Geol. Paläont. Mitt. Innsbruck, ISSN 0378–6870, Bd. 19, S. 165–~~200~~, 1994

IUGS UNESCO IGCP 359

MIDDLE TRIASSIC CONODONTS FROM THE SOUTHERN KARAWANKEN MOUNTAINS (SOUTHERN ALPS) AND THEIR STRATIGRAPHIC IMPORTANCE

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With 3 Figures and 4 Plates

Abstract:

The conodont fauna of south alpine Middle Triassic pelagic limestones (Loibl Formation and Buchenstein Formation) of the Karawanken Mountains in Carinthia, southern Austria, is described and the systematics and stratigraphic importance of Late Illyrian and Fassanian gondolellid conodonts are discussed.

The investigated conodont fauna contains the following new taxa: *Neogondolella cornuta ladinica* n. subsp., *Neogondolella aldae* n. sp., *Neogondolella aldae aldae* n. subsp., *Neogondolella aldae posterolonga* n. subsp., *Neogondolella ? postpridaensis* n. sp., *Paragondolella ? pridaensis posteroacuta* n. subsp. and *Budurovignathus gabriellae* n. sp.

The stratigraphic evaluation of the conodonts supports the priority of the position of the Anisian-Ladinian boundary at the base of the *Reitziites reitzi* - Zone, where a distinct change of all stratigraphically important microfossil groups is observed.The oldest investigated sediments are red fissure fillings within the uppermost part of the Late Anisian platform carbonates of the Contrin Formation, containing conodonts probably indicating latest Illyrian age. The conodont fauna of the Loibl Formation points to Fassanian age. Sediments of the Buchenstein Formation range in age from the Fassanian to the Late Langobardian (*Budurovignathus mungoensis* - Zone).

Zusammenfassung:

In der vorliegenden Arbeit wird die Conodontenfauna mitteltriadischer pelagischer Kalke (Loibl Formation und Buchenstein Formation) aus dem Südalpin der Karawanken in Kärnten (Südösterreich) beschrieben sowie die Systematik und stratigraphische Bedeutung illyrischer und fassanischer gondolellider Conodonten diskutiert.

Die untersuchte Conodontenfauna enthält folgende neue Taxa: *Neogondolella cornuta ladinica* n. subsp., *Neogondolella aldae* n. sp., *Neogondolella aldae aldae* n. subsp., *Neogondolella aldae posterolonga* n. subsp., *Neogondolella ? postpridaensis* n. sp., *Paragondolella ? pridaensis posteroacuta* n. subsp. und *Budurovignathus gabriellae* n. sp.

Die stratigraphische Auswertung der Conodonten bekräftigt die Position der Anis-Ladin-Grenze an der Basis der *Reitziites reitzi* - Zone, die auch der Priorität entspricht. An dieser Grenze kann eine deutliche Änderung aller stratigraphisch wichtigen Mikrofossilien beobachtet werden.Die ältesten untersuchten Sedimente sind Rotkalke in Form von Spaltenfüllungen im obersten Teil der oberanisischen Plattformkarbonate der Contrin Formation, deren Conodonten auf oberstes Illyr hinweisen.Die Conodontenfauna der Loibl Formation ist in das Fassan einzustufen. Sedimente der Buchenstein Formation reichen altersmäßig vom Fassan bis in das obere Langobard (*Budurovignathus mungoensis* - Zone).

1. Introduction

Although the investigation of the Triassic sequence in the Karawanken Mountains already started during the last century (MOJSISOVICS 1871, TELLER 1887, 1898 for example), until recently much confusion existed concerning Middle Triassic stratigraphy in the southalpine part of the Karawanken Mountains (see BAUER 1980, 1984, BAUER et al. 1983). Especially the position of the Anisian-Ladinian boundary and the age of the Middle Triassic basin sequence was unclear due to the lack of detailed paleontological and biostratigraphical investigations.

BAUER (1980, 1984) reported ammonites from red pelagic limestones of the Loibl Formation: *Kellnerites* sp. from the peak of the Zeller Prapotnik mountain and an Early Ladinian am-

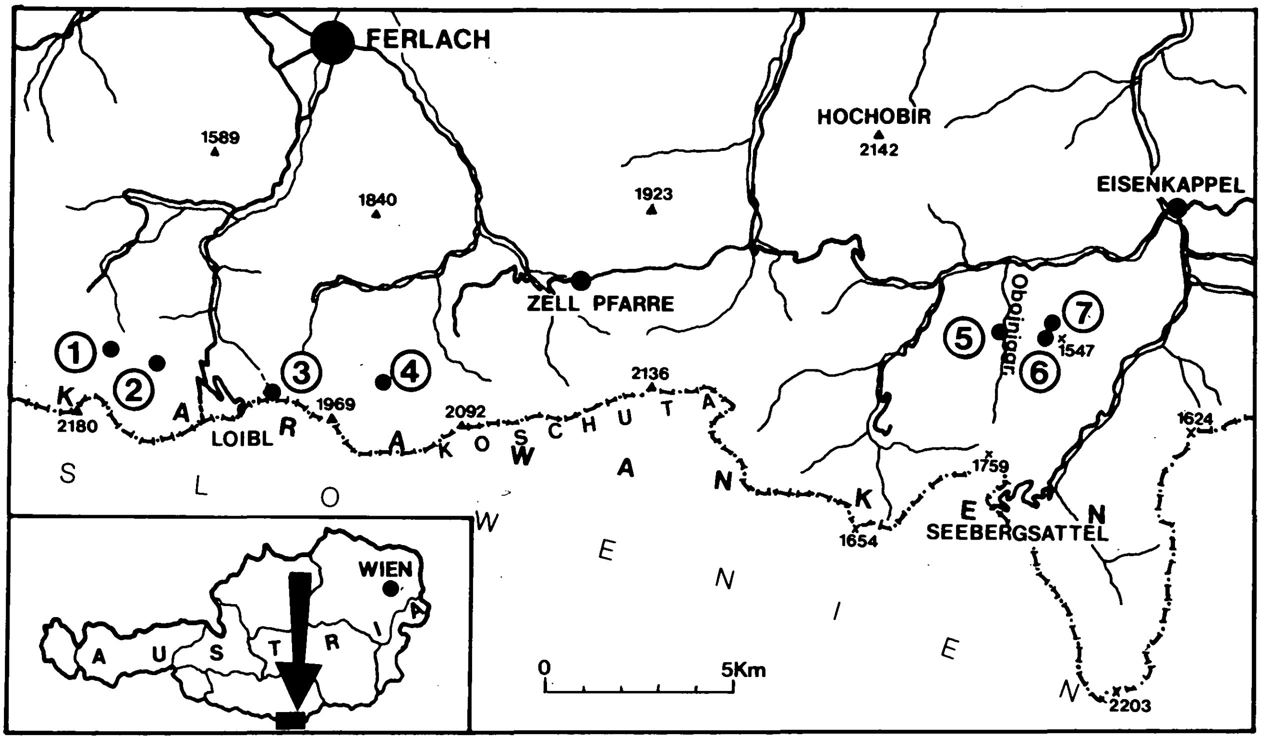

Fig. 1: Location map of the study area. 1 - 7: investigated outcrops (1 Weiße Wand, 2 Zelenitza forest road, 3 Kraßniggraben section, 4 Zeller Prapotnik, 5 Obojniggraben section, 6 Zimpaserkogel west, 7 Zimpaserkogel northwest).

monite fauna from outcrops along the Zelenitza forest road (see also geol. map of BAUER 1981, 1985).

KRAINER & MOSTLER (1992) described siliceous sponge spicules from red nodular limestones (Weiße Wand Member) of the Loibl Formation and dated these limestones as Early Fassanain based on the radiolarian- and conodont fauna (*Spongosilicarmiger italicus* -Zone; *Paragondolella trammeri praetrammeri* -Zone). The radiolarian fauna will be described in a separate paper (KRAINER & MOSTLER in prep.).

Rich radiolarian faunas from the Buchenstein Formation of the central Karawanken Mountains indicate an age ranging from Late Fassanian to Late Langobardian (MOSTLER & KRAINER 1994).

The investigation of the stratigraphically important conodont fauna is of decisive importance for the final definition of the Anisian–Ladinian boundary. In contrast to further opinions, the Middle Triassic gondollellid conodonts show their strongest changes at the base of the *Reitziites reitzi* - Zone which corresponds to the base of the Ladinian according to the more than 100 year old priority. At or near this boundary a major change in the stratigraphically important microfossils can be observed.

In the present paper the conodont fauna from the Middle Triassic basin sequence of the central Karawanken Mountains is described. For the stratigraphic evaluation of the investigated conodont fauna it is also necessary to discuss the systematics of the Illyrian and Fassanian gondolellid conodonts and the position of the Anisian-Ladinian boundary.

2. Location

The conodont faunas described and discussed in this paper are derived from red and grey pelagic limestones of the Loibl Formation and from nodular cherty limestones in the middle and upper part of the Buchenstein Formation of the south alpine Triassic seuqence of the Karawanken Mountains in southern Carinthia (Austria), near the Austrian/Slovenian border.

Investigated outcrops of the Loibl Formation are situated in the central Karawanken Mountains, between Zell Pfarre/Koschuta in the east and Märchenwiese/Weiße Wand in the west: Zeller Prapotnik, Zelenitza forest road west of Loibl and Weiße Wand (the locations are shown on fig. 1).

Two sequences of nodular limestones of the Buchenstein Formation, exposed along forest roads on the northern and western side of the Zimpaserkogel southwest of Eisenkappel also provided a relatively rich and interesting conodont fauna (location see fig. 1).

3. Geological setting and stratigraphy

The southern Karawanken Mountains are part of the Southern Alps and separated from the Eastern Alps (Northern Karawanken Mountains) by the Periadriatic Line, which runs through the Karawanken Mountains in an E–W-direction.

The southern Karawanken Mountains are composed of a Variscan basement (Late Silurian to Middle Carboniferous) and a postvariscan cover sequence which starts with sediments of the Late Carboniferous Auernig Group. The Permian is represented by sediments of the Rattendorf Group, Trogkofel Group, Tarvis Breccia, Gröden and Bellerophon Formation.

The Triassic sequence is more than 2000m thick and predominantly composed of shallow water and pelagic carbonates. The Middle Triassic sequence is shown on Fig 2.

The Triassic sequence begins with the south alpine Werfen Formation, which is developed in a very similar facies as in the Dolomites, and is overlain by several hundred m thick, well bedded and sometimes evaporitic platform carbonates corresponding to the Lower Sarl Formation of the Dolomites.

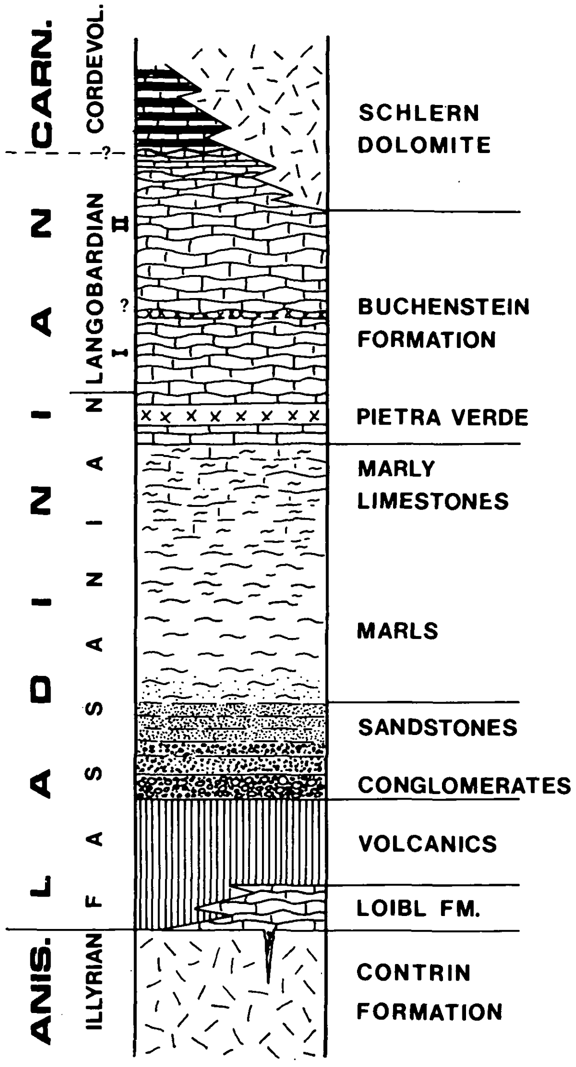

Fig. 2: Composite section of the south alpine Middle Triassic (Ladinian) basin sequence in the central Karawanken Mountains.

Above there follow dark grey, well bedded, bioturbated marly limestones ('Wurstelkalke') and intercalated marls, up to some tens of m thick, and about 30 m thick, thin bedded laminated dolomites.

At the Weiße Wand (location see fig. 1) these dolomites are overlain at places by an approximately 7 m thick sequence of red marls and intercalated limestonebeds (probably equivalents of the Lower Peres Formation of the Dolomites).

