Rivista Italiana di Paleontologia e Stratigrafia	volume 103	numero 2	tavole 1-2	pagine 173-182	Settembre 1997

CONODONT BIOSTRATIGRAPHY OF THE LATE TRIASSIC SEQUENCE OF MONTE COCUZZO (CATENA COSTIERA, CALABRIA, ITALY)

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Key-words: Catena Costiera Calabrese, Basin deposits, Conodonts, Norian, Rhaetian.

Riassunto. Nel presente lavoro sono riportati i risultati preliminari di uno studio biostratigrafico, basato sui conodonti, dei terreni carbonatici triassici della Catena Costiera Calabrese, affioranti nella finestra tettonica di Monte Cocuzzo. La successione studiata (Colle del Crapio) si è depositata in contesti di piede scarpata/bacino ed ha fornito faune a conodonti ricche e ben preservate. Sono riconoscibili due biozone: la prima, nella parte inferiore-media dell'unità, è marcata da *Epigondolella slovakensis* e può essere riferita al Norico superiore (Sevatiano); la seconda è caratterizzata da *Misikella hernsteini*, in associazione con *M. posthernsteini*, ed ha un inquadramento cronostratigrafico più controverso. Secondo Krystyn (1990) e Golebiowski (1990) potrebbe essere riferita al Sevatiano sommitale (Norico superiore), mentre per Kozur & Mock (1991) la comparsa di *M. posthernsteini* indicherebbe il passaggio al Retico.

Abstract. Preliminary results are reported from an investigation of the conodont associations found in the Late Triassic carbonate succession of the so-called "Catena Costiera Calabrese" that crops out in the tectonic window of Monte Cocuzzo. The succession of Colle del Crapio consists of alternating carbonate mud, breccia and calciturbidites deposited in a toe-of-slope to basin setting and contains rich and well-preserved conodont faunas pertaining to two biozones. The lower zone is characterised by the occurrence of *Epigondolella slovakensis* and may be referred to the Late Norian (Sevatian). The upper zone is characterised by *Misikella hernsteini* associated with *M. posthernsteini*. The chronostratigraphic setting of the latter zone is more controversial, as it may be regarded as latest Sevatian (Upper Norian) according to Krystyn (1990) and Golebiowski (1990), while according to the zonation of Kozur & Mock (1991) the first occurrence of *M. posthernsteini* marks the beginning of the Rhaetian stage.

Introduction.

This paper is the first contribution on conodont stratigraphy of the Late Triassic succession cropping out in the so-called *Monte Cocuzzo tectonic window Auct.*, pertaining to the "Catena Costiera Calabrese" and located west of Cosenza.

The succession, mainly consisting of strongly dolomitized carbonate rocks, has been interpreted by Amodio Morelli et al. (1976) as a tract of the African margin of Apulia, cropping out as a tectonic window below the thrust sheets pertaining to the "Calabrian (Calabridi) units" (Ogniben, 1969).

The stratigraphic section studied was measured and sampled near Colle del Crapio (Fig. 1). The section is 73 m thick, including the upper part of the "Intermediate Complex or Monte Cocuzzo Complex" and the lower part of the "Upper Complex or Colle del Crapio-Valle delle Pernici Complex" of Ietto et al. (1995) (Fig. 2). Observations on the same stratigraphic interval were also made in a quarry on the southern slope of Monte Cocuzzo (Fig. 1).

The little data on the age of this succession available to date were based on benthic fossils, such as the dasycladacean green alga *Griphoporella curvata* (Gümbel, 1972) Pia, 1915, occurring in the Upper Complex of Colle del Crapio (Ietto et al., 1993) and referred to the Late Triassic (Norian-Rhaetian) (Barattolo et al., 1993).

The finding of a rich conodont fauna in the section studied allows more accurate biostratigraphic dating. Two distinct conodont biozones were recognized within the relatively thin interval sampled.

The stratigraphic section

Lithostratigraphy and sedimentology.

The stratigraphic section studied (Fig. 2) includes, from a lithostratigraphic view point, the upper part of the "Intermediate Complex" and the lower part of the "Upper Complex" of Ietto et al. (1993; 1995).

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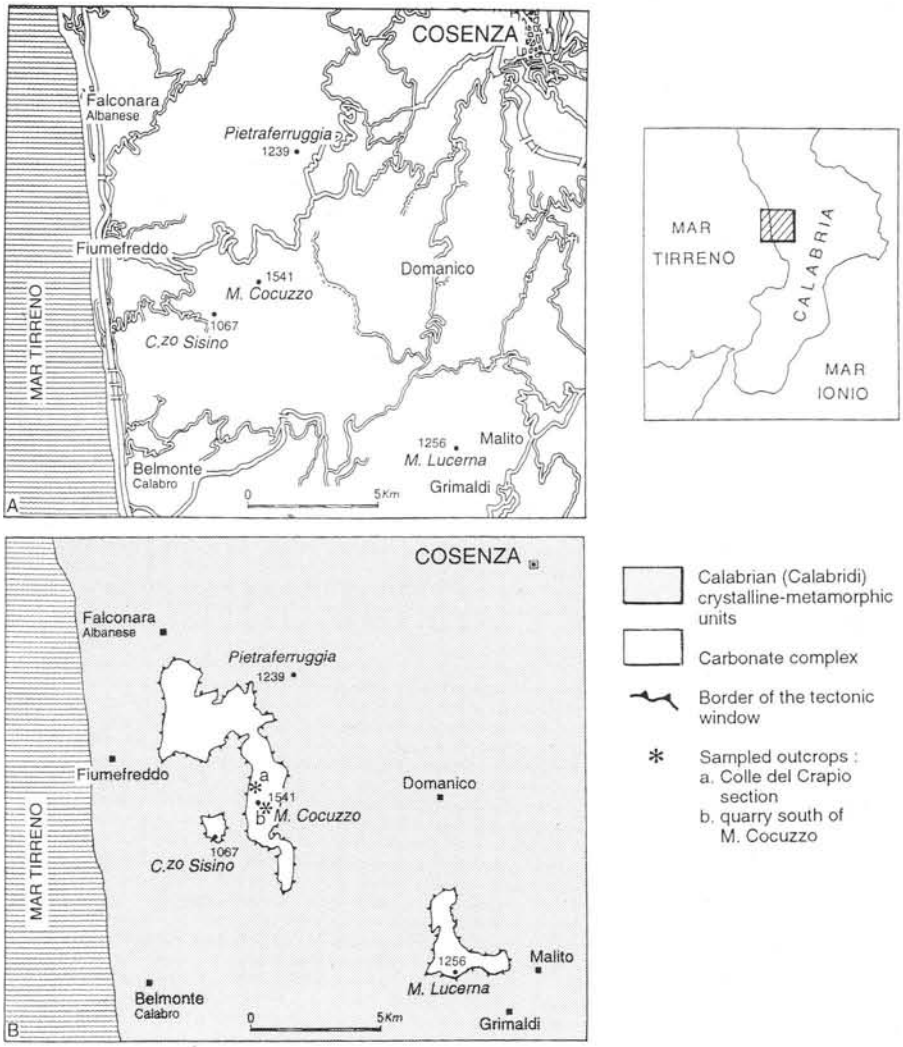


