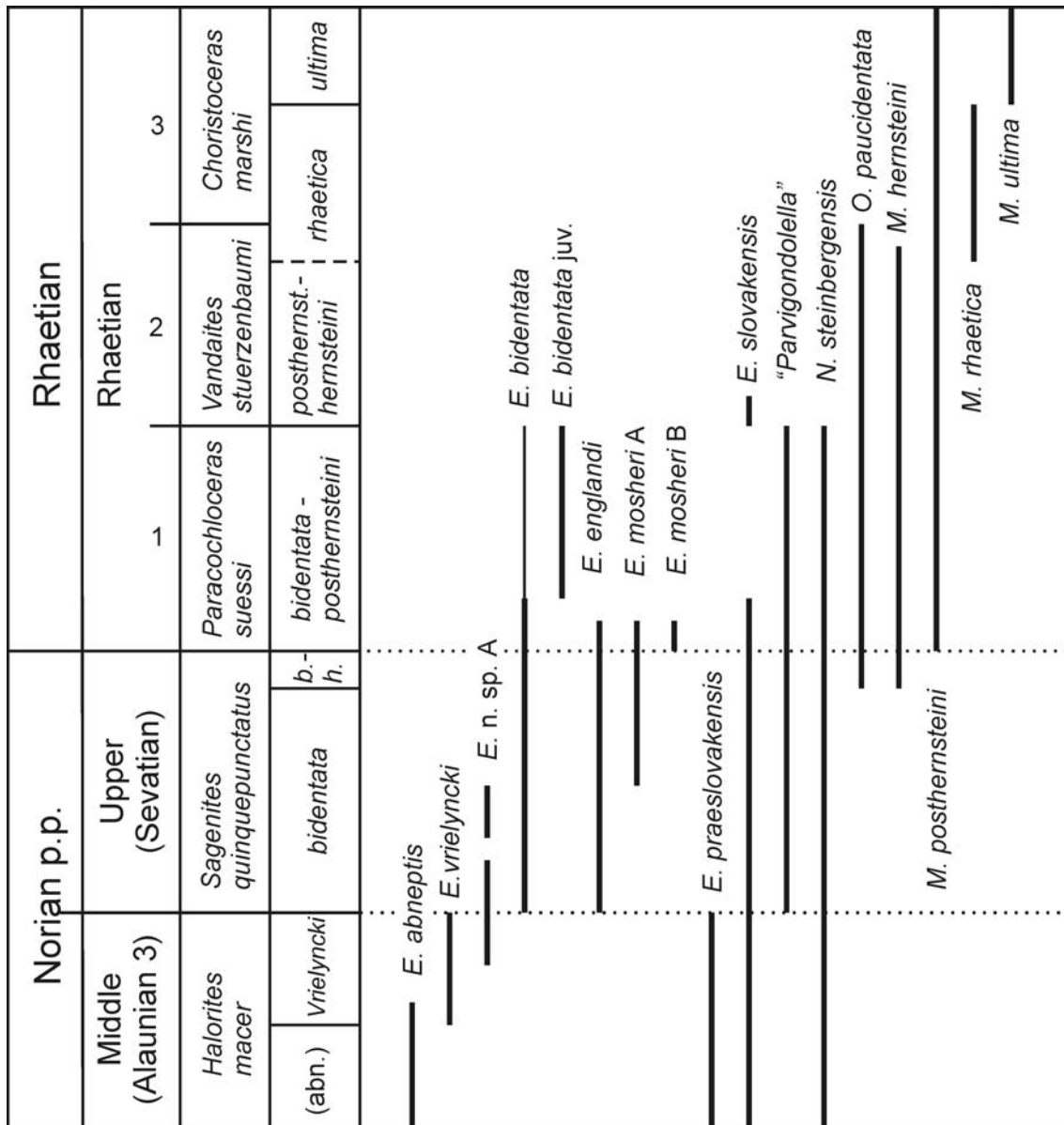


Fig.1: An ammonoid-calibrated Tethyan conodont time scale of the late Upper Triassic

The base of the *Vandaites stuerzenbaumi* Z. corresponds to the last occurrence (LO) of *E. bidentata* s.l. and shows a distinct frequency change in the represented misikellids, with *M. posthernsteini* now clearly dominating *M. hernsteini* by a ratio of 2:1 to 10:1. This conodont association characterizes a major part of the *V. stuerzenbaumi* Z. and is replaced in its top by another *Misikella* interval based on the appearance of *M. rhaetica* MOSTLER. The latter species reaches up into the lower *Choristoceras marshi* Z. as demonstrated in ammonoid bearing sections of the Zlambach and Eiberg basins in Austria.

Two *Misikella* range zones finally mark the top of the Triassic in Austria: the *M. rhaetica* R. Z. in the middle and the *M. ultima* R. Z. in the upper *marshi* Zone. Since the conodont record ends with *M. ultima* in carbonatic sequences and the topmost terrigenous Triassic above is devoid of conodonts in Austria, a post-*ultima* conodont interval as described from Hungary is missing but its existence can not be excluded.

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