The red marls and laminated dolomites are overlain by massive, light grey limestones (Con-

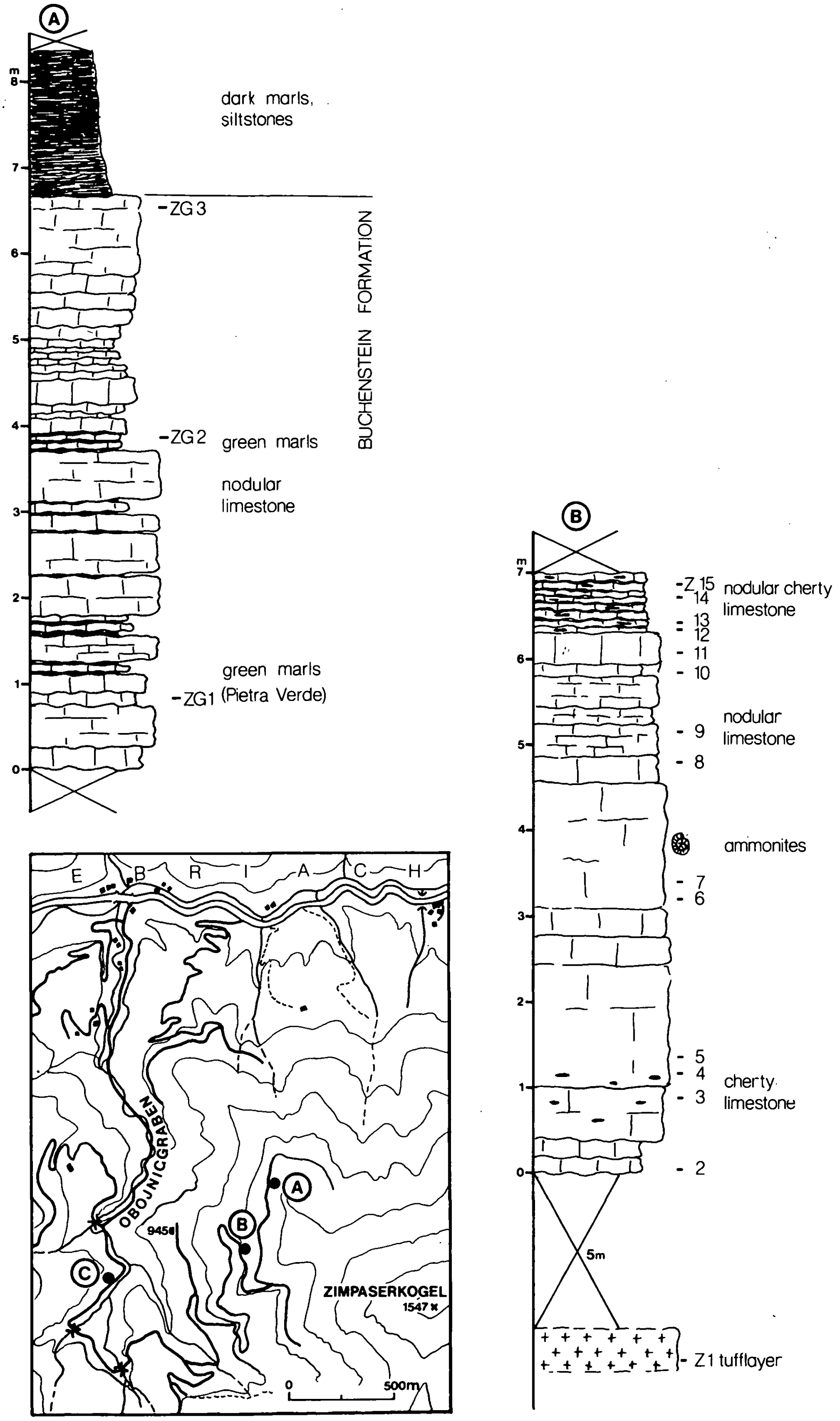

Fig. 3: Measured sections through parts of the Buchenstein Formation exposed along the forest road on the northwestern side (section A) and western side (section B) of the Zimpaserkogel SW Eisenkappel, and location map (see also fig. 1).

trin Formation) with a maximum thickness of about 50 m (Late Anisian "algal reefs"), forming prominent cliffs like Motschiwa, Kosmatica, Weiße Wand and Heilige Wand.

At the base of the Ladinian (Fassanian), extensional tectonic movements caused breakdown of the Anisian carbonate platforms and formation of basins by rapid subsidence of distinct blocks, which were filled with different types of basin sediments and volcanic rocks.

These tectonic processes are indicated by fissures within the uppermost algal reef limestones (Contrin Formation) filled with red limestones, and red pelagic limestones (Loibl Formation) which at places overlie the massive shallow water limestones of the Contrin Formation.

Due to the rich microfauna (sponge spiculae, holothurian remains, radiolarians and conodonts) the pelagic limestones of the Loibl Formation are of Early Fassanian age (*Spongosilicarmiger italicus* - Zone; *Paragondolella trammeri praetrammeri* - Zone; KRAINER & MOSTLER 1992, KRAINER & MOSTLER in prep.).

Two types of red pelagic limestones can be distinguished:

a) A very thin sequence of nodular cherty limestones (bioclastic wackestones rich in sponge spiculae and radiolarians; Weiße Wand Member), interpreted as the basin facies, and

b) massive to indistinctly bedded red limestones containing abundant echinoderm fragments, representing the slope facies. Thin layers of pyroclastic material (tuffs) are intercalated.

Grey limestones are composed of wackestones containing radiolarians, spiculae and shell fragments. Echinoderm remains, foraminifers, gastropods and ostracods are also present.

Red limestones are represented by wackestones-packstones rich in echinoderm fragments or radiolarians, and less frequently by grainstones. The grainstones are composed mainly of echinoderm remains. Carbonate lithoclasts derived from shallow water carbonates are also present. Nodular red limestones (radiolarian wackestones) also contain some ammonites.

The fauna of the nodular cherty limestones (Weiße Wand Member) points to water depths of approximately 200m. The sponge spiculae fauna is very similar to that of the Vicentinian Alps (Recoaro, Southern Alps), but differs significantly from that of the Northern Limestone Alps (Eastern Alps).

A detailed description of the Loibl Formation will be presented in a separate paper.

The tectonic event at the Anisian/Ladinian boundary lasted for a very short time and was a preliminary stage to the intra-Ladinian tectonic event which resulted in the formation of basins filled with sediments of the Buchenstein Formation and associated deposits.

Contrin and Loibl Formation are overlain by volcanic rocks (agglomerates, tuffs, lavabreccias and lavas) of andesitic to dacitic composition and a maximum thickness of about 100m (see OBENHOLZNER 1985).

The basin sequence above these volcanic rocks starts with clastic sediments (polymict conglomerates, sandstones, siltstones and mudstones) with thicknesses ranging between a few meters and 45 m. The conglomerates contain many volcanic clasts derived from the underlying volcanic rocks and a few red imestone clasts derived from the Loibl Formation. The sandstones are also rich in reworked volcanic material.

These clastic sediments are equivalents of the Uggowitz Breccia and are interpreted to be formed by submarine mass flows (debris flows, turbidites).

The clastic sequence upward grades into mudstones, which in the lower part contain intercalations of fine-grained conglomerate, sandstone and siltstone layers. Carbonate content increases upward and up to several m thick nodular marly limestones are frequently interbedded. In the Kraßniggraben east of the Loiblpaß this sequence reaches a thickness of 150 m.

With a relatively sharp boundary sediments of the Buchenstein Formation overlie this muddy sequence.

In the Kraßniggraben the Buchenstein Formation is completely exposed and about 40 m thick. The sequence starts with 2.5 m thick, bedded limestones with thin tuffaceous intercalations, overlain by 6 m thick, coarse grained crystal tuffs (Pietra Verde), and thin bedded, nodular grey limestones (bioclastic wackestones rich in radiolarians and filaments), partly with chert nodules, thin chert layers and thin marl and green tuffaceous intercalations.

In the upper part red and green nodular limestones with up to 10 cm thick marl intercalations are developed.

In the Kraßniggraben section the Buchenstein Formation is overlain by thin bedded, dark grey platy limestones with dark marl intercalations.

West of the Loiblpaß, on the northeastern flank of the Bielschitza (location see fig. 1), the uppermost Buchenstein Formation is composed of cm to dm bedded calcarenites and fine grained breccias (turbiditic shallow water detritus derived from the prograding Schlern platform). This facies is overlain by massive carbonates (reef-facies) of the Schlern Dolomite.

In the Obojniggraben (location see fig. 1) the Buchenstein Formation (about 20 m thick) is composed of well bedded grey nodular limestones with up to several cm thick dark marly intercalations and a few thin Pietra Verde layers. Cherty limestones are rare. On top of the Buchenstein Formation thin bedded dark grey platy limestones are developed.

Of interest are outcrops of the Buchenstein Formation along a forest road on the northwestern and western side of the Zimpaserkogel on the eastern side of the Obojniggraben (fig. 3).

On the western side (ca. 1050m) a 7 m thick sequence of grey and light red colored nodular limestones, indistinctly thick bedded, in the upper part thinn bedded with thin shale partings is exposed above a coarse grained crystal tuff (Pietra Verde). Samples from this section contained a rich conodont fauna.

On the northwestern side of the Zimpaserkogel (ca. 1160 m) along the forest road the uppermost part of the Buchenstein Formation is exposed: grey, well bedded nodular limestones without chert, bed thickness ranges between 5 and 30 cm. Thin green tuffaceous intercalations and marls occur. The sequence is overlain by dark grey, partly laminated marls and siltstones with small scale current ripples (? equivalents of the Wengen Formation). From the nodular limestones of this section conodonts were obtained.

Conodont faunas desribed in this paper are derived from (locations see fig.1 and 3):

a) Red and grey pelagic limestones of the Loibl Formation from following localities:
- Weiße Wand (Weiße Wand Member)
- Zelenitza forest road
- Zeller Prapotnik

b) from the middle and upper part of the Buchenstein Formation, exposed along forest roads on the western and northwestern side of the Zimpaserkogel.

Samples from other localities (Obojniggraben section, Kraßniggraben section, Bielschitza section, Rotschitzagraben and Rauscherbach-Graben) did not contain determinable conodonts, althogh more than 100 samples have been investigated.

4. Systematic part

Most of the stratigraphically important Illyrian and Fassanian conodonts belong to the genus *Neogondolella* BENDER & STOPPEL, 1965 emend. KOZUR, 1990 and *Paragondolella* MOSHER, 1968 emend. KOZUR, 1990. These smooth platform conodonts need a revision. A first revision of the *N. constricta-N. mombergensis* group by NICORA & KOVÁCS (1984) has failed. These authors have included into *Neogondolella constricta* several well defined and partly even not related species and subspecies, such as *Neogondolella cornuta* BUDUROV & STEFANOV, 1973, *N. balkanica* BUDUROV & STEFANOV, 1975, *Neogondolella mombergensis prava* KOZUR. Moreover, they placed the early juvenile forms of all Illyrian and Ladinian *Neogondolella* species into *N. constricta*.

KOVÁCS used for this publication a sample from the German Basin given by KOZUR together with conodont descriptions for the never published conodont catalagous of Middle and Upper Triassic platform conodonts. Because he has not contacted KOZUR about the fossil content of this sample before using it for publication, he has not known that this sample yielded only conodonts of the *N. mombergensis* group (the sample has been derived from the type locality of *N. mombergensis*). Whereas some forms from this sample have been correctly placed into *N. mombergensis*, a part of juvenile forms have been placed into *N. constricta* and misinterpreted as medium ontogenetic stage (NICORA & KOVÁCS, 1984, Pl. 8, fig. 4).

Identical late juvenile *Neogondolella* from another sample have been placed partly into *N. constricta*, partly into *N. mombergensis* (e.g., NICORA & KOVÁCS, 1984, pl. 7, figs. 12, 13). On the other hand, none of the *N. mombergensis* from Nevada, figured by NICORA & KOVÁCS, 1984) belong to this species.

Because NICORA & KOVÁCS (1984) placed even juvenile forms of typical *N. mombergensis* and of stratigraphically still younger *Neogondolella* species into *N. constricta*, the stratigraphic value of the Illyrian and Ladinian Neogondolella, for the first time shown by KOZUR (1968) and BUDUROV & STEFANOV (1973 a) have been totally mask. As an logic consequence, RITTER (1989) has then all *N. constricta* and *N. mombergensis*, figured by NICORA & KOVÁCS (1984), placed in a single species (according the priority *N. mombergensis*).

KOVÁCS et al. (1990) subdivided their *N. constricta* s.l. into several morphotypes of different stratigraphic ranges. However, in the conodont form taxonomy all species with different ranges are morphotypes. Therefore the term morphotype should be only used for intraspecific form groups of the same stratigraphic range or as informative term before establishing a form taxon. Most of the morphotype gamma sensu KOVÁCS et al. (1990) belong to *N. mesotriassica* (KOZUR & MOSTLER, 1982).

The Illyrian and Ladinian *Neogondolella* species will be revised by KOZUR & MOSTLER (in prep.). The preliminary results are used in the present paper to make some remarks on species that are present in our material or near related to them. Moreover, some new taxa are described.

Unfortunately, by technical mistakes much of the conodonts have been crashed during sticking. However, using the data of the revision of the Middle Triassic gondolellids (KOZUR & MOSTLER, in prep.), also broken specimens consisting only of the posterior half or even third of an adult form can be determined.

Neogondolella mombergensis
(TATGE, 1956)

Remarks: Typical adult representatives of this species display high anterior and posterior denticles without prominent cusp, or the penultimate tooth is the cusp. The middle part of the carina is low and mostly fused to a smooth to wavy ridge. The basal cavity is somewhat foreward-shifted with respect to the keel end. Early juvenile stages are of *constricta* type (the penultimate denticle is the cusp, the last denticle is smaller than the cusp) and have been therefore erroneously placed into this species by NICORA & KOVÁCS (1984). Late juvenile stages are of modified *mombergensis* type (or media type, all denticles have about the same size). Medium ontogenetic and subadult stages have already a *mombergensis* type of carina, but the denticles of the lower middle carina are still separated, at least at their tips.