Fig. 1 - A, Location map of the area studied; B, Structural units and location of the outcrops sampled.

Intermediate Complex.

The *Intermediate Complex* (52 m, excluding a not precisely determinable lower tract of the complex) consists mainly of dark grey to blackish dolostone with minor marly interlayers. The main lithofacies are as follows.

a - Black dolomicrite with minor thin (mm- to cm-thick) fine-grained, graded dolomite intercalations, interpreted as fine, distal or starved, turbidites embedded into basin lime mudstone.

b - Coarse grained dolostone, deriving from the dolomitization of a calcarenite and a fine breccia, forming individual beds 3-4 to 30-40 cm thick, with erosional base, normal grading, even lamination and, occasionally, current ripples. These beds are interpreted as turbidites (usually T_{ab}); they are either amalgamated or separated by centimetre-thick dolomicritic interlayers. The grains are usually too deeply recrystallized to be recognizable; however, in some rare case, bioclasts such as dasyclads (*Gryphoporella* sp.) or fragments of microbialitic boundstone can be observed.

c - Dolomitic breccia, mainly with flat clasts, forming beds ranging in thickness from 50-60 cm to 2-3 m; clasts are mainly represented by tabular fragments of beds, 1-5 cm thick and 20-50 cm wide. They consist both of basinal dark dolomicrite (lithofacies a) and of calciturbidites (lithofacies b); platform-derived clasts are more rare, usually small in size (4-5 cm) and consist of microbialite boundstone (stromatolite-like laminite with associated skeletal cyanobacteria and encrusting foraminifers). The breccia bodies show quite different degrees of organization, ranging from chaotic mud-supported deposits (mud flows) to normal-graded, clast-supported beds capped by laminated doloarenite (turbidites). Lateral and vertical transition between slumped beds and flat pebble breccia is frequent.

These lithofacies are frequently organized into coarsening-up sequences, mainly made of facies a and b, or, more rarely, into fining-up sequences. The intervals dominated by flat clast breccia do not show any defined organisation. Moreover, the tract of the Intermediate Complex studied does not show a clear vertical evolution, although an upward increase in the amount of breccia occurs. The frequent occurrence of slumped ho-

