

## TAXONOMY AND PHYLLMORPHOGENESIS OF THE CARNIAN / NORIAN CONODONTS FROM PIZZO MONDELLO SECTION (SICANI MOUNTAINS, SICILY)

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Pizzo Mondello (Sicani Mountains, Western Sicily, Italy) is one of the best sites for the study of the Carnian/Norian boundary and of Upper Triassic conodonts phylogenesis as well. Pizzo Mondello section is a 450 m thick continuous succession of pelagic-hemipelagic limestones (*Calcarei con selce* or *Halobia Limestone auctorum*; Cherty Limestone, MUTTONI et al, 2001; 2004) consisting in evenly-bedded to nodular calcilutites (mostly mudstones/wackestones with radiolarians) rich in bivalves (*Halobia*) and ammonoids, with cherty lists and nodules (GUAUIMI et al., 2007; NICORA et al., 2007).

Conodonts are very abundant giving the opportunity to observe and to point out clear relationships among the four most widespread Upper Carnian/Lower Norian conodont genera (*Paragondolella*, *Carnepigondolella*, *Metapolygnathus* and *Epigondolella*) and to identify trends of the genera turnovers.

Genera have been classified and separated following the original diagnosis given by the Authors, regarding also as discriminating for the genera taxonomy the following morphological elements: position of the pit, with respect both to the platform and to the keel; shape of the keel end; length of the platform and occurrence of nodes and/or denticles on the platform margins.

Studies on conodont populations allowed recognizing precise trends in the evolution of the platform morphology that are common to the four genera listed above (*Paragondolella*, *Carnepigondolella*, *Metapolygnathus* and *Epigondolella*): a) forward-shifting of the pit, b) shortening of the platform and c) development of nodes and denticles on the platform margins (see also ORCHARD, 1991a,b). Through the analyses of these elements and the finding of transitional forms occurring among forerunners and descendants, it was possible to assign the four main Late Carnian-Early Norian genera considered to two separate monophyletic lineages: i) the *Paragondolella-Metapolygnathus* lineage and ii) the *Carnepigondolella-Epigondolella* lineage, according also to KOZUR, 2003:

- transitional forms, here referred to *Metapolygnathus* n. sp., between the genus *Paragondolella* and the genus *Metapolygnathus* have been found at Pizzo Mondello section from sample PM6A to NA35 (NICORA et al., 2007), before the first occurrence of *Epigondolella quadrata* Orchard (sample FNP88A, NICORA et al., 2007). This new species represents the transition between *Paragondolella noah*

(Hayashi) and *Metapolygnathus communisti* Hayashi. In fact forward-shifting of the pit towards the centre of the element, posterior prolongation of the keel, shortening of platform margins and occurrence of little nodes at the geniculation points are observed. These morphological variations are clearly transitional to *Metapolygnathus communisti* and thus suit *Metapolygnathus communisti* as the immediate descendant of *Paragondolella noah* (according to KOZUR, 2003);

- transitional forms (occurring from sample FNP51A to sample NA33, NICORA et al., 2007) between the genus *Carnepigondolella* and the genus *Epigondolella* are represented by *Carnepigondolella orchardi* (KOZUR) (= *Epigondolella orchardi* in KOZUR, 2003). This species, in fact, shows intermediate features between *Epigondolella quadrata* (the first real representative of genus *Epigondolella*) and its forerunner, *Carnepigondolella pseudodiebeli* (KOZUR). *Carnepigondolella pseudodiebeli* evolves into *Epigondolella quadrata* through the shifting of the pit to the centre of the element, the shortening of the platform and the evolution of nodes into denticles on the platform margins. The gradual evolution of these morphological elements is clearly present in *Carnepigondolella orchardi*, suiting this species as the morphocline between *Carnepigondolella pseudodiebeli* and *Epigondolella quadrata*.

The finding, at Pizzo Mondello section, of morphoclines between *Carnepigondolella pseudodiebeli*-*Epigondolella quadrata* and between *Paragondolella noah* - *Metapolygnathus communisti*, demonstrates that:

- 1) the evolution of *Paragondolella noah* and *Carnepigondolella pseudodiebeli* into their relative descendent occurred surely in the Sicano Basin and thus, *Metapolygnathus communisti* and *Epigondolella quadrata* did not migrate from other provinces;
- 2) because of the recognition of the morphoclines with their ancestors, the first occurrence of *Epigondolella quadrata* in sample FNP88A and of *Metapolygnathus communisti* in sample NA35 represents their phylogenetic first appearance and, thus, their FAD (according to Remane, 2003).

On these bases we consider the FAD of both *Epigondolella quadrata* and *Metapolygnathus communisti* at Pizzo Mondello section as two possible primary biomarkers for the base of the Norian.

Semi-quantitative curves of the conodont abundances for each of the four main Carnian/Norian genera have been provided. The analysis of these curves show three turnovers involving the four genera:

**Turnover 1:** genus *Paragondolella* extinguishes while genus *Carnepigondolella* almost disappears and it is replaced by the occurrence of genus *Epigondolella*.

**Turnover 2:** genus *Epigondolella* abruptly decreases and is overturned by a mass occurrence of genus *Metapolygnathus*.

**Turnover 3:** genus *Metapolygnathus* almost disappears and is replaced by the re-occurrence of genus *Epigondolella*.

These three turnovers, along with the curve trends, seem to evidence some sort of competition first of genus *Carnepigondolella* versus genus *Paragondolella* and, later, of genera *Carnepigondolella* and *Epigondolella* versus genus *Metapolygnathus* (see also KOZUR, 2003). The competition between genera *Paragondolella* and *Carnepigondolella* is also mirrored by the competition between their descendent genera *Metapolygnathus* and *Epigondolella* respectively, which probably inherited the same ecological niche of their forerunners. This competition thus reflects and strengthens the phylogenetic relationships of the *Paragondolella*-*Metapolygnathus* and *Carnepigondolella*-*Epigondolella* lineages.

Further integrated studies and correlations with other stratigraphic sections will provide a better understanding of the causes that might generate conodont genera turnovers and thus better define the base of the Norian.

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