Occurrence: Upper *P. trinodosus* - Zone and Fassanian. Dominant in the German Basin. Present also in the Northern Tethys (e.g. Beckov section of Slovakia). Rare in the Southern Tethys. So far not known from North America. All Nevadian uppermost Anisian and Ladinian adult forms figured as *N. mombergensis mombergensis* by NICORA & KOVÁCS (1984) represent other species (mostly *N. aldae* n. sp.).

Neogondolella constricta
MOSHER & CLARK, 1965
(Pl. 4, figs. 12–15, 17, 20)

Remarks: The holotype of *N. constricta* is a juvenile form. All Illyrian and Fassanian *Neogondolella* species display an early juvenile ontogenetic *constricta* stage. Unfortunately, so far no adult specimens have been figured from the stratum typicum of *N. constricta* (sample FH-3 by MOSHER & CLARK, 1965 from the *Paraceratites clarkei* beds of the *Rotelliforme* Zone). Even NICORA & KOVÁCS (1984), who revised the *N. constricta* group, did not figure any adult specimen from the stratum typicum and even not from the *P. clarkei* beds, but only from younger beds. They reported, however, the presence of adult forms in the *P. clarkei* beds that correspond to their opinion to the *cornuta* morphotype and to the *balkanica* morphotype. The presence of *N. balkanica* s. str., a Ladinian guide form, in the lower part of the Illyrian *Paraceratites* beds is not likely. However, it is well possible that two *Neogondolella* species, separable only in adult stages occur together with the juvenile *N. constricta* in the *Paraceratites clarkei* beds. In this case, *N. constricta* has to be abandoned, because all Illyrian and Ladinian *Neogondolella* species have at least an early ontogenetic *constricta* stage. In some of them, even the late juvenile forms are of *constricta* type. If in the type material two different species occur together with juvenile forms attributed to the type *constricta*, then it is not clear, to which of the two species belong the juvenile forms.

In our material from the lower part of *Paraceratites* beds of the Eurasian Tethys all neogondolellid juvenile platform conodonts, but also medium ontogenetic stages are of *N. constricta* type. They are accompanied by two different species of adult *Neogondolella* that may be identical with the adult forms mentioned but not figured by NICORA & KOVÁCS and erroneously attributed to the *cornuta* and *balkanica* morphotypes. The dominating form (A) has a carina very similar to that of *N. mombergensis* with high denticles in the anterior and posterior part and a fused low middle part. The cusp, if present, is terminal, fused with the posterior platform margin and not prominent. The only difference to *N. mombergensis* is the position of the basal cavity that is situated nearly at the terminal end of the keel even in adult forms. In *N. mombergensis*, the basal cavity is somewhat foreward-shifted in adults and lies subterminal with respect the keel end. This form (A) could correspond to the *cornuta* morphotype sensu NICORA & KOVÁCS (1984) of the *P. clarkei* beds. The second, rare form (B) has a distinct cusp, surrounded by a brim. It is similar to the paratypes of *Neogondolella basisymmetrica* BUDUROV & STEFANOV, 1973, that are, however, not identical with the holotype (see under remarks to *N. aldae* n. sp.). This form (B) could be identical with the *balkanica* morphotype sensu NICORA & KOVÁCS (1984) that they reported, but not figured from the *P. clarkei* beds.

Both discussed adult forms correspond also in their medium ontogenetic stages to *N. constricta*. By this they are clearly distinguished from *N. cornuta* and *N. balkanica* that have both a slender medium ontogenetic stage with a carina of *mombergensis* type (denticles of the same height or somewhat lower in the middle part, in this stage no distinct main cusp is present). For this reason neither *N. cornuta* nor *N. balkanica* are junior synonyms of *N. constricta* as assumed by NICORA & KOVÁCS (1984).

At present, we regard the *mombergensis*-like adult forms as true adults of *N. constricta*, because the adults with distinct cusp, surrounded by a brim, are rare (seemingly also in the type material of *N. constricta* the so-called *balkanica* morphotype is rarer than the so-called *cornuta* morphotype). In this restricted scope *N. constricta* does not reach above the Illyrian *Paraceratites* beds both of North America and the Eurasiatic Tethys. Perhaps it is even restricted to the lower part of the *Paraceratites* beds. However, an occurrence in the lower Illyrian *Paragondolella bifurcata* - Zone or even in the Pelsonian cannot be excluded, because also there the

Neogondolella species have a *constricta* juvenile stage.

Neogondolella transita
(KOZUR & MOSTLER, 1971)

Remarks: The central morphotype of this species displays a nearly symmetrical, but mostly slightly sigmoidally bent platform. The holotype belongs to this morphotype (posterior end only slightly curved). In other forms the posterior end is more or less strongly curved toward the left or the right. Between all these forms gradual transitions exist throughout the entire stratigraphic range. BUDUROV & STEFANOV (1973 a) established for the same species the taxon *N. excentrica*. As holotype an eccentric form (posterior end curved toward right) has been chosen, but also the central morphotype of *N. transita* was included into *N. excentrica* that is a junior synonym of *N. transita.*

Occurrence: Typical *N. transita* with oblique and pointed posterior end of the keel occurs in the *Nevadites* - Zone and in the lower *E. curionii* - Zone. Often different forms with asymmetric posterior end (a feature that is common in many *Neogondolella* species) have been placed into *N. 'excentrica'*. However, in these forms the keel end is only oblique, but blunt or rounded, never pointed. Such forms with distinctly foreward-shifted basal cavity with respect to the keel end are common in the *Reitziites reitzi* - Zone. They are here listed as *N.* sp. aff. *transita.* They are seemingly the forerunner of *N. transita.* In the Illyrian and even in the Pelsonian forms with similar eccentric posterior end occur that display a nearly terminal basal cavity with respect to the keel end. They are eccentric morphotypes of different Illyrian *Neogondolella* that have been partly placed into *N. 'excentrica'* as well. None of these forms is directly related to *N. transita* (including *N. excentrica*).

Neogondolella bacalovi
BUDUROV & STEFANOV, 1973

Remarks: This relatively small, slender form is easily recognizable by the distinctly protruding margin of the basal cavity and the strongly foreward-shifted basal cavity both in respect to the platform and keel end. Already in juvenile forms this foreward-shifting of the basal cavity is recognizable, but it is not so strong in juvenile forms and not present in earliest juvenile stages. Characteristic is also the upward bent of the posterior platform after the basal cavity. The keel is also distinct in this upward bent part. BUDUROV & STEFANOV (1973 a) figured only symmetrical or slightly asymmetrical forms (to the latter ones belong the holotype). However, there are also strongly asymmetric forms, often strongly constricted on one or two side of the upward bent part of the platform. Such forms that are connected with *N. bacalovi* by all transitions and occur also in the same stratigraphic level, have been described as *N. huckriedei* BUDUROV & STEFANOV, 1975. The typical *bacalovi* features of the lower side of *N. huckriedei* are especially well figured by BUDUROV (1976, Pl. 1). This species is here regarded as junior synonym of *N. bacalovi* BUDUROV & STEFANOV, 1973.

N. transita KOZUR & MOSTLER, 1971 is similar, but the platform is broader and the unit is mostly larger. Especially the part after the basal cavity is broader and shorter and not so distinctly upward bent. By this, there is no strong protrusion of the basal cavity margin.

Neogondolella cornuta
BUDUROV & STEFANOV, 1973
(Pl. 3, Figs. 2, 5, 8, 11, 14, 17; Pl. 4, Figs. 16, 18, 19, 21)

Remarks: As already shown by BUDUROV & STEFANOV (1973 a), *N. cornuta* has a medium ontogenetic stage with *mombergensis* type of the carina. By this it is clearly distinguished from *N. constricta* in the here used narrow scope. Only the early juvenile stages are of *constricta* type.

Typical *Neogondolella balkanica* BUDUROV & STEFANOV, 1975 are distinguished by an erect main cusp, surrounded by a distinct platform brim. These forms are restricted to the Ladinian. BUDUROV & STEFANOV (1975) and later papers placed all rather slender forms with erect main cusp into *N. balkanica*, but as holotype a specimen was chosen that displays a distinct platform brim behind the erect cusp. Forms with erect cusp fused with the posterior platform end are gradually and transitionally connected with such forms of *N. cornuta* that display a posteriorly inclined cusp, likewise fused with the platform end. However, such forms become more frequent in the upper range of *cornuta*. May be that they represent an independent subspecies, transitional to *N. balkanica*. Only such forms with terminal erect cusp we place into *N. balkanica*, in which the cusp is not more distinctly fused with the posterioir platform margin. All these forms have a distinctly forward-shifted basal cavity and are therefore only similar to *N. cornuta ladinica* n. subsp.

Advanced *N. cornuta* (*N. cornuta ladinica*, description below) from the Fassanian have a distinctly foreward-shifted basal cavity with respect to the keel. The posterior platform part behind the basal cavity is somewhat upward bent and the keel portion behind the basal cavity is distinct on this part as well.

Occurrence: *N. cornuta cornuta* is very common in the (upper) *Paraceratites* faunas of the Illyrian. Fassanian forms have been derived often from condensed beds (like from glauconite-bearing limestones of the Karwendel). In uncondensed beds *N. cornuta cornuta* is successively replaced by *N. cornuta ladinica* during the early Fassanian. All late Fassanian *N. cornuta* belong to *N. cornuta ladinica*.

Neogondolella longa
BUDUROV & STEFANOV, 1973
(Pl. 2, Figs. 18, 21, 22; Pl. 4, Figs. 3–5)

Remarks: The holotype of *N. longa* is a medium ontogenetic stage to subadult form with *mombergensis* type of carina. The separation of medium ontogenetic to subadult stages of *N. longa* and *N. balkanica* is difficult. The differences are gradual, because also *N. balkanica* displays a slender medium to subadult ontogenetic stage with *mombergensis* type of carina without pronounced main cusp that cannot be well separated from specimens of the same ontogenetic stage of *N. longa*. In the present paper all very long, very slender medium ontogenetic to subadult stages with *mombergensis* type of carina and somewhat foreward-shifted basal cavity are attributed to *N. longa*. The adults of *N. longa* are long, but not so slender as the medium ontogenetic to subadult stages. The cusp is terminal, not pronounced, erect or posteriorly inclined.

Both *N. balkanica* and *N. longa* are typical representatives of the Southern Tethyan Lower Ladinian beds, where they have the same range. In the northern Tethys, these species are mostly rare.

N. pseudolonga KOVÁCS, KOZUR & MIETTO, 1980 is a somewhat earlier juvenile stage (late juvenile to early medium ontogenetic stage) than *N. longa* and therefore a junior synonym of this species. In this ontogenetic stage the carina has still the *constricta* type with the second last denticle as cusp. In contrast to *N. constricta* already in this ontogenetic stage the basal cavity is somewhat foreward-shifted and not terminal with respect to the keel end as in the same ontogenetic stage in *N. constricta*. Moreover, the unit is longer in this ontogenetic stage compared with the relatively short juvenile to medium ontogenetic stages in *N. constricta*. In still earlier juvenile stages the unit is shorter and the basal cavity is not foreward-shifted. Such forms are inseparable from juvenile *N. constricta*.

Occurrence: *Reitziites reitzi* - Zone to *Eoprotrachyceras curionii* - Zone. Common in the

Southern Tethys, in the *R. reitzi* - Zone sometimes rare. Mostly rare in the Fassanian of the Northern Tethys.

Neogondolella balkanica
BUDUROV & STEFANOV, 1975
(Pl. 1, Fig. 22; Pl. 2, Figs. 3, 6, 9;
Pl. 3, Figs. 3, 6, 9, 27–29)

Remarks: *N. balkanica* is restricted to rather slender forms with platform brim behind the erect cusp, as discussed under *N. cornuta*. *N. suhodolica* BUDUROV & STEFANOV, 1973 has a shorter and broader platform. According to BUDUROV & STEFANOV (1975) *N. suhodolica* has evolved from *N. balkanica*, but no exact range data has been given and both forms have been derived from different localities from the same stratigraphic level (*excentrica* - Zone according to BUDUROV & STEFANOV, 1973 a, 1975).

N. balkanica evolved at the base of the *Reitziites reitzi* - Zone from advanced *N. cornuta* with erect terminal cusp by development of a platform brim or at least by separation of the cusp from the posterior platform margin. In the *R. reitzi* - Zone the brim is always very narrow or even missing, but the cusp is not fused with the platform end in *N. balkanica*. This is a good distinction against advanced *N. cornuta*.

N. longa BUDUROV & STEFANOV, 1973 is also very similar, but more slender. However, the holotype is a subadult form with *mombergensis* type of carina, in which the cusp is not yet pronounced. All *N. balkanica* display a *longa* stage during their ontogenesis, but this does not exclude that *N. longa* is an independent species. Adults of *N. longa* are long and slender and display a rather small, terminal, inclined or erect cusp.

Occurrence: *Reitziites reitzi* - Zone to *Eoprotrachyceras curionii* - Zone. Common in the Southern Tethys, sometimes rare in the *R. reitzi* - Zone. Mostly rare in the Fassanian of the Northern Tethys.

Neogondolella mesotriassica
(KOZUR & MOSTLER, 1982)
(Pl. 2, ? Figs. 12, 15, 20; Pl. 4, Figs. 7–9)

Remarks: The type series of this species are medium to subadult ontogenetic stages. Early juvenile forms are of *constricta* type. Already in medium ontogenetic stages the basal cavity is foreward-shifted with respect to the keel end. The platform end in these forms is typically upturned to a narrow ridge. In adult forms on one or both side denticles evolve on this ridge. These forms have been often erroneously placed into *P. bifurcata* BUDUROV & STEFANOV, from which they are clearly distinguished by the very low middle part of the carina.

Most specimens of morphotype gamma of *N. constricta* sensu KOVÁCS et al. (1990) belong to this species.