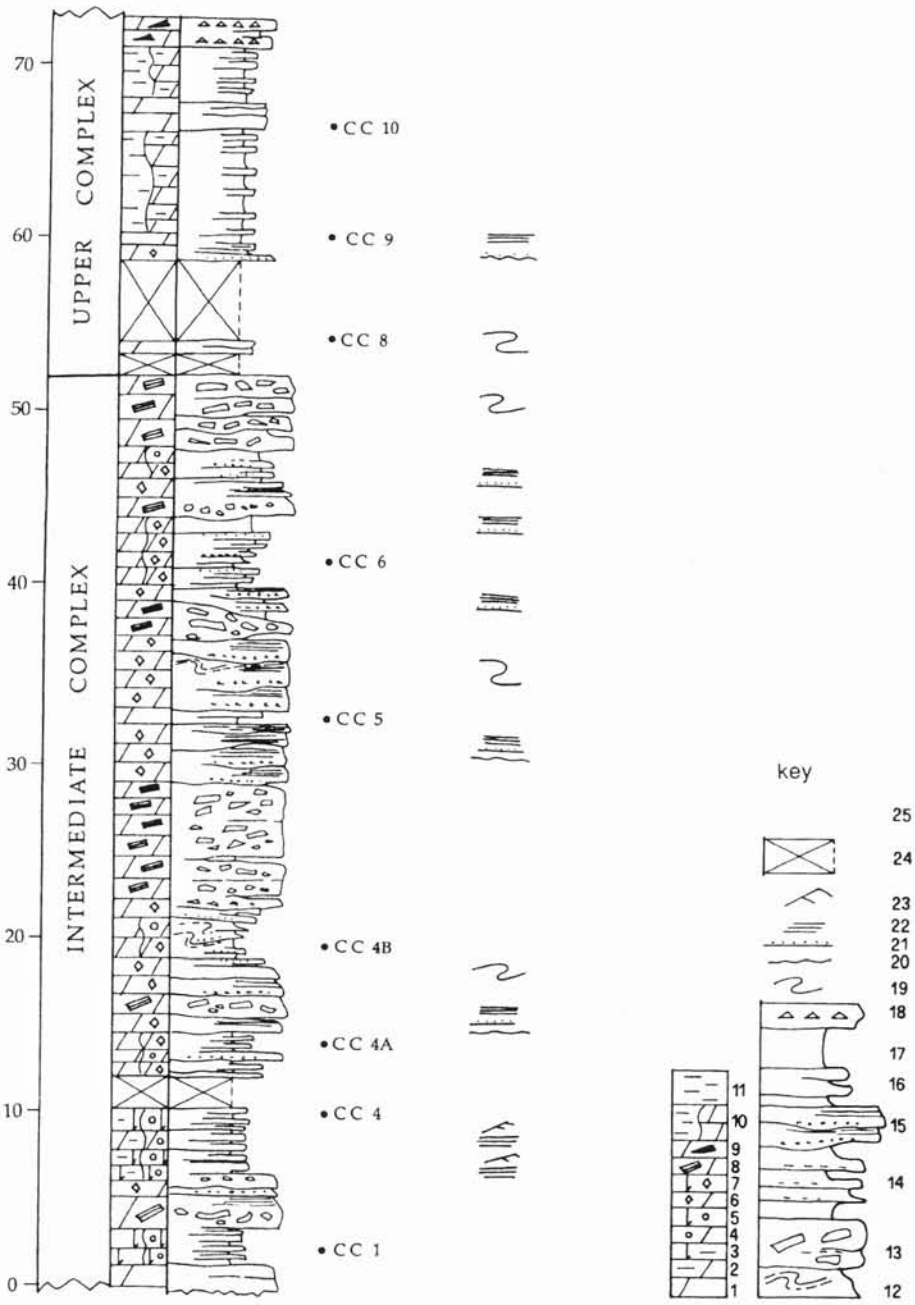


Fig. 2 - Colle del Crapio stratigraphic section. Key: 1) dolostone; 2 and 3) marly dolostone and dolomitic limestone; 4 and 5) fine-grained doloarenites; and dolomitic calcarenites; 6 and 7) coarse-grained dolostone and dolomitic limestone; 8 and 13) dolomitic breccia with platy laminated clasts; 9 and 18) dolomitic breccia with marly clasts; 10) alternating lithologies; 11) marls; 12) slumped deposits; 14) thin turbidites; 15) coarse amalgamated turbidites; 16) carbonate mud (possibly dolomitized); 17) marly/pelitic mud; 19) slump; 20) erosive surface; 21) normal grading; 22) even lamination; 23) small scale cross-lamination; 24) covered interval; 25) sample.

rizons and chaotic deposits consisting of tabular slabs derived from slope deposits in the upper part of the unit may indicate a pronounced slope instability, probably due to synsedimentary tectonics.

Upper Complex.

Only the lowermost part of the Upper Complex (20 m) was investigated. This unit is very poorly exposed, due to the abundance of marls intercalated in the succession. Outcrops consist of dm-thick blackish dolomite, represented by both dolomitized mudstone and calciturbidites, and of yellow to grey dolomitic marls. Poor exposure makes facies analysis and paleoenvironmental interpretation difficult, but according to the available data the overall depositional setting indicates a basinal environment. The unit records a marked reduction in the carbonate gravitational sedimentation and an increase in pelite input.

Biostratigraphy.

The Conodont fauna.

Nine samples, with a minimum weight of 7 kg, were collected in the Colle del Crapio section. Six were obtained from the Intermediate Complex and three from the Upper Complex (Fig. 2). Two additional samples collected from a quarry south of Mt. Cocuzzo, at the boundary between the Intermediate and Upper Complex, were consistent with the data from Colle del

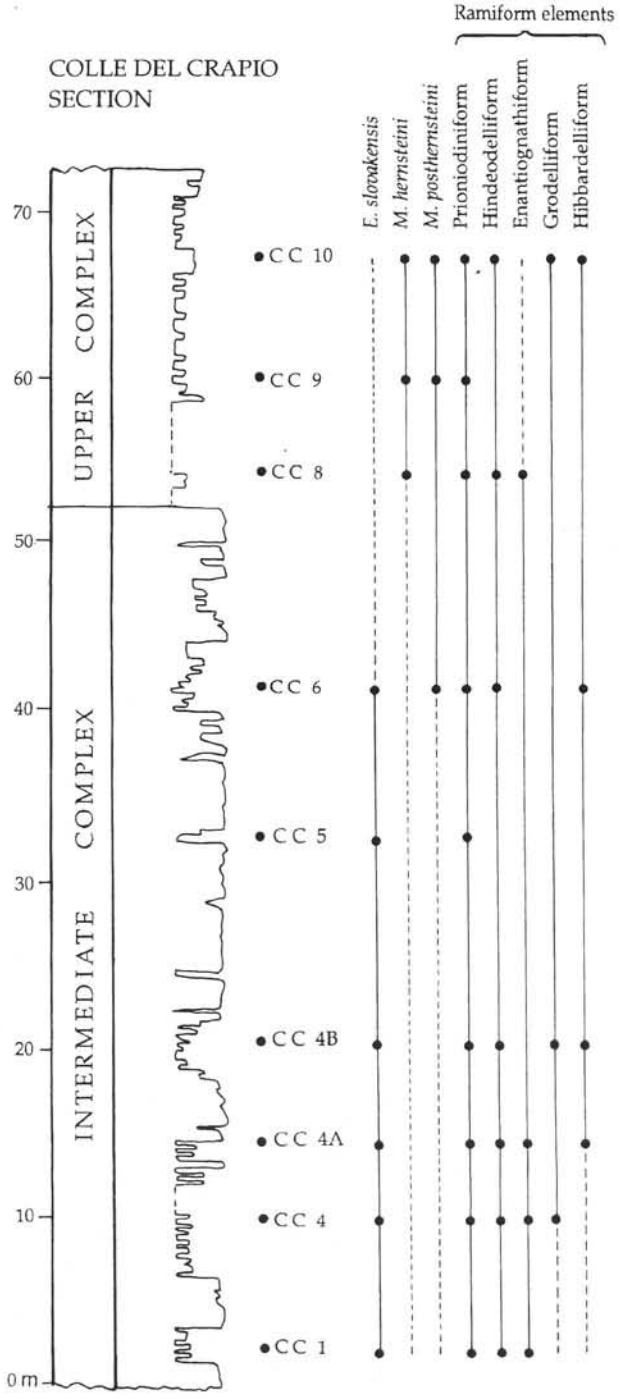


Fig. 3 - Occurrence and vertical range of conodonts in the Colle del Crapio section.