Occurrence: Very characteristic form of the Fassanian that starts at the base of the *R. reitzi* - Zone. Transitional forms to *N. cornuta* occur in the uppermost *P. trinodosus* - Zone (*Asseretoceras camunum* horizon).

Paragondolella alpina
(KOZUR & MOSTLER, 1982)
(? Pl. 2, Figs. 2, 5, 8)

Remarks: This very characteristic Fassanian guide form is easily recognizably by its free blade and the relatively high denticles throughout the entire carina. In juvenile, medium and subadult ontogenetic stages the platform is narrow and the difference to the free blade is then not so pronounced.

KOVÁCS (1983) described a *'Gondolella' szaboi* from the same stratigraphic level as *P. alpina*. As an adult form he figured a subadult specimen with narrow platform. The holotype is a late juvenile to medium ontogenetic stage. All the figured specimens by KOVÁCS (1983) are identical with late juvenile to subadult ontogenetic stages of *P. alpina* and therefore *'G.' szaboi* is a junior synonym of this species.

KOVÁCS (1983) did not discuss the relations between *'G.' szaboi* and *P. alpina*, but compared it only with *P. trammeri* (KOZUR). KOVÁCS (in GAETANI, 1993) recognized already the above synonymy and mentioned *'G.' szaboi* now as *'G.'alpina szaboi*. There is no reason to separate the two contemporaneous forms as subspecies. The platform width is not only dependent from the ontogenetic stage, but also somewhat variable in adult form. KOZUR & MOSTLER (1982) have figured broader specimens, in which the free blade is especially well recognizable. As holotype a specimen with relatively narrow platform was selected that is only a little broader than the platform of the only adult (or subadult) specimen, figured by KOVÁCS (1983) and in the diagnosis of *P. alpina* by KOZUR & MOSTLER (1982) the platform was described as narrow to moderately wide.

Occurrence: *P. alpina* is a characteristic form of the *P. reitzi* -Zone and the lower *Nevadites* -Zone. Its first occurrence is at the base of the *P. reitzi* - Zone. Transitional forms to the *P. hanbulogi* group occur in the uppermost *P. trinodosus* - Zone (*Asseretoceras camunum* horizon). They have not yet a free blade and represent most probably a new species. In any case they cannot be placed into *P. alpina*.

Few specimens are very little arched in lateral view (Pl. 2, Figs. 2, 5, 8). They may represent an independent species near related to *P. alpina*. However, so far only juvenile forms of this type are known. For the moment, they are determined as *P.* cf. *alpina* (KOZUR & MOSTLER).

Paragondolella excelsa MOSHER, 1968

(Pl. 4, Fig. 6)

Remarks: Adults of typical *P. excelsa*, conspecific with the holotype, display a very high carina decreasing uniformly to a posterior nodelike denticle (cusp). There is a wide platform brim behind the last denticle. Such forms appear at the base of the *Reitzi* - Zone. In the Illyrian and Fassanian there is a similar form with very high anterior carina, that has in adult stages (like in all juvenile *P. excelsa*) one or two, rarely three small denticles behind the cusp that reaches to or nearly to the posterior margin. These forms will be described in a separate paper as new subspecies of *P. excelsa*.

There is still a third species of the *P. excelsa* group with very high anterior carina, but in contrast to *P. excelsa*, the carina becomes not much lower toward the posterior end and reaches until the posterior platform margin. Such forms have been determined by SASHIDA et al. (1993) as *'Neogondolella' bulgarica* (BUDUROV & STEFANOV) and therefore regarded as Pelsonian in age. However, the accompanying radiolarians are clearly Ladinian. This new species is common in our material from fissure fillings of pelagic limestones in the Weiße Wand section (Pl. 1, Figs. 1-5, 11-19). Unfortunately, the few complete preserved specimens have been crashed during the sticking of the material. Therefore this species will be described in a later paper.

Paragondolella trammeri **KOZUR, 1972**

(Pl. 2, figs. 19, 23, 24; Pl. 3, Figs. 10, 13, 16)

Remarks: *Paragondolella trammeri* is one of the most important Ladinian conodont guide forms, easily recognizable both in juvenile forms and adults, common both in the Southern an Northern Tethys, in open pelagic and in somewhat restricted pelagic deposits. There are only minor changes in the *P. trammeri* populations during the Ladinian. The holotype is a late juvenile to medium ontogenetic stage of an advance *P. trammeri* from the Fassanian-Langobardian boundary, figured and described in KOZUR & MOCK (1972). An adult form from the same sample has been figured as *Gondolella trammeri trammeri* in KOZUR & MOCK (1972). These adults are 500-600 µm long, in the Longobardian still a little shorter. The keel is high and narrow. The basal cavity is with respect to the keel wide (almost as wide as the widest part of the keel).

Primitive forms of *P. trammeri* from the *R. reitzi* - Zone, described as *P. trammeri praetrammeri* (KOZUR & MOSTLER, 1982) are very similar to advanced *P. trammeri* and can be only separated in adults. They are somewhat larger (600-700 µm), the keel is broader and shallower and the basal cavity is distinctly narrower (often only as half as wide as the surrounding keel). Moreover, often the platform is parallel-sided and the anterior decrease of the platform width begins only before the midlength. However, the latter feature cannot be used for separation of the two subspecies, because also in some adults of *P. trammeri praetrammeri* the anterior decrease of the platform width begins after the midlength and in some advanced *P. trammeri trammeri* the anterior decrease of the platform width starts only in front of the midlength. The adults of medium advanced forms from the upper *R. reitzi* - Zone and from the *Nevadites* - Zone are as large as the primitive *P. trammeri praetrammeri*, but the keel is already relatively narrow and the basal cavity is only a little narrower than the widest part of the platform. These forms are transitional between *P. trammeri praetrammeri* and advanced *P. trammeri*.

Already medium ontogenetic stages of *P. trammeri trammeri* and *P. trammeri praetrammeri* with terminal cusp, but still relatively narrow platform are not more definitely separable, because also in medium ontogenetic stages of *P. trammeri praetrammeri* the keel is narrow and high and the basal cavity is nearly as wide as the widest part of the keel. Juvenile forms of advanced and primitive *P. trammeri* are inseparable. In these forms the cusp is in penultimate position and a small denticle is present behind the cusp. As typical for all juvenile *Paragondolella*, the keel is narrow and high, the basal cavity lies terminal with respect to the keel end that flared around the basal cavity.

The transition from primitive to advanced *P. trammeri* is gradual and does not mark any distinct conodont boundary. This is well documented by the fact that KRYSTYN (1983) and KOVÁCS et al. (1990) failed to separate these forms despite the fact that they believe that the development of typical (advanced) *P. trammeri* from more primitive representatives is a first order conodont event (see also chapter "Stratigraphic evaluation of the conodont faunas"). KRYSTYN (1983, p. 257) rejected *P. trammeri praetrammeri* and regarded it as typical *P. trammeri*. He was so sure in his determination that he wrote that the conodont fauna with *P. trammeri praetrammeri* (= typical *'G.' trammeri* sensu KRYSTYN, 1983) is „...ganz sicher für die *Nevadites* - Zone und keineswegs für die *Parakellnerites* -Zone charakteristisch...". However, according to a personal communication KRYSTYN has now restudied the ammonoid fauna of the stratum typicum of *P. trammeri praetrammeri* and he could now in contrast to his above statement confirm that this fauna belongs to his *Kellnerites* fauna (= *R. reitzi* - Zone) as pointed out by KOZUR & MOSTLER (1982). After this confirmation of the age he finds now also differences between *P. trammeri praetrammeri* and *P. trammeri trammeri*. In the discussion on the Anisian/Ladinian boundary field workshop he explained repeatedly that he had misinterpreted *P. trammeri praetrammeri* because KOZUR & MOSTLER (1982) have only figured adult specimens and no juvenile form. This explanation is strange, because juvenile forms of all *P. trammeri* (both very primitive and advanced forms) are inseparable. Moreover, in the paper KOZUR & MOSTLER (1982) not only adult forms, but also a juvenile *P. trammeri praetrammeri* has been figured. What we can see from KRYSTYN's statement is the fact that the primitive *P. trammeri* are so similar to *P. trammeri trammeri* (advanced *P. trammeri*) that KRYSTYN could not separate these forms as long he believed that the ammonoid fauna belongs to his *Nevadites* fauna. The later separation (after knowing that the ammonoid data by KOZUR & MOSTLER are correct) can be only evaluated as the attempt to maintain his conodont boundary at the base of the *Nevadites* fauna.

KOVÁCS et al. (1990) wrote: 'KOZUR & MOSTLER (1982) also introduced a new species to describe the forerunner of *G. trammeri*; however, the holotype of their *G. praetrammeri* (see MOSTLER & KOZUR, 1982, Pl. 5, Figs. 5a-b), is a true *G. trammeri* specimen with straight upper edge of the carina. Consequently, '*G. praetrammeri*' KOZUR & MOSTLER, 1982, should be treated as a junior synonym of *G. trammeri* KOZUR, 1972.' Superficial evaluation of papers and often intentionally wrong quotation are characteristic for papers of KOVÁCS or KOVÁCS et co-authors, if he has made the quotations. Thus, KOZUR & MOSTLER (1982) have not introduced a new species *Gondolella praetrammeri*, but a new subspecies *Gondolella trammeri praetrammeri*. The holotype was not figured in a paper MOSTLER & KOZUR, 1982, Pl. 5, Fig. 5, but in KOZUR & MOSTLER, 1982, Pl. 1, Fig. 5. In species rank, *P. trammeri praetrammeri* is, of course, a *P. trammeri* KOZUR, 1972 as pointed out by KOZUR & MOSTLER (1982) and therefore it gives no new data to write that '*Gondolella*' *(trammeri) praetrammeri* is a '*G.*' *trammeri*. Moreover, KOZUR & MOSTLER (1982) have not separated *P. trammeri praetrammeri* from *P. trammeri trammeri* by having no straight upper edge of the carina, but by the above mentioned differences in the keel, basal cavity and size of the unit. These differences have not been discussed by KOVÁCS et al. (1990).

The position of '*Gondolella*' *eotrammeri* KRYSTYN (1983) is not yet clear. The figured adult forms are rather large (around 800 µm long). The holotype has a flat platform and also in the anterior part a rather high carina. Platform shape and development of the keel and basal cavity are identical with *P. trammeri praetrammeri*. The adult paratype is not so flat and the carina in the anterior part is rather low. This form corresponds to *P. trammeri praetrammeri*. Also the other paratypes, juvenile to medium ontogenetic stages cannot be separated from *P. trammeri praetrammeri*. Thus, the holotype is either an extreme form or, more probably, an independent species with transitional character between *P. hanbulogi* SUDAR & BUDUROV and *P. trammeri*.

Unfortunately, in contrast to the opinion of KRYSTYN (1983), the Epidaurus section is unsuitable for exact correlation between the Middle Triassic ammonoid and conodont succession, because the sediments are strongly condensed. Therefore the age of *P. eotriassica* s.str. (restricted here to the holotype) is unknown. Similar forms are so far unknown from the Alps and Western Carpathians.

In the following some new taxa will be described.

Genus *Neogondolella*
BENDER & STOPPEL, 1965
Type species: ***Gondolella mombergensis***
TATGE, 1956

Neogondolella cornuta ladinica n. subsp.
(Pl. 3, Figs. 2, 5, 8, 11, 14, 17; Pl. 4, Fig. 21)

Derivatio nominis: According to the stratigraphic occurrence
Holotype: The specimen figured on Pl. 3, Figs. 2, 5, 8, rep.-no. KKM 1993 III-17
Locus typicus: Zelenitza forest road W Loiblpass, Southern Karawanken Mts.
Stratum typicum: Red pelagic limestones of the Loibl Formation, sample ZE 6a.
Material: More than 100 specimens, mostly from the here not described Karwendel sequence.
Diagnosis: A slender *N. cornuta* with relatively long, somewhat upward bent posterior platform behind the distinctly foreward-shifted basal cavity. Keel behind the basal cavity distinct on the lower side of the upward bent platform portion.
Description: Unit in primitive forms large, in advanced forms medium sized. Platform long, slender, in large part nearly parallel-sided, with rounded posterior margin. Carina low, the 13-18 denticles are highest in the anterior third and in the posterior part. Middle part of carina lowest and more or less fused. Cusp distinct, fused with

the posterior platform margin, inclined posteriorly to nearly erect.

Platform in lateral view arched, relatively long posterior part behind the basal cavity upward bent. Keel broad with distinct basal furrow. Basal cavity distinctly foreward-shifted, with two pits, connected by a furrow. The keel continues on the lower surface of the upward bent part.

The foreward-shifting of the basal cavity can be already observed in medium ontogenetic stages, in which the continuation of the keel behind the basal cavity reaches somewhat on the lower surface of the upward bent part. These medium ontogenetic stages have a *mombergensis* type of carina with higher denticles in the anterior and posterior part of the carina and without distinct main cusp. Early ontogenetic stages are of *constricta* type, like in all Upper Anisian and Ladinian *Neogondolella* species.

Occurrence: Fassanian. In the *R. reitzi* - Zone primitive, large forms occur, in the *E. curionii* - Zone advanced, smaller forms are present.

Remarks: *N. cornuta ladinica* n. subsp. has evolved from *N. cornuta cornuta* at the base of the *R. reitzi* - Zone. In *N. cornuta cornuta* the upward bent posterior part of the platform is short and the continuation of the keel behind the basal cavity does not continue on the lower side of the upward bent part of the platform. Primitive representatives of *N. cornuta ladinica* from the *R. reitzi* - Zone are still as large as *N. cornuta cornuta*, but the upward bent part of the platform behind the basal cavity is already long and the keel continues on the lower surface of this part. Advanced specimens from the upper Fassanian are smaller, but otherwise identical. The trend to size reduction can be observed in all Ladinian *Neogondolella* lines.