Crapio. Four samples taken from the underlying Lower Complex (Serra Mezzana) yielded large mono-specific collections of *Epigondolella slovakensis*.

All the samples from Colle del Crapio were collected from black dolomicrites, quasi-stoichiometric and very rich in organic matter (Russo F. et al. in preparation), with thin graded intercalations interpreted as fine turbidites. The samples yielded a very rich conodont fauna, well preserved as single elements or less frequently as clusters. Conodonts showed a colour alteration index (CAI) of 5 (Epstein et al. 1977).

Conodont occurrences and vertical ranges are given in Fig. 3.

Discussion.

Fauna 1 - Samples **CC1** to **CC5** from Colle del Crapio (Fig. 3) yielded a rich monospecific conodont assemblage exclusively containing specimens of *Epigondolella slovakensis* (Kozur) emend. Budai & Kovacs, 1986 (Fig. 3). This species is very abundant (approximately 530 platform elements and some clusters) and well preserved. Mostly broken specimens of ramiform elements (i.e., prioniodiniform, enantiognathiform, hideodelliform, and hibbardelliform) of the apparatus were also found.

Budai & Kovacs (1986) and Kovacs & Nagy (1989) reported the presence of *Epigondolella slovakensis* from the Rezi Dolomite Formation of Keszthely Mts. and Fekete-hegy Limestone Formation ("Avicula limestone") of Pilis Mts. in the Balaton Highland (Hungary) where it ranges from Upper Alaunian to Sevatian. The *E. slovakensis* population described by these authors includes elements with great morphological variability, similar to those observed in the Colle del Crapio fauna.

Orchard (1983, 1991) recognised a significant morphological variety in the *Epigondolella* population of the Norian of British Columbia and therefore defined four conodont biozones in the Columbianus Zone (Ammonite Standard Scale of Canada, Tozer, 1994), corresponding to the Middle Norian (Alaunian 2 and 3 *sensu* Krystyn in Zapfe, 1983).

PLATE 1

Upper Norian conodonts from Colle del Crapio (Monte Cocuzzo) section (CC).

Fig. 1-9 - *Epigondolella slovakensis* (Kozur, 1972) emend. Budai & Kovacs, 1986. 1) upper view, IPUM 25715, CC1, x 80. 2) upper view, IPUM 25716, CC4, x 80. 3) lateral view, IPUM 25717, CC1, x 80. 4) oblique lateral view, IPUM 25718, CC4, x 100. 5a) upper view; 5b) lower view, IPUM 25719, CC4, x 80. 6) upper view, IPUM 25720, CC1, x 80. 7) upper view, IPUM 25721, CC4, x 80. 8) lateral view, IPUM 25722, CC6, x 80. 9) lower view, IPUM 25723, CC1, x 80.

Fig. 10 - Enantiognathiform elements, IPUM 25724, CC4, x 100.

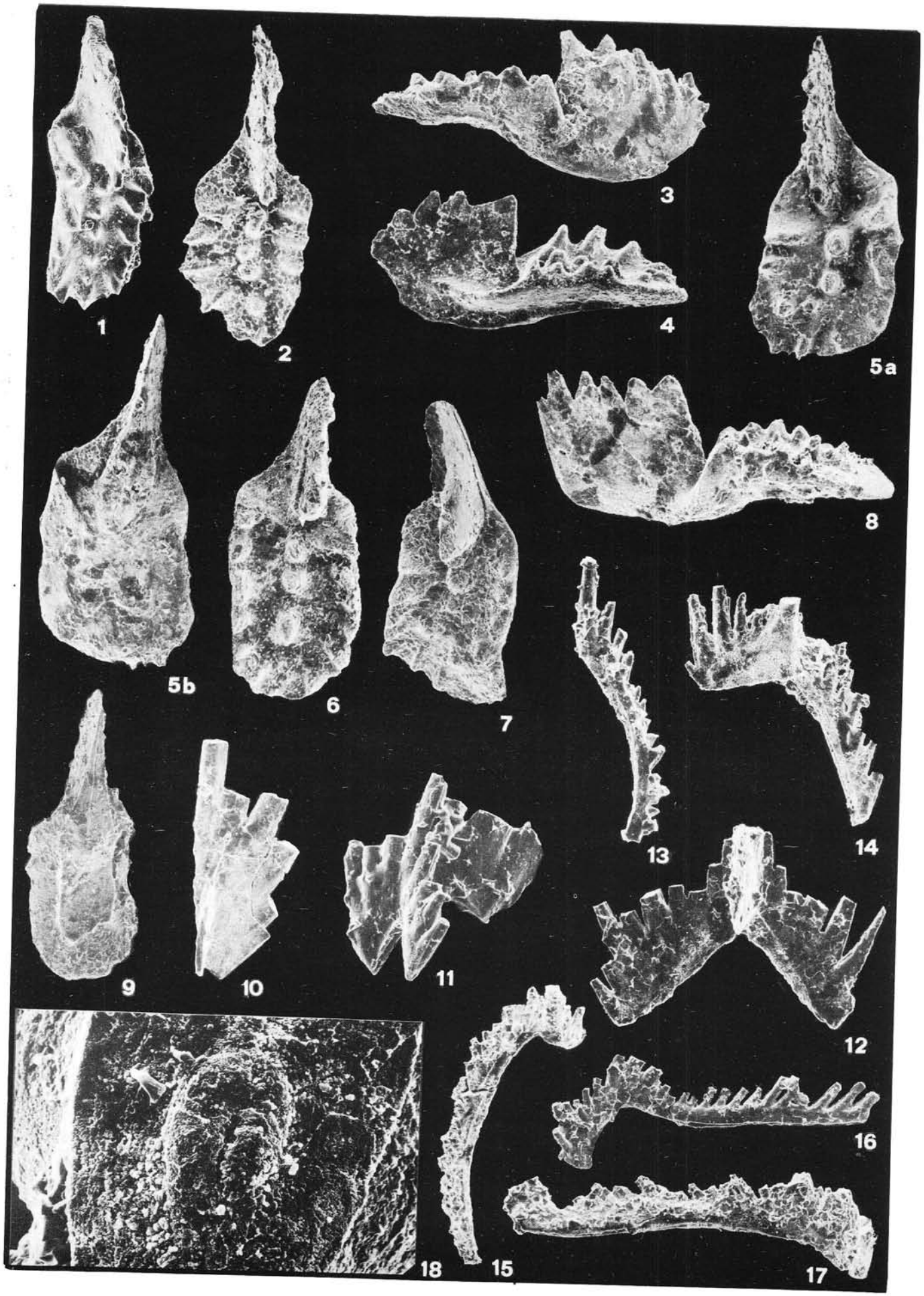
Fig. 11, 12 - Hibbardelliform element. 11) IPUM 25725, CC10, x 200. 12) IPUM 25726, CC4A, x 150.

Fig. 13 - Grodelliform element, IPUM 25727, CC10, x 100.

Fig. 14, 15 - Prioniodiniform elements. 14) IPUM 25728, CC4, x 100. 15) IPUM 25729, CC4B, x 70.

Fig. 16, 17 - Hindeodelliform elements. 16) IPUM 25730, CC8, x 100. 17) IPUM 25731, CC4B, x 100.

Fig. 18 - Particular of the pit of *Epigondolella slovakensis*, fig. 9, x 800.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Krystyn (in Zapfe, 1983)				Krystyn, 1980; 1988	Kozur, 1989; Kozur e Mock, 1991
RHAETIAN		Marshi		*posthernsteini*	*detrei*
				rhaetica	*ultima*
		Stuerzenbaumi		*paucidentata*	*posthernsteini*
				steinbergensis	
NORIAN	SEVATIAN	Suessi	Reticulatus	*hernsteini*	*hernsteini - andrusovi*
			Quinque - punctatus	*bidentata*	*bidentata*
	ALAUNIAN	Macer		*E.* n.sp. E	*postera*
				E. n.sp. D	
		Hogarti		*postera*	
Stage	Substage	AMMONOID ZONES		CONODONT ZONES	

Fig. 4 - Biostratigraphic zonations based on ammonoids and conodonts of the Upper Norian and Rhaetian stages.

Roghi et al. (1995) noted, in the *E. slovakensis* population collected in the Dolomia di Forni (Carnia), an evolutionary trend similar to the one described by Orchard (1983; 1991) in two different species, *E. postera* and *E. serrulata*. On the basis of this observation they referred the Dolomia di Forni to the Alaunian (Middle Norian).

According to Kozur (1972; 1989) and Kozur & Mock (1991) *Epigondolella slovakensis* is a typical Sevatian (Upper Norian) species. Its main occurrence marks the upper part of the *E. bidentata* Zone and its disappearance corresponds to the lower boundary of the *Misikella hernsteini-Parvigondolella andrusovi* Assemblage Zone (*sensu* Kozur & Mock, 1991) of the uppermost Sevatian (Fig. 4). This species has been reported also from the *Calcari Selciferi* of the late Sevatian age in the Lagonegro Basin, southern Italy (Amodeo et al., 1993).

Fauna 2. In sample **CC6** specimens of *Epigondolella slovakensis* (Kozur) occur together with *Misikella posthernsteini* Kozur & Mock. The occurrence of *M. posthernsteini* earlier than *M. hernsteini* (which first appears in sample **CC8**) is problematic, since *M. posthernsteini* is thought to have evolved from the latter.

Samples **CC8**, **CC9** and **CC10**, from the Upper Complex, yielded a conodont fauna composed exclusively of the genus *Misikella*, represented by *M. hernsteini* and *M. posthernsteini* associated with ramiform elements. The first species is quantitatively dominant over the second. Transitional forms between *M. hernsteini* and *M. posthernsteini* occur in sample **CC8** (Fig. 3).

Misikella hernsteini (Mostler) has been considered typical of the Suessi Zone (Upper Norian)(Mostler et al., 1978; Gazdzicki et al., 1979; Kovacs & Kozur, 1980), as well as the Stuerzenbaumi Subzone (Lower Rhaetian) in the Zlambach Marls and Koessen Beds of the Northern Calcareous Alps (Krystyn, 1980; Golebiowski, 1986; 1990).

Misikella posthernsteini was originally described from the Lower Rhaetian in the Zlambach Beds of Maly Mlynsky vrch (Slovakia) by Kozur & Mock (1974). Since then it has been reported many times from stratigraphic successions attributed to the Upper Norian and/or Rhaetian of Europe and Japan (Mostler et al., 1978; Gazdzicki, 1978; Gazdzicki et al., 1979; Kovacs & Kozur, 1980; Isozaki & Matsuda, 1982; Krystyn, 1980, 1988; Golebiowski, 1986, 1990; Gullo, 1996). Recently, *M. posthernsteini* was collected from the uppermost Triassic (Crickmayi Zone) of Canada (Orchard, 1991).