Medium ontogenetic stages of *N. mesotriassica* (KOZUR & MOSTLER, 1982) are sometimes similar to the same ontogenetioc stages of *N. cornuta ladinica*, especially specimens with rounded posterior end without v-shaped incision. However, the posterior end of the platform is always strongly and steeply upturned in form of a narrow sharp ridge in medium ontogenetic stages of *N. mesotriassica*, whereas the posterior platform end is rather low in *N. cornuta ladinica*.

Neogondolella aldae n. sp.

1965 *Gondolella constricta* n. sp. pars – MOSHER & CLARK, p. 560, Pl. 65, only Pl. 65, Figs. ? 14, ? 15, ? 19, 22.

1965 *Gondolella mombergensis* TATGE, pars – MOSHER & CLARK, p. 560, Pl. 65, only Figs. 20, ? 23, ? 26, ? 27, 29.

1965 *Gondolella navicula* HUCKRIEDE – MOSHER & CLARK, p. 560–561, Pl. 66, figs. 10, 17–21, non ! Figs. 14, 16.

1973 a *Neogondolella basisymmetrica* sp. n., pars – BUDUROV & STEFANOV, p. 837–838, Pl. 3, Figs. 4–8, non ! Figs. 1–3 (holotype).

1979 *Neogondolella basisymmetrica* BUDUROV & STEFANOV – BUDUROV GANEV & STEFANOV, Pl. 1, Figs. 3, 4.

1984 *Gondolella constricta* MOSHER & CLARK, 1965, pars – NICORA & KOVÁCS, p. 144–148, only the specimens on Pl. 7, Fig. 11; Pl. 8, Fig. 3; Pl. 10, fig. 1.

1984 *Gondolella mombergensis mombergensis* TATGE, 1965 - NICORA & KOVÁCS, p. 149, 150, Pl 7, Figs. 3, 15; Pl. 8, Figs. 6–12; Pl. 9, Figs. 7, ? 8, 9, 10, 12–14; Pl. 10, Figs. 3, ? 5; non! Pl. 7, Figs. 2, 5, 7, 13; Pl. 9, Fig. 11.

1984 *Gondolella mombergensis longa* (BUDUROV & STEFANOV, 1973) – NICORA & KOVÁCS, p. 150, Pl. 10, Figs. 2, 4, 6–10.

Derivatio nominis: In honour of Prof. Dr. Alda Nicora, Milano.

Holotypus: The specimen, figured by NICORA & KOVÁCS, 1984, Pl. 10, Fig. 9 as *Gondolella mombergensis longa* BUDUROV & STEFANOV.

Locus typicus: Site A, Fossil Hill, Humboldt Range, Nevada (see NICORA & KOVÁCS, 1984).

Stratum typicum: Sample N 49, middle Prida Formation, *Nevadites humboldtensis* beds of lower *Occidentalis* - Zone (see NICORA & KOVÁCS, 1984).

Material: From the Alps (KOZUR & MOSTLER, in prep.) 12 specimens are known. The holotype is therefore chosen from the Nevadian material, where this form is dominating.

Diagnosis: Platform moderately broad to slender, also in adult stages mostly with distinct constriction near the posterior end, widest in or somewhat before the midlength. Platform part after the constriction short and broad or long and slender. Widest before or in the midlength. Carina in adults low, highest in the anterior third, in the middle and partly also in the posterior part fused to a ridge. Cusp distinct, terminal, not fused with the posterior platform margin, without or rarely with narrow platform brim behind the cusp. Basal cavity somewhat foreward-shifted with respect to the keel.

Description: Adults moderately large to large. Platform moderately broad to slender. Posterior part also in adult forms constricted. Constriction sometimes only on the lower surface visible, in general distinct. Platform part after the constriction short and broad or long and slender. Platform end rounded. Platform widest before or in the midlength. Toward the posterior platform end the width decreases only very few or remains nearly constant. Toward the anterior end the platform width decreases more rapid. Lateral platform margins moderately wide and moderately upturned, with honeycomb microsculpture. Furrow on both sides of the carina smooth and relatively deep. Carina in adults in the middle part and most of the posterior part fused to a low ridge. The penultimate denticle and the terminal cusp are mostly free, but sometimes also the penultimate denticle is included into the fused ridge that rarely reaches even the cusp that is posteriorly inclined or nearly erect. Denticles in the anterior part of the carina highest and in their upper part always free. Distinct cusp always terminal, not fused with the posterior platform margin. Platform brim behind the cusp missing or very narrow. Keel narrow with distinct basal furrow. Basal cavity somewhat to distinctly foreward-shifted with respect to the keel end. Two pits, connected by a furrow are present in the basal cavity.

Early juvenile stages are of *constricta* type and not separable from early juvenile stages of other late Illyrian and Fassanian *Neogondolella* species. Late juvenile forms are of *mombergensis* type (denticles all of the same size or on the middle part a little lower, no distinct main cusp). Already in this ontogenetic stage the basal cavity is a little foreward-shifted (see NICORA & KOVÁCS, 1984, Pl. 7, Fig. 11, late juvenile *N. aldae*, erroneously placed into *N. constricta* that has in this ontogenetic stage always a terminal basal cavity). Medium ontogenetic stages have already a terminal cusp, but the denticles are not yet fused (well recognizable in the specimen figured by MOSHER & CLARK, 1965, Pl. 66, Figs. 10, 17, 18 and assigned to *Gondolella navicula* HUCKRIEDE). Until this ontogenetic stage the constriction is very prominent. Subadult forms are already very similar to adult ones, but only in the middle part of the carina the denticles are fused to a ridge.

Occurrence: Fassanian (*Meeki-* to *Subasperum* - Zone) of Nevada. Dominant form in the Upper *Meeki-* and *Occidentalis* - Zone, rare in the *Subasperum* - Zone. Rare in the Fassanian of the Alps and of Bulgaria.

Remarks: Nearly all forms, figured by NICORA & KOVÁCS (1984) as *'Gondolella' mombergensis* from Nevada belong to *N. aldae* n. sp. that can be subdivided into two subspecies (see below). Only the few figured juvenile forms from the *Paraceratites vogdesi* and *P. cricki* beds belong to *N. cornuta* or a similar form. Also the assumed adult form from these beds (NICORA & KOVÁCS, 1984, Pl. 9, Fig. 11) is a late juvenile to medium ontogenetic stage of a *Neogondolella* of the *mombergensis* group. *N. aldae* is therefore restricted to the *Meeki-*, *Occidentalis-* and lower *Subasperum* - Zone.

Adults of *N. mombergensis* have mostly 3 slender large teeth in the posterior part of the carina. A distinct cusp is mostly not present. In some forms the penultimate teeth is the cusp (e.g. in *N. mombergensis prava*). Adult *N. mombergensis* have in general no distinct posterior constriction.

Some representatives of the *N. mombergensis* group s.l. from the German Basin display a distinct terminal cusp. Among these forms *Neogondolella haslachensis* TATGE, 1956 is a small form with very slender long, mostly separate teeth. It is unrelated to *N. aldae* and an endemic species restricted to the German Basin. Other forms (only from the Hauptmuschelkalk mo 1) belong to *N. cornuta* (differences to *N. aldae*, see below). A few forms from the Hauptmuschelkalk mo 2 belong to *N. balkanica* (differences to *N. aldae*, see below). A further new species from the German Hauptmuschelkalk (only in the mo 2) with distinct terminal cusp displays slender long denticles that are not fused to a ridge in the middle part of the carina in adult forms. Subordinately, forms similar to *N. aldae* are present in the German Hauptmuschelkalk (mo 1 ß, mo 2).

In *N. cornuta* BUDUROV & STEFANOV, 1973 the very prominent terminal cusp is always fused with the posterior platform margin, the posterior constriction of the platform in adult forms is mostly missing. The lateral platform margins are mostly over a longer distance parallel.

N. balkanica BUDUROV & STEFANOV, 1975 displays an prominent, always erect cusp, surrounded by a distinct platform brim. In richer populations of *N. aldae* there are few specimens with very narrow platform brim and nearly erect cusp (see NICORA & KOVÁCS, 1984, P. 9, Fig. 8) that are hardly separable from very primitive *N. balkanica*. Either the intraspecific variability of both species overlaps a little (more probably) or primitive *N. balkanica* are present in the Nevadian material.

The paratypes of *N. basisymmetrica* BUDUROV & STEFANOV and the specimen figured by BUDUROV, GANEV & STEFANOV (1979) as *N. basisymmetrica* corresponds to slender morphotypes of *N. aldae aldae*. However, the holotype of *N. basisymmetrica* (BUDUROV & STEFANOV, 1973 a, pl. 3, figs. 1-3) is a medium ontogenetic stage without a cusp, with upward bent posterior platform and distinctly foreward-shifted basal cavity. The last denticle is rather small. The holotype does not fit in the diagnosis of the species (last denticles not larger than the other ones, but distinctly smaller!), but corresponds to the drawing by BUDUROV & STEFANOV (1973 a, fig. 5). Thus, the holotype was not chosen erroneously. It is very similar to *N. bacalovi* BUDUROV & STEFANOV, 1973, but the basal cavity is not so strongly foreward-shifted and its margins are not so strongly protruding as in *N. bacalovi*. The holotype belongs to the *N. bacalovi* group, but is more primitive. The other figured specimens of *N. basisymmetrica* (BUDUROV & STEFANOV, 1973 a, pl. 3, figs. 4-8; BUDUROV, GANEV & STEFANOV, 1979, Pl. 1. Figs. 3, 4) belong clearly to an other species (*N. aldae*).

The differences to *B. longa* BUDUROV & STEFANOV, 1973 are discussed under *N. aldae posterolonga* n. subsp.

Neogondolella aldae aldae n. subsp.

1965 *Gondolella constricta* n. sp. pars – MOSHER & CLARK, p. 560,Pl. 65, only Pl. 65, Figs. ? 14, ? 15, ? 19, 22.

1965 *Gondolella mombergensis* TATGE, pars – MOSHER & CLARK, p. 560, Pl. 65, only Figs. 20, ? 23, ? 26, ? 27, 29.

1965 *Gondolella navicula* HUCKRIEDE – MOSHER & CLARK, p. 560-561, Pl. 66, figs. 10, 17–21, non ! Figs. 14, 16.

1973 a *Neogondolella basisymmetrica* sp. n., pars – BUDUROV & STEFANOV, p. 837-838, Pl. 3, Figs. 4–8, non ! Figs. 1–3 (holotype).

1979 *Neogondolella basisymmetrica* BUDUROV & STEFANOV – BUDUROV, GANEV & STEFANOV, Pl. 1, Figs. 3, 4.

1984 *Gondolella constricta* MOSHER & CLARK, 1965, pars – NICORA & KOVÁCS, p. 144-148, only the specimens on Pl. 7, Fig. 11; Pl. 10, fig. 1.
1984 *Gondolella mombergensis mombergensis* TATGE, 1965 – NICORA & KOVÁCS, p. 149, 150, Pl. 7, Figs. 3, 15; Pl. 8, Figs. 7-12; Pl. 9, Figs. ? 8, 9, 12–14; Pl. 10, Figs. ? 3, 5; non! Pl. 7, Figs. 2, 5, 7, 13; Pl. 8, Fig. ? 6; Pl. 9, Figs. ? 7, ? 10, 11.
1984 *Gondolella mombergensis longa* (BUDUROV & STEFANOV, 1973),pars – NICORA & KOVÁCS, p. 150, Pl. 10, Figs. 2, 8-10, non ! Figs. ? 4, 6, 7.

Derivatio nominis, holotypus and stratum typicum: As for the species.
Diagnosis: With the character of the species (description see above). Platform slender to moderately wide. Posterior platform part after the constriction always short, comprising on the carina only the cusp or the cusp and the penultimate tooth.
Occurrence: *Meeki*- and *Occidentalis* - Zone of Nevada. *Reitzi* - Zone and *Nevadites* - Zone of the Alps and Bulgaria.
Remarks: *N. aldae posterolonga* n. subsp. is distinguished by a rather long, slender constricted part of the always slender to very slender platform. The narrow platform behind the constriction comprises on the carina the main cusp and two further denticles. Already late juvenile forms with equally sized denticles without terminal cusp and very narrow posterior constricted platform display a distinctly foreward-shifted basal cavity.

The differences between the two subspecies are rather gradual. Few specimens, placed by NICORA & KOVÁCS (1984) into *'G.' mombergensis mombergensis* belong rather to *N. aldae posterolonga* n. subsp., but have clearly transitional character to *N. aldae aldae*. However, the ranges of the two subspecies are different. *N. aldae posterolonga* starts later (upper *Meeki*- or lower *Occidentalis* - Zone) than *N. aldae aldae* (lower *Meeki* - Zone, lower *Reitzi* - Zone) and ranges in younger beds (lower *Subasperum* - Zone). The more important feature for separation seem not to be the width of the platform, but the width of the constricted posterior part of the platform that is longer and narrower in *N. aldae posterolonga*. Such forms have, of course, always a slender to very slender platform, but slender platforms display also some *N. aldae aldae* with short constricted posterior platform part.

Neogondolella aldae posterolonga n. subsp.

Derivatio nominis: According to the long constricted posterior part of the platform.
Holotypus: The specimen figured by NICORA & KOVÁCS, 1984, Pl. 10, Fig. 7 as *N. mombergensis longa.*
Locus typicus: Site A, Fossil Hill, Humboldt Range, Nevada (see NICORA & KOVÁCS, 1984).
Stratum typicum: Sample N 50, middle part of Prida Formation, lower *Occidentalis*- Zone
Material: Only few doubtful juvenile forms are present in our collections, therefore the holotype is chosen from the Nevadian material.