M. posthernsteini is generally considered a species characteristic of the Rhaetian. However, according to Krystyn (1990) and Golebiowski (1990) it appears from the uppermost Sevatian (Suessi Zone); and the predominance of *M. hernsteini* on *M. posthernsteini* is diagnostic of the uppermost Norian age.

Kozur & Mock (1991) suggest that the first occurrence of *M. posthernsteini* can be used as a marker to define the Norian/Rhaetian boundary, an event easily recognisable in the Tethyan successions. In this case, most of the *Cochloceras suessi* ammonoid zone would belong to the Rhaetian.

On the other hand, Krystyn (1988, 1990) defined the base of the Rhaetian in the Hallstatt region as the first occurrence of "*Choristoceras*" *haueri* (Stuerzenbaumi Zone). This corresponds, in terms of conodont biostratigraphy, to the Last Occurrence Datum (LOD) of

PLATE 2

Upper Norian/Early Rhaetian conodonts from Colle del Crapio (Monte Cocuzzo) section (CC).

Fig. 1-6 - *Misikella hernsteini* (Mostler, 1967). 1) oblique lateral view, IPUM 25732, CC9, x 100. 2a) upper view; 2b) lateral view, IPUM 25733, CC8, x 170. 3) lower view, IPUM 25734; 4) upper view, IPUM 25735; CC8, x 170. 5) lateral view, IPUM 25736, CC9, x 100.

Fig. 6a-b - *Misikella hernsteini-Misikella posthernsteini* 6a) oblique lateral view; 6b) lower view, IPUM 25737, CC8, x 170.

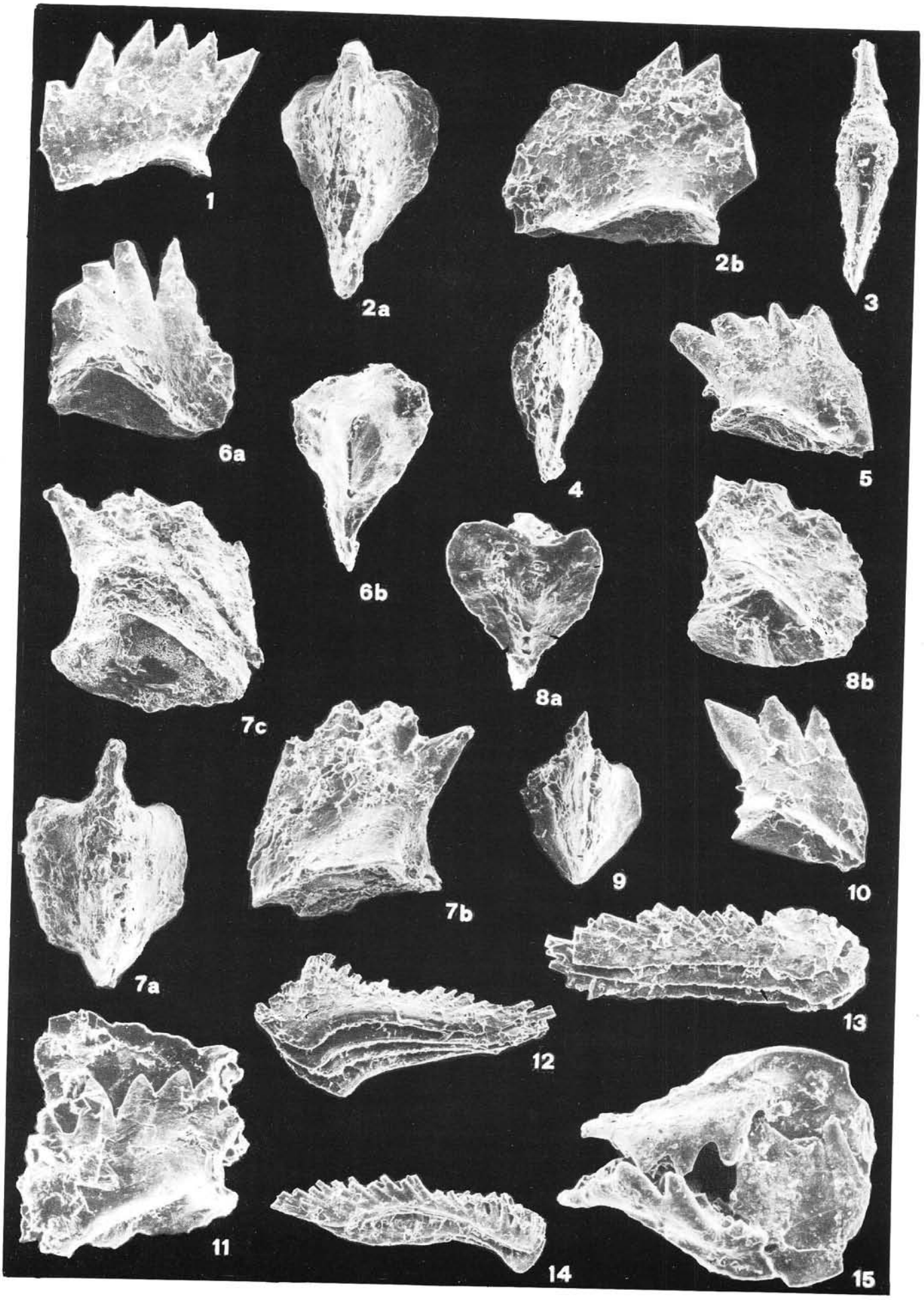
Fig. 7-10 - *Misikella posthernsteini* Kozur & Mock, 1974. 7a) upper view; 7b) lateral view; 7c) oblique lateral view; IPUM 25738, CC6, x 170. 8a) lower view; 8b) oblique lateral view; IPUM 25739, CC6, x 170. 9) upper view, IPUM 25740, CC6, x 170. 10) oblique lateral view, IPUM 25741, CC6, x 170.

Fig. 11 - Cluster of *Misikella hernsteini*. IPUM 25742, CC10, x 150.

Fig. 12, 13 - Clusters of hideodelliform elements. IPUM 25743, CC8, x 150.

Fig. 14 - Cluster of *Grodella delicatula*. IPUM 25744, CC8, x 100.

Fig. 15 - Cluster of *Epigondolella slovakensis*. IPUM 25745, CC4, x 150.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Epigondolella bidentata, First Occurrence Datum (FOD) of *Misikella rhaetica* and *M. koessenensis*, all species not documented in the Catena Costiera Calabrese.

Following the scheme of Kozur & Mock (1991), the conodont fauna from samples CC6 to CC10 could be referred to the Early Rhaetian (*M. hernsteini* - *M. posthernsteini* Subzone, *M. posthernsteini* Zone), whereas according to Krystyn (1990) it should be ascribed to the latest Norian (*M. hernsteini* Zone) (Fig. 4).

Conclusions.

1. The lower part of the Colle del Crapio sequence (samples CC1 to CC5) is characterised by the occurrence of *Epigondolella slovakensis*, a taxon referred to the Aulanian-Sevatian (Middle-Upper Norian) by many authors (Kozur, 1972, 1989; Budai & Kovacs, 1986; Kovacs & Nagy, 1989; Kozur & Mock, 1991; Roghi et al., 1995).

2. The chronostratigraphic attribution of the upper part of the succession (from samples CC6 to CC10) is more controversial, as it involves the unsolved definition of the Norian-Rhaetian boundary. Samples CC8 to CC10 record the occurrence of the genus *Misikella*, represented by *M. hernsteini* and *M. posthernsteini*.

3. According to many Authors, *M. hernsteini* and *M. posthernsteini* indicate an Upper Norian-Rhaetian age, even if a large part of the *M. posthernsteini* range is typically Rhaetian. The presence and abundance of *M. hernsteini* still at the top of the section, and the absence of diagnostic species such as *M. rhaetica* and *M. koessenensis*, may indicate that the upper part of the the Colle del Crapio section (Upper Complex) belongs to the uppermost Norian (Krystyn, 1990; Golebiowski, 1990). On the contrary, according to the scheme of Kozur & Mock (1991), the upper part of this section would be regarded as Early Rhaetian in age.

4. Since this preliminary study is based on a single stratigraphic section, we are not able to address the chronostratigraphic problems connected with the Norian/Rhaetian boundary. However, we provide a description of the vertical distribution of conodonts within the stratigraphic succession of the "Catena Costiera".

Acknowledgements.

We are grateful to A. Nicora (Milano) and M.J.Orchard (Vancouver) for revisions of the original manuscript. Field and printing expenses were supported by a grant of MURST 40% and CNR 96.00364 (F. Russo, Cosenza). English revision by E. Fois Erickson (Cleveland).

Illustrated specimens are housed in the Collections of the Institute of Paleontology, University of Modena (IPUM 25715-25745).

REFERENCES

Amodeo F., Molisso F., Kozur H., Marsella E. & D'Argenio B. (1993) - Age of transitional beds from "Cherty Limestones" (calcari con selce) to "Radiolarites" (scisti silicei) in the Lagonegro Domain (Southern Italy). First evidence of Rhaetian conodonts in peninsular Italy. *Boll. Serv. Geol. d'Italia*, v. 110(1991), pp. 3-22, Roma.

Amodio Morelli L., Bonardi G., Colonna V., Dietrich D., Giunta G., Ippolito F., Liguori V., Lorenzoni S., Paglionico A., Perrone V., Piccarretta G., Russo M., Scandone P. , Zanettin Lorenzoni E. & Zuppetta A. (1976) - L'Arco Calabro-peloritano nell'orogene appenninico-maghrebide. *Mem. Soc. Geol. It.*, v. 17, pp. 1-60, Roma.

Barattolo F., De Castro P. & Parente M. (1993) - Some remarks on *Griphoporella curvata* (Gümbel 1872) Pia 1915, dasycladacean green alga from the Upper Triassic. In Barattolo F., De Castro P. & Parente M.(Eds.) - Studies on fossil benthic algae. *Boll. Soc. Paleont. It.*, spec. v. 1, pp. 23-46, Modena.

Budai T. & Kovacs S. (1986) - A rezi Dolomit Rétegtani Helyzete a Keszthelyi-Hegységben. *Földt. Int. Evi Jel.* 1984-röl, pp. 175-191, Budapest.

Epstein A.G., Epstein J.B. & Harris L.D. (1977) - Conodont alteration - an Index to Organic Metamorphism. *Geol. Surv. Prof. Pap.*, v. 995, pp. 1-27, Washington.

Gazdzicki A. (1978) - Conodonts of the Genus *Misikella* Kozur & Mock, 1974 from the Rhaetian of the Tatra Mts (West Carpahians). *Acta Palaeont. Pol.*, v. 23, pp. 341-350, Warsaw.

Gazdzicki A., Kozur H. & Mock R. (1979) - The Norian-Rhaetian boundary in the light of micropaleontological data. *Geologija*, v. 22, pp. 71-112, Ljubljana.

Golebiowski R. (1986) - Neue Misikellen-Funde (Conodonta) und ihre Bedeutung für die Abgrenzung des Rhät s. str. in den Kössener Schichten. *Sitz. Ber. Akad. Wiss. Wien, math.-nat.Kl.*, v. 195, pp. 53-65, Wien.

Golebiowski R. (1990) - The Alpine Kössen Formation, a key for European topmost Triassic correlations. A sequence-and ecostratigraphic contribution to the Norian-Rhaetian discussion. *Albertiana*, v. 8, pp. 25-35, Utrecht.