1984 *Gondolella constricta* MOSHER & CLARK, 1965, pars - NICORA & KOVÁCS, p. 144-148, only the specimens on Pl. 8, Fig. 3.
1984 *Gondolella mombergensis mombergensis*, pars - NICORA & KOVÁCS, p. 149-150, only Pl. 8, Fig. ? 6; Pl. 9, Figs. ? 7, ? 10.
1984 *Gondolella mombergensis longa* (BUDUROV & STEFANOV, 1973), pars - NICORA & KOVÁCS, p. 150, only the specimens on Pl. 10; figs. ? 4, 6, 7.

Diagnosis: With the character of the species (description see under *N. aldae*). Platform very slender to slender, widest before the mid-length of the unit, with long, narrow, constricted posterior part. Juvenile forms display a very narrow, constricted posterior part of the platform. Already these late juvenile stages that have not yet a terminal main cusp, but denticles of the same size throughout the carina (see NICORA & KOVÁCS, 1984, Pl. 3, Fig. 3, specimen erroneously assigned to *'Gondolella' constricta*) have a distinctly foreward-shifted basal cavity.

Occurrence: ? Upper *Meeki* - Zone, *Occidentalis*- to lower *Subasperum* - Zone of Nevada.

Remarks: Differences to *N. aldae aldae* see under this subspecies.

Only a part of *'Gondolella' mombergensis longa* sensu NICORA & KOVÁCS (1984) belongs to *N. aldae posterolonga* n. subsp., the others are slender *N. aldae aldae* with short constricted posterior platform portion.

N. longa BUDUROV & STEFANOV, 1973 displays in the same ontogenetic stages a still longer, compared with the length narrower platform, widest distinctly behind the midlength.

Only adult forms have an indistinct terminal cusp.

Neogondolella ? postpridaensis n. sp.

1981 *Gondolella pridaensis* sp. n., pars – NICORA, KOZUR & MIETTO, p. 762–763, Pl. 89, Figs. 5, 7.

Derivatio nominis: According to the stratigraphic occurrence after *N. pridaensis* s.str.

Holotypus: The specimen figured by NICORA, KOZUR & MIETTO (1981), Pl. 89, Figs. 5 a-c.

Locus typicus: Section C, Fossil Hill, Humboldt Range, Nevada (locality data see SILBERLING & NICHOLS (1982).

Stratum typicum: Sample N 77, lower part of *Eoprotrachyceras* beds, lower part of Upper Fassanian

Material: Typical representatives of this species are so far only known from Nevada. Therefore the holotype is chosen from this material.

Diagnosis: Platform slender. Posterior end mostly pointed, partly narrowly rounded, marginally only slightly upturned. In advanced forms the platform is mostly very slender and ends often before the last denticle. Outer part of platform surface with honeycomb microstructure.

Carina very high, highly fused, but the upper part of the slender denticles (up to 14) is never fused to a wavy line. The last denticle is fused with the platform margin. It is mostly smaller than the following 1-2 denticles. The second or third denticle is largest, but no distinct cusp is present. The other denticles of the carina have nearly the same size. Only the 2-3 anterior denticles are smaller. Sometimes the size of the denticles varies irregularly with a bigger denticle near the midlength of the carina. Lower surface with high, narrow keel. Loop elongated, posterior end narrowly rounded or even pointed. The basal furrow is broad and distinct. Behind the pit that is situated at the beginning of the posterior widening of the keel a distinct short furrow continues that is at its end not widened into a distinct second pit, typically for *Neogondolella.*

Occurrence: Middle and lower part of upper Fassanian of North America.

Remarks: *Paragondolella ? pridaensis* (NICORA; KOZUR & MIETTO, 1981) from the Illyrian of North America and Japan displays a distinct cusp, the carina is lower and in adult forms generally fused to a wavy line. The teeth of the carina are broadly triangular.

Both *P. ? pridaensis* and especially *P. ? postpridaensis* are not typical *Paragondolella* according to their basal cavity. However, a distinct second pit on the end of furrow behind the pit, typically for all *Neogondolella* species, is also not present. Because the basal cavity of *P. ? pridaensis* is near related to the basal cavity of typical *Paragondolella*, both species are placed tentatively into *Paragondolella.*

Paragondolella ? pridaensis posteroacuta n. subsp.

(Pl. 1, Figs. 7, 8, 10, 20, 21, 24)

1981 *Gondolella pridaensis* sp. n., pars – NICORA, KOZUR & MIETTO, p. 762–763, only P. 89, Fig. 3.

Derivatio nominis: According to the pointed posterior end.
Locus typicus: Weiße Wand, W Loiblpaß, Southern Karawanken Mountains (Southern Alps), Carinthia (Austria).
Stratum typicum: Fissure filling of red pelagic limestone (Weiße Wand Member) of the Loibl Formation in the uppermost part of the Contrin Formation.
Material: 15, mostly broken specimens.
Diagnosis: Unit small. Platform pointed both at the anterior and posterior end, widest in or behind the mid-length. Prominent terminal cusp fused with the platform end. Carina high, denticles in the posterior part nearly of the same size, in the anterior part somewhat longer.
Description: Small conodonts with unusual platform shape, sharply pointed at both ends. The platform sometimes does not reach the posterior edge of the terminal, prominent, posteriorly inclined cusp that is fused with the posterior platform margin. The platform is widest in or somewhat behind the midlength, their lateral margins are only slightly thickened and slightly to moderately upturned. The smooth furrow along the carina is rather wide. The carina is high, the denticles are not fused to a ridge. In the posterior part the denticles have the same length or their length increases slightly anteriorly, like in the anterior part of the carina. The keel is narrow, with rather wide basal furrow. Its posterior end is pointed. The basal cavity is only slightly foreward-shifted with respect to the keel end. At the beginning of the basal cavity lies a rather large pit, followed by a short furrow that does not widen to a secondary pit.
Occurrence: Lower Ladinian of Nevada. The European occurrences are somewhat doubtful in the age (see stratigraphic evaluation of the conodont faunas). However, *P. ? pridaensis posteroacuta* is seemingly a little more advanced than *P. ? pridaensis pridaensis* from the *Paraceratites cricki* beds of Nevada. Because these beds are contemporaneous with upper *P. trinodosus* Zone of the European Tethys, *P. ? pridaensis posteroacuta* should belong to the latest Illyrian or earliest Fassanian. Because the Radiolarian fauna is pre-Fassanian (older than *Reitzi* -Zone), a latest Illyrian age is probably, but somewhat older ages cannot be excluded from the faunal evidence.
Remarks: *P. pridaensis pridaensis* (NICORA, KOZUR & MIETTO, 1981) has always a rounded posterior end and the denticles of the carina are strongly fused.

N. acuta (KOZUR, 1972) displays also a pointed posterior platform end. This species is clearly distinguished by its low carina.

Genus *Budurovignathus* KOZUR, 1988

Synonyma: *Carinella* BUDUROV, , 1973; *Sephardiella* MARCH et al., 1988.
Type species: *Polygnathus mungoensis* DIEBEL, 1956.
Remarks: The genera *Budurovignathus* KOZUR, 1988 and *Sephardiella* MARCH et al., 1988 have been established in the same abstract volume of the Frankfurt ECOS V to replace the homonym genus *Carinella* BUDUROV, 1973. Because a homonym was replaced by a new name, none of the taxa has an taxonomic advantage and the procedure of the first revising author is not necessary.. Therefore the page priority is decisive. Moreover, the real publication appeared later, in 1990. There, *Budurovignathus* KOZUR has been published some months before *Sephardiella* MARCH et al. For these reasons, *Budurovignathus* has clearly the priority.

Budurovignathus gabriellae n. sp.
(Pl. 3, Figs. 1, 4, 7, 19, 22, 25)

Derivatio nominis: In honour of Prof. Dr. Gabriella Bagnoli, Pisa.
Holotypus: The specimen on Pl. 3, figs. 1, 4, 7, rep.-no. KKM 1993 III-1
Locus typicus: Section at the Zelenitza forest road, W Loiblpass, Southern Karawanken (Southern Alps), Carinthia (Austria).

Stratum typicum: Sample ZE 6a, red pelagic limestones of the Loibl Formation, Upper Fassanian.

Material: 4 specimens.

Diagnosis: Smooth *Budurovignathus* with sigmoidally bent broad platform, broadly rounded platform end, widely separated long denticles on the carina and a basal cavity situated at the beginning of the posterior third of the unit.

Description: Platform relatively broad, flat, with thickened, only slightly upturned platform margin. The smooth furrow along the carina is narrow and shallow, the honeycomb microstructure covers therefore the largest part of the platform surface. The platform is slightly sigmoidally bent and the asymmetric posterior margin is broadly rounded. The carina bears few (7-8, widely separated, long, uniformly posteriorly inclined denticles, somewhat larger in the anterior part than in the posterior part. No distinct cusp.

The keel is narrow to moderately wide, slightly sigmoidally bent like the platform, but with pointed posterior end. Until the almost not expanded basal cavity the basal furrow is distinct. The basal cavity has two pits connected by a relatively long furrow. After the posterior pit the basal furrow is missing or very indistinct.

Occurrence: Upper Fassanian of the type locality.

Remarks: *Budurovignathus truempyi* (HIRSCH) displays a pointed posterior platform end and the keel is more distinctly expanded around the basal cavity.

BAGNOLI et al. (1984) figured a form with identical platform shape from the Ladinian of Sardinia. This form is a little more advanced, because the basal cavity lies only a little behind the mid-length of the platform. This form occurs together with a new subspecies of *B. truempyi*, transitional between typical *B. truempyi* (HIRSCH) and *B. hungaricus* (KOZUR & VÉGH). From this it can be concluded that our new species is a little older, perhaps contemporaneous with *B. truempyi truempyi* or even still a little older. The relatively slightly foreward-shifted basal cavity indicates that *B. gabriellae* is the oldest known *Budurovignathus* species, still transitional to *Neogondolella.*

5. Stratigraphic evaluation of the conodont faunas and some remarks to the Anisian-Ladinian boundary

The conodonts are the most important guide forms for the Triassic biostratigraphy. Most of the stage and substage boundaries are better defined by conodonts than by any other fossil group. Only at the Anisian-Ladinian boundary the conodonts are said to be stratigraphically unimportant or of minor importance. However, this depends on two facts: (1) the Anisian-Ladinian boundary is placed by different authors and in different faunal realms in different levels. Early Ladinian guide forms of one author become Illyrian forms by other authors. By this, Illyrian-Fassanian ranges are constructed for several species that would be in reality restricted to one of these substages, if a uniform Anisian-Ladinian boundary will be applied. (2) Both the Illyrian and Fassanian (except the upper *curionii* -Zone) are characterized by smooth gondolellids, a taxonomically difficult conodont group. Many species are used in a wide sense comprising often different species or subspecies that straddle the Anisian-Ladinian boundary. Sometimes these species are subdivided into different morphotypes of different stratigraphic ranges (KOVÁCS et al., 1990). However, in a form taxonomy all conodont species of a form genus are form taxons and therefore morphotypes. This term should be in the form taxonomy only used for intraspecific form groups with the same stratigraphic range. If the Middle Triassic *Neogondolella-* and *Paragondolella* species are used in a more restricted sense, then they are good guideforms also for this time-interval.

The main problem of the Middle Triassic stratigraphy is the Anisian-Ladinian boundary or better to say, the problems that the ammonoid specialists made with this boundary. The priority of this boundary is clear and a priority boundary should not be changed, if this boundary is not problematical by large time gap or overlap between the two zones, with the boundary of which a stage or substage boundary has been defined. There will be always still a little "better" boundary in the future, if we use other fossil groups or other stratigraphical methods or simply because of the fact that a certain level is better studied than another one. The stability of the stratigraphic boundaries requires the recognition of the priority rules also in the stratigraphy, because otherwise certain schools will try to press the international geological community to accept their boundaries.

BÖCKH (1873) established for the first time the 'Niveau des *Ceratites reitzi*' in the Balaton Highland, one of the first recognized ammonoid zones in the Triassic. MOJSISOVICS (1874) established the Norian stage as the second stage of the Triassic. Due to a later polemic, this stage was later re-named as Ladinian stage and the term Norian was used for the former Juvavian Upper Triassic stage. The Norian stage of MOJSISOVICS (1874) = Ladinian stage of later use was the best defined one of the Mediterranean Triassic stages. Already MOJSISOVICS (1874) defined this stage with the 'Horizont des *Trachyceras reitzi*' and with the Buchenstein Limestone of Gröden/Val Gardena for the lower part and with the 'Zone der *Daonella lommeli* und des *Trachyceras archelaus*' and Wengen Beds for the upper part. MOJSISOVICS (1879) slightly redefined this zonation and placed into the Lower Ladinian (in this time his Lower Norian) the 'Zone des *Trachyceras curionii* und des *Trachyceras reitzi* and in the upper Ladinian again the *Archelaus* ammonoid zone and the *Lommeli* bivalve zone. As youngest pre-Ladinian ('Norian') zone he regarded the *'Trachyceras' trinodosus* - Zone. The same zonation was used by MOJSISOVICS (1882).