Gullo M. (1996) - Conodont biostratigraphy of uppermost Triassic deep-water calcilutites from Pizzo Mondello

(Sicani Mountains): evidence for Rhaetian pelagites in Sicily. *Palaeogeog., Palaeoclim., Palaeoecol.*, v. 126, pp. 309-323, Amsterdam.

Ietto A., Perri E. & Silvagni C. (1993) - La successione dolomitica triassica di Monte Cocuzzo (Catena Costiera, Calabria). *Atti Acc. Sc. Fis. Mat.*, v. 60, pp. 147-164, Napoli.

Ietto A., Perri E., Ietto F. & Rende L. (1995) - The sequence of Mount Cocuzzo (Catena Costiera, Calabria) in the dolomitic Trias of the Southern Appennines. *Boll. Soc. Geol. It.*, v. 114 (1995), pp. 215-244, Roma.

Isozaki Y. & Matsuda T. (1982) - Middle and Late Triassic Conodonts from Bedded Chert Sequences in the Mino-Tamba Belt, Southwest Japan. Part 2: *Misikella* and *Parvigondolella*. *J. Geosci.Osaka City Univ.*, v. 26, pp. 65-86, Osaka.

Kovacs S. & Nagy G. (1989) - A Pilis Hegység Aviculas és Halobias Meszköösszletének Kora. *Földt. Int. Evi Jel.* 1987-röl, pp. 95-129, Budapest.

Kovacs S. & Kozur H. (1980) - Stratigraphische Reichweite der wichtigsten Conodonten (ohne Zahnreihenconodonten) der Mittel- und Obertrias. *Geol. Paläont .Mitt. Innsbruck.*, v. 10, pp. 47-78, Innsbruck.

Kozur H. (1972) - Die Conodontengattung *Metapolygnathus* HAYASHI 1968 und ihr stratigraphischer Wert. *Geol. Paläont. Mitt. Innsbruck.*, v. 2 (11), pp. 1-37, Innsbruck.

Kozur H. (1980) - Revision der Conodonten-zonierung der Mittle-und Obertrias des tethyalen Faunenreichs. *Geol. Paläont. Mitt. Innsbruck.*, v. 10, pp. 79-172, Innsbruck.

Kozur H. (1989) - Significance of events in Conodont evolution for the Permian and Triassic stratigraphy. *Courier Forsch.-Inst.Senckenberg*, v. 117, pp. 385-408, Frankfurt a.M.

Kozur H. & Mock R. (1974) - *Misikella posthernsteini* n.sp., jüngste Conodontenart der tethyalen Trias. *Cas. min. geol.*, v. 19, pp. 245-250, Praha.

Kozur H. & Mock R. (1991) - New Middle Carnian and Rhaetian Conodonts from Hungary and the Alps. Stratigraphic importance and Tectonic implications for the Buda Mountains and adiacent areas. *Jb. Geol. B. -A.*, v. 134, pp. 271-297, Wien.

Krystyn L. (1980) - Triassic conodont localities of the Salzkammergut Region (Northern Calcareous Alps). Field Trip B. In Schönlaub H.P. (Ed.) Second European Conodont Symposium (ECOS II), Guidebook and Abstracts. *Abh. Geol. B.-A.*, v. 35, pp. 61-98, Wien.

Krystyn L. (1988) - Zur Rhät-Stratigraphie in den Zamblach-Schichten (vorläufiger Bericht). *Sitz. Ber. Akad. Wiss. Wien, math.-nat.Kl.*, v. 196, pp. 21-36 Wien.

Krystyn L. (1990) - A Rhaetian Stage - Chronostratigraphy, subdivisions and their intercontinental correlation. *Albertiana*, v. 8, pp. 15-24, Utrecht.

Mostler H., Scheuring B. & Urlichs M. (1978) - Zur Mega-Microfauna und Mikroflora der Kössener Schichten (alpine Obertrias) vom Weissloferbach in Tirol unter besonderer Berücksichtigung der in der *suessi-* und *marshi-*Zone auftretenden Conodonten. *Österr. Akad. Wiss. Schriftenr. Erdwiss. Komm.*, v. 4, pp. 141-174, Wien.

Orchard M.J. (1983) - *Epigondolella* populations and their phylogeny and zonation in the Upper Triassic. *Fossil and Strata*, v. 15, pp. 177-192, Oslo.

Orchard M.J. (1991) - Upper Triassic conodont biochronology and new index species from the Canadian Cordillera. In Orchard M.J. & McCracken (Eds.) - Ordovician to Triassic conodont paleontology of the Canadian Cordillera. *Geol. Surv. Canada Bull.*, v. 417, pp. 299-335, Ottawa.

Ogniben L. (1969) - Schema introduttivo alla geologia del confine calabro-lucano. *Mem. Soc. Geol. It.*, v. 8, pp. 453-763, Roma.

Roghi G., Mietto P. & Dalla Vecchia F.M. (1995) - Contribution to the Conodont biostratigraphy of the Dolomia di Forni (Upper Triassic, Carnia, NE Italy). *Mem. Sci. Geol.*, v. 47, pp. 125-133, Padova.

Tozer E.T. (1994) - Significance of Triassic stage boundaries defined in North America. In Gueaux J. & Baud A. (Eds.) - Recent developments on Triassic Stratigraphy. Proceedings of the Triassic Symposium, Lausanne, 20-25 Oct. 1991, *Mèm. de Géologie*, v. 22, pp. 155-170, Lausanne.

Zapfe H. (1983) - Das Forschungsprojekt "Triassic of the Tethys Realm" (IGCP Proj.4). Abschlussbericht. *Österr. Akad. Wiss. Schriftenr. Erdwiss. Komm.*, v. 5, pp. 7-16, Wien.

Received December 19, 1996; accepted May 5, 1997