In the first comprehensive work about the Mediterranean Triassic the terms Fassanian (for the Lower 'Norian' = Lower Ladinian) and Langobardian (for the Upper 'Norian' = Upper Ladinian) have been introduced. The Fassanian was defined with the *Protrachyceras curionii* - Zone (below) and the *Dinarites avisianus* - Zone (above) and the Langobardian was defined by the *Protrachyceras archelaus* - Zone. The top of the Anisian was again defined by the top of the *Trinodosus* - Zone. The *Curionii* - Zone was at that time used for the whole time interval from the base of the *Reitzi* - Zone until the top of the *Recubariense* - Zone as clearly indicated in several papers. *Reitzi* - Zone s.l. and *Curionii* - Zone s.l. have been used in this time in the same sense. Thus, MOJSISOVICS (1882) listed among the fossils of the 'Zone des *Trachyceras reitzi*', for instance, *Trachyceras reitzi, T. chiesense, T. recubariense* and *T. curionii.* At that moment, when these zones have been again separated, the base of the Ladinian has been placed without any exception at the base of the *Reitziites reitzi* - Zone for about 70 years. Only the position of the *Aplococeras avisianum* - Zone was disputed. Many geologists placed the Anisian-Ladinian boundary between the *A. avisianum*- and the *R. reitzi* - Zone. Only KOZUR (1972 and later papers) stated that the *Avisianum* - Zone has the same Lower Ladinian microfauna as the *Reitzi* - Zone. KOZUR & MOSTLER (in press since 1991) could now prove by detailed radiolarian correlations that the *Avisianum*- Zone corresponds to the upper *Reitzi* - Zone and somewhat younger beds. The hardly understandable position of the *Avisianum* - Zone above the *Curionii* - Zone in MOJSISOVICS; WAAGEN & DIENER (1895) was by this result easily explainable. The *Avisianum* - Zone is characteristic for rather shallow water sediments near the platform slope, the *Reitzi* - Zone for pelagic beds. If pelagic beds of the *Reitzi* - Zone s.str. (= lower *Curionii* - Zone sensu MOJSISOVICS, WAAGEN & DIENER, 1895) have been overlain by a carbonate platform then in the transitional facies *Aplococeras avisianum* can be found above the *Reitzi* - Zone s.l. (= *Curionii* - Zone s.l.). Because the carbonate platform is free of ammonites, ammonoid faunas of the *Curionii* - Zone s.l. are overlain by ammonoid faunas of the *Avisianum* - Zone.

Independent from the position of the *Avisianum* - Zone, the base of the *Reitzi* - Zone was invariably used as base of the Ladinian for about a century, one of the clearest priorities in the Tethyan Triassic stratigraphy. This priority is not invalid by the fact that in the Southern Alps other ammonoids have been misinterpreted as *'Ceratites' reitzi*. The *Reitzi* - Zone was from the beginning defined in the Balaton Highland, its type locality is the Forráshegy section at Felsöörs, where all 4 subzones of the *Reitzi* - Zone are present and also the underlying Illyrian beds are rich in ammonoid faunas. This section is excellently exposed and was studied in detail by many Hungarian and foreign geologists. The scope of a zone does not change, if somebody makes a misidentification of the index species outside the type locality of the zone.

PIA (1930) showed that in the *Reitzi* - Zone *Diplopora annulata* appears for the first time, a dasycladacean guideform for the whole Ladinian in the widespread Tethyan carbonate platforms.

TOZER (1967) placed the base of the Ladinian considerably higher, at the base of the *Eoprotrachyceras subasperum* - Zone which corresponds to the base of the *E. curionii* - Zone in the European Tethys. Geologists, who worked in the Arctics and the RIEBER school from Zürich followed him. This boundary is a good ammonoid boundary, but it lies considerably above the priority boundary and it is not correlable by any pronounced boundary in conodont and radiolarian faunas and neither in the dasycladacean association (inside the *Diplopora annulata* flora) nor in sporomorph zonations. Therefore this boundary is hardly correlable in ammonoid-free Triassic successions that compris by far more than 90 % of the known Triassic in the world. Moreover, by this high boundary the Fassanian would be reduced to a very short time interval between the base of the *Curionii* - Zone and the base of the *Gredleri* - Zone.

A third Anisian-Ladinian boundary was proposed by KRYSTYN (1983) in the Epidauros section. According to his studies the first appearance of *Nevadites* coincides with a sharp boundary in the conodont fauna, indicated by the first appearance of *P. trammeri*. This boundary was overtaken by the Milano school (GAETANI, NICORA) and for a time also by KOVÁCS who meanwhile again supports the priority boundary at the base of the *Reitzi* - Zone. In an ad hoc voting on the Anisian/Ladinian boundary field workshop (27. 6. - 4. 7. 93, application made by TOZER), 4 participants voted for the base of the *Curionii* - Zone, 4 participants for the base of the *Nevadites* fauna and 7 for the base of the *Reitzi* - Zone as Anisian-Ladinian boundary.

There was general agreement that the base of the *Curionii* - Zone is not supported by any distinct change in microfauna. However, according to our opinion, there are not yet enough conodont data from this boundary. According to the data of the Italian colleagues, there are no changes in the conodont faunas near the base of the *Curionii* -Zone. However, in Hungary *Budurovignathus truempyi* occurs in the upper part of the *Curionii* - Zone, but the ammonoid correlations in this section (Köveskál) are rather weak.

There was no agreement about the assumed sharp conodont boundary at the base of the *Nevadites* fauna. Wheareas KRYSTYN and NICORA continue to believe in this boundary, KOZUR has shown that *P. trammeri* appears considerably earlier in agreement with the data published by KOZUR & MOSTLER (1982). A distinct conodont boundary can be, in turn, observed at the base of the *Reitzi* - Zone, where one of the two major radiolarian boundaries in the Late Illyrian to Longobardian interval occurs.

How may these different opinions be explained ? KRYSTYN (1983) found his conodont boundary (first appearance of *P. trammeri*) at the base of the *Nevadites* fauna in the Epidauros section. According to his opinion, this section is condensed in the Anisian part, but uncondensed in the Ladinian part (including the *Nevadites* fauna). This view could not be confirmed by KOZUR & MOCK (in prep.) who re-sampled this section. Also the Ladinian part is strongly condensed. The bed with the first *Nevadites* occurs above a several cm thick manganese oxide layer indicating strong condension. Also the conodont fauna of the level with *Nevadites* is strongly condensed. Thus the very strange conodont ranges shown by KRYSTYN (1983) from this section (e.g. beginning of *P. trammeri* at the base of the *Nevadites* fauna, beginning of the Longobardian *B. hungaricus* at the base of the *Curionii* - Zone) can be explained. In uncondensed sections P. trammeri begins by far earlier. This was unintentionally confirmed by KRYSTYN (1983) and KOVÁCS et al. (1990) that means by all conodont workers that believe in a strong conodont boundary at the base of the *Nevadites* - Zone.

KOZUR & MOSTLER (1982) recorded a conodont fauna with *N. longa* and *P. trammeri praetrammeri* in ammonoid dated beds belonging to the *Kellnerites* fauna (*R. reitzi* - Zone). To the paper of KOZUR & MOSTLER (1982) KRYSTYN (1983, p. 257) remarked the following: 'In obiger Arbeit wird aus der angeblich durch *Parakellnerites* abgesicherten Probe FQ eine Conodontenfauna genannt, die verglichen mit Epidaurus und anderen Profilen ganz sicher für die *Nevadites* - Zone und keineswegs für die *Parakellnerites* - Zone charakteristisch ist. In diesem Lichte sind die stratigraphischen Schlußfolgerungen der Autoren hinsichtlich der Einstufung ihrer Probe und der enthaltenen Plattform-Conodonten ('typisch unterladinisch') bemerkenswert, weil sie sich insbesondere auf *Gondolella trammeri* und *Gondolella pseudolonga* stützen. Die neubeschriebene *Gondolella trammeri praetrammeri* hat hier zur Umbenennung von *Gondolella praetrammeri* in *Gondolella eotrammeri* n. sp. genötigt. Überflüssigerweise leider, weil *G. trammeri praetrammeri* KOZUR & MOSTLER eindeutig in die Synonymie von *G. trammeri* zu verweisen ist, während sie sich andererseits von *G. eotrammeri* n. sp. artlich sicher unterscheidet.' From this statement the following facts can be taken: 1. KRYSTYN (1983) agrees that this conodont fauna is a typical Lower Ladinian conodont fauna. He was so sure about the Lower Ladinian character that he assigned the ammonoid fauna without investigation into the *Nevadites* fauna. 2. KRYSTYN agrees that the form described by KOZUR & MOSTLER (1983) is a *P. trammeri*. According to a pers. comm., Dr. KRYSTYN has meanwhile restudied the ammonoid fauna and could confirm the data of KOZUR & MOSTLER (1982) that this fauna belongs to the *Kellnerites* fauna (*R. reitzi* - Zone). Therefore he has unintentionally confirmed that the *R. reitzi* - Zone contains a typical Lower Ladinian fauna with *P. trammeri*. He now agrees that this form is a little more primitive and can be separated in subspecies level (see remarks in the systematic part). KOVÁCS et al. (1990) also confirmed that *P. trammeri praetrammeri* is a 'typical' *P. trammeri* and also they regarded therefore the horizon from where the sample has been derived as Early Ladinian in age. Therefore all conodont workers that regard the first appearance of *P. trammeri* as an important marker for defining the Anisian-Ladinian boundary have unintentionally confirmed that the *R. reitzi* - Zone has an undoubtedly Lower Ladinian conodont fauna.

Medium advanced *P. trammeri* that are hardly separable from the primitive *P. trammeri praetrammeri* occur in the Felsöörs section in the upper Subzone of the *R. reitzi* - Zone (see also KOVÁCS in GAETANI, 1993). In the same section *P. trammeri praetrammeri* is present in the *Liepoldti* - Subzone, the second lowest Subzone of the *R. reitzi* - Zone. KOVÁCS wrote: 'Appearance of *G. trammeri* evolved from *G.* aff. *eotrammeri* near to the base (?) of the *Costosus* horizon. This is the most remarkable and easiest recognizable one among the four events discussed here, being *G. trammeri* a very common and characteristic form in the Tethyan eupelagic facies' We agree that the first appearance of *P. trammeri* is an important conodont event, but not the appearance of medium advanced forms at the base of the upper subzone of the *Reitzi* - Zone, but the first appearance of the species itself (first appearance of *P. trammeri praetrammeri*). It is very difficult to separate the medium advanced *P. trammeri* of the upper *Reitzi* - Zone and of the *Nevadites* fauna from the more primitive *P. trammeri* of the lower *Reitzi* - Zone as well demonstrated by KRYSTYN (1983) and KOVÁCS et al. (1990) by regarding the primitive *P. trammeri praetrammeri* as typical *P. trammeri*. *P. trammeri praetrammeri* was established to separate it from the advanced *P. trammeri* of the uppermost *Curionii* - Zone and of the Langobardian. Even this separation is not too easy. The medium advanced forms from the upper *Reitzi* - Zone and *Nevadites* fauna are transitional between these two subspecies! Of course, the very difficult separation of these forms from *P. trammeri praetrammeri* (KRYSTYN, 1983 and KOVÁCS et al., 1990 failed in separating *P. trammeri praetrammeri* of the *Reitzi* - Zone from typical *P. trammeri*) cannot be used as an important conodont event, only the first appearance of *P. trammeri* themselves and this event is in the lower *Reitzi* - Zone ! At the base of the *Reitzi* - Zone *N. mesotriassica* appears, a typical Ladinian form. *N. cornuta ladinica* n. subsp., *N. balkanica* s.str., *N. longa*, *N. basisymmetrica* and *N. aldae* first appear at or near the base of the *Reitzi* - Zone. All these forms are typical Lower Ladinian forms, often difficult to separate from each other, especially in juvenile and medium ontogenetic stages. The common feature of all these forms is that they have rather long and slender juvenile forms of *constricta* type, in which already in medium ontogenetic or late juvenile stages the basal cavity is somewhat foreward-shifted, a typical Ladinian (and younger feature), unknown in any Illyrian platform conodont.

Also the *Paragondolella* associations, characteristic for deep pelagic associations, change distinctly at or near the base of the *Reitzi* - Zone. At the base of the *Reitzi* - Zone appears *P. alpina* (and its junior synonym *P. szaboi*, the juvenile forms of *P. alpina*). *P. alpina* belongs to the *P. trammeri* group that dominates among the gondolellids of the deep pelagic Ladinian conodont faunas. *P. trammeri* itself first appears in the lower *Reitzi* - Zone with the primitive *P. trammeri praetrammeri* that is almost inseparable from medium advanced forms that begin in the upper *Reitzi* - Zone. Also among the *P. excelsa* group distinct changes can be observed, but the investigation of the range of the different taxa of the *P. excelsa* group is not yet finished. Typical *P. excelsa* with very high anterior platform and broad platform brim behind the last denticles appear seemingly near the base of the *Reitzi* - Zone.

The next distinct conodont change is only within the *Curionii* - or *Recubariense* - Zone, where in a still unknown exact level the genus *Budurovignathus* appears. In the interval between these two conodont events only slight modifications within the Lower Ladinian conodont fauna can be observed.

The distinct conodont boundary at the base of the *Reitzi* - Zone is not facies controlled. Transitional forms to Illyrian forerunners can be found in the underlying *Asseretoceras*- and *Lardaroceras* faunas.

The distinct change in the conodont faunas at and near the base of the *Reitzi* - Zone is accompanied by a drastic change in the dominant radiolarian groups. The first typical Oertlispongidae with curved main spine (genus *Oertlispongus*) appeared at the base of the *Reitzi* - Zone (KOZUR & MOSTLER, in press, DOSZTÁLY, in press). In the same level *Triassocampe deweveri* and *T. scalaris* and some near related forms that dominate the Ladinian Nasselarian faunas appear. The common and characteristic Ladinian *Eptingium manfredi* and the genus *Yeharaia* appear also in this level. Further common and important Ladinian guideforms appear in the same level. Therefore the radiolarian faunas of the upper *Paraceratites trinodosus* - Zone and the basal *Reitzi* - Zone are definitely different in their most important components. Within the Fassanian, a gradual development of the Ladinian faunas can be observed without changing the general Lower Ladinian character of the faunas. Only at the base of the *Budurovignathus mungoensis* - Zone the next drastic change in the main components of the radiolarian faunas can be observed. Also the radiolarian faunas support the placement of the Anisian-Ladinian boundary at the base of the *Reitzi* - Zone.

Near the base of the *Reitzi* - Zone the Ladinian phase of the sporomorph development sensu BRUGMAN starts. According to GÓCZÀN (in GAETANI (1993) the decisive important forms for the Ladinian phase, *Cannanoropollis scheuringi, C. brugmani, Kuglerina meieri* in the Felsöörs section first appear in beds 98, immediately below the base of the *Reitzi* - Zone within the *Lardaroceras* ammonoid fauna. In the same level also a distinct change in the foraminifer fauna can be observed (ORAVECZ-SCHEFFER in GAETANI, 1993). As known since long time, also the Ladinian dasycladacean flora with *Diplopora annulata* appears near the base of the *Reitzi* -Zone.

The priority Anisian-Ladinian boundary is therefore supported by all important microfossil groups that allow correlations within the pelagic ammonoid-bearing facies, within the deep pelagic ammonoid-free facies (radiolarites), within the ammonoid-free shallow-water facies and in the continental Triassic (sporomorphs). None of the other proposed ammonoid boundaries have this advantage and moreover, they are not in agreement with the priority. For this reason, we place the base of the Ladinian in agreement with the more than 100 year old priority and use at the base of the *Reitziites reitzi* - Zone.

Accepting this boundary, all the investigated conodont faunas of the Southern Karawanken Mountains with exception of the samples WWS and ZG 1, ZG 2 and ZG 3 (see below) belong to the Lower Ladinian. This is indicated by the presence of *Paragondolella trammeri, P. alpina,* advanced *P. excelsa, Neogondolella cornuta ladinica, N. mesotriassica, N. longa, N. balkanica.* In agreement with the above statements, within the Lower Ladinian only in few samples a specification is possible by conodonts. Sample ZE 6a contains already very primitive *Budurovignathus* and should be therefore Late Fassanian in age.

The samples ZG 1 to ZG 3 yielded among other forms *Budurovignathus mungoensis*. They belong therefore to the *B. mungoensis* A.Z. of the Langobardian.

Sample WWS from a fissure filling of red pelagic limestones (Weiße Wand Member of the Loibl Formation) in the uppermost part o the underlying platform carbonates (Contrin Formation) contained *Nicoraella kockeli* (TATGE). The disappearance of *N. kockeli* only in the Northern Tethys is a good time-marker for the top of the Pelsonian. In the Southern Tethys this species ranges up into younger beds and still in the Cordevolian the very similar *N. postkockeli* occurs (KOZUR, 1993). Also the other conodonts are not very diagnostic. An early juvenile *Paragondolella* (Pl. 1, Fig. 6) cannot be determined, because in these early juvenile stages the gondolellid conodonts are not well distinguishable. It could be an early juvenile *P. trammeri*, but also an early juvenile *P. eotrammeri*, the age of which is not clear because of the strong condension in the Epidauros section. *P. ? pridaensis posteroacuta* is probably an advanced *P. pridaensis*, because this subspecies is also present in the Ladinian of Nevada. If this is true, the fauna of sample WWS must be younger than the *Paraceratites cricki* beds and (because of the radiolarian fauna) older than the base of the *Reitzi* - Zone. This would indicate a latest Illyrian age. However, because the forerunner of *P. ? pridaensis* is unknown, it cannot be totally excluded that *P. ? pridaensis posteroacuta* is a primitive *P. pridaensis*. Typical *Paragondolella* n. sp. ex gr. *excelsa* that are dominant in sample WWS are known from the Lower Ladinian of Japan, but the whole range of the species is unknown. Thus, for the moment a latest Illyrian age is most probably for this sample that has an rather unusual species composition, perhaps predominantly forms that lived in a fissure.

6. Conclusion

The conodont fauna derived from pelagic limestones of the Loibl Formation, containing *Paragondolella trammeri, P. alpina,* advanced *P. excelsa, Neogondolella cornuta ladinica, N. mesotriassica, N. longa, N. balkanica* and already primitive *Budurovignathus*, points to Early to Late Fassanian age.

Early Fassanain age is also indicated by the radiolarian fauna from one locality (Weiße Wand Member of the Loibl Formation at the

Weiße Wand; KRAINER & MOSTLER 1992, KRAINER & MOSTLER in prep.) and by ammonites from red limestones exposed along the Zelenica forest road (BAUER 1980).

Red fissure fillings in the uppermost Contrin Formation at the Weiße Wand containing *Nicorella kockeli* may be of latest Illyrian age.

Late Illyrian age is also reported from red pelagic limestones from the peak of the Zeller Prapotnik mountain by BAUER (1984) due to the occurrence of *Kellnerites* sp.

The conodont fauna derived from the Buchenstein Formation is of Fassanian (section Zimpasser Gupf west) and Late Langobardian age (section Zimpasser Gupf north), the latter indicated by *Budurovignathus mungoensis*.

This is in good conformity with the radiolarian fauna obtained from samples of the Buchenstein Formation from other localities in the Karawanken Mountains which also points to an age ranging from the Late Fassanian to the Late Langobardian.

This indicates that the volcanic rocks and clastic sediments between the Loibl Formation and the Buchenstein Formation were formed during a very short time span within the Fassanian.

Acknowledgements

We are very grateful to the Jubiläumsfonds of the Oesterreichische Nationalbank (Project no. 3935) for the financial support of this study.

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submitted: January 21, 1994 accepted: February 5, 1994

Explanation of Plates

Plate 1

All figured specimens, except Fig. 22, have been derived from sample WWS, a fissure filling of red pelagic limestones (Weiße Wand Member of the Loibl Formation) in the underlying platform carbonates (Contrin Formation) of the section Weiße Wand, W Loiblpass. Uppermost Illyrian (?), according to the radiolarian fauna somewhat older than the base of the *R. reitzi* - Zone.

Figs. 1–5, 11–19: *Paragondolella* n. sp. ex gr. *excelsa* MOSHER, Figs. 1-3: lateral, oblique lower and upper views of one specimen, Figs. 11, 14, 17: lateral, upper and lower views of a specimen with partly damaged platform, Figs. 12, 15, 18: lateral, upper and lower views of a juvenile specimen, Figs. 13, 16, 19: lateral, upper and lower views of a specimen with partly damaged platform and carina; rep.- no. KKM 1993 III-2, Figs. 1, 3–5: x 130, Fig. 2: x 120, Figs. 11–19: x 100.

Figs. 6, 9: Early juvenile *Paragondolella* probably of the *P. trammeri* group, Fig. 6, lateral view, Fig. 9: somewhat oblique lower view; x 160, rep.-no. KKM 1993 III-3.

Figs. 7, 8, 10, 20, 21, 24: *Paragondolella ? pridaensis posteroacuta* n. subsp., Figs. 7, 8, 10: lateral, upper and lower views of holotype, x 110, rep.-no. KKM 1993 III-4; Figs. 20, 21, 24: lateral, lower and oblique upper view of a broken specimen (anterior part missing), x 130, rep.-no. KKM 1993 III-5.

Fig. 23: *Nicoraella kockeli* (TATGE), lateral view, x 160, rep.-no. KKM 1993 III-6.

Fig. 22: *Neogondolella balkanica* BUDUROV & STEFANOV, lateral view of a broken specimen (anterior part missing). Cusp terminal, but not fused with the platform margin, sample ZE 6 a, red pelagic limestones (Loibl Formation) at the Zeller Prapotnik (E of Loiblpass), upper Fassanian, x 80, rep.-no. KKM 1993 III-7.

Plate 2

All figured specimens are from sample PR 1, outcrops at the Zeller Prapotnik E of Loiblpass (Loibl Formation). The fauna displays a distinct Fassanian character, but their position inside the Fassanian cannot be determined (surely below the upper Fassanian *Budurovignathus truempyi* - Zone). With exception of figures 1, 2, 4, 5 and 7, 8 all specimens are broken (mostly crashed during the sticking), but the posterior half is well suitable for determination of Ladinian *Neogondolella*, at least for recognition, whether Illyrian or Fassanian forms are present.

Figs. 1, 4, 7: Lateral, upper and lower views of a juvenile form (*constricta* stage) of a slender, long *Neogondolella*, x 120, rep.-no. KKM 1993 III-8. An exact determination of the species is impossible in such juvenile forms. However, such long, slender, little arched juvenile forms do not occur before the base of the *Reitzi* - Zone. They are world-wide distributed and in deep pelagic rocks (radiolarites) beside juvenile *Paragondolella* often the only conodonts, because in such facies adult gondolellid conodonts are rare. In restricted pelagic environments near the ecologic tolerance boundary for platform conodonts juvenile *Neogondolella* are the only platform conodonts. If the base of the Ladinian is placed at the base of the *R. reitzi* - Zone, then the Ansisian-Ladinian boundary can be well determined by the first appearance of such long, slender juvenile *Neogondolella* in conodont faunas from all these environments, that are mostly free of ammonoids. If we use the base of the *Nevadites* fauna or the base of the *E. curionii* - Zone as base of Ladinian, then all these faunas can be only assigned as Illyrian to Fassanian faunas, because these long, slender juvenile *Neogondolella* dominate all neogondolellid faunas from the base of the *Reitzi* - Zone up to the top of the Fassanian.

Figs. 2, 5, 8: *Paragondolella* cf. *alpina* (KOZUR & MOSTLER), juvenile specimen with unusually little arching of the unit, x 140, rep.-no. KKM 1993 III-9.

Figs. 3, 6, 9: *Neogondolella balkanica* BUDUROV & STEFANOV, typical specimen with platform brim and prominent, broad, conical cusp, x 100, rep.-no. KKM 1993 III-10.

Figs. 10, 11, 13, 14, 16, 17: Juvenile stages (*constricta* stage) of *Neogondolella* sp., Fig. 10, 13, 16: x 120, rep.-no. KKM 1993 III-11, Fig. 11, 14, 17: x 150, rep.-no. KKM 1993 III-12. Broken juvenile stages of Illyrian and Fassanian *Neogondolella* are in general indeterminable in species level.

Figs. 12, 15, 20: *Neogondolella mesotriassica* (KOZUR & MOSTLER), transitional form to *N. cornuta ladinica* n. subsp., x 100, rep.-no. KKM 1993 III-13.

Figs. 18, 21, 22: *Neogondolella longa* BUDUROV & STEFANOV, lateral, upper and lower view of a late juvenile modified *constricta* stage (*'pseudolonga'* stage), x 130, rep.-no KKM 1993 III-14.

Figs. 19, 23, 24: *Paragondolella trammeri* (KOZUR), upper, lateral and oblique lower view of a juvenile specimen, x 150, rep.-no. KKM 1993 III-15.

Plate 3

The specimens on Figs. 1–18, 19, 22, 25 have been derived from sample ZE 6 a (outcrops along the Zelenitza forest road, W of Loiblpass). Because of the occurrence of primitive *Budurovignathus*, this sample can be placed into the upper Fassanian. The specimens on Figs 20, 23, 26–29 have been derived from sample PR 1 (see Pl. 2). The specimen on figs. 21, 24 has been derived from sample WW 3 (Weiße Wand section W Loiblpass). The fauna of this level is extremely poor in conodonts, but belongs probably to the Lower Ladinian.

Figs. 1, 4, 7, 19, 22, 25: *Budurovignathus gabriellae* n. sp., x 120, Figs. 1,4, 7: upper, lateral and lower view of holotype, rep.-no. KKM 1993 III-1, Figs. 19, 22, 25: upper, lateral and lower views of a paratype, rep.-no. KKM 1993 III-16.

Figs. 2, 5, 8, 11, 14, 17: *Neogondolella cornuta ladinica* n. subsp., Figs. 2, 5, 8: upper, lateral and lower views of holotype, x 100, rep.-no. KKM 1993 III-17, Figs. 11, 14, 17: upper, lateral and lower views of a broken specimen, consisting of the posterior half of the unit, x 86, rep.-no. KKM 1993 III-18.

Figs. 3, 6, 9, 27-29: *Neogondolella balkanica* BUDUROV & STEFANOV, Figs. 3, 6, 9: upper, lateral and lower views of a broken specimen consisting of the posterior half of the unit, x 110, rep.-no. KKM 1993 III-19, Figs. 27–29: lateral, upper and oblique lower views of an unusual short specimen with very long main cusp, representing perhaps a new subspecies, x 80, rep.-no. KKM 1993 III-20.

Figs. 10, 13, 16: *Paragondolella trammeri* (KOZUR), upper, lateral and oblique lower views of a juvenile specimen, x 150, rep.-no. KKM 1993 III-21.

Figs. 12, 15, 18: *Gladigondolella* cf. *malayensis* NOGAMI, morphologically transitional to *G. tethydis* (Huckriede), upper and lateral views, x 80, rep.-no. KKM 1993 III-22.

Fig. 20: *Neogondolella* sp., early juvenile stage (*constricta* stage), upper view, x 140, rep.-no. KKM 1993 III-23.

Figs. 21, 24: Eccentric *Neogondolella* sp. aff. *N. transita* (KOZUR & MOSTLER), upper and lower view of a broken specimen, x 100, rep.-no. KKM 1993 III-24.

Figs. 23, 26: *Neogondolella* sp., slender long juvenile form of *constricta* stage, transitional to *mombergensis* stage, rep.-no. KKM 1993 III-25, fig. 23: upper view, x 110, Fig. 26: lateral view, x 115.

Plate 4

Figs. 1, 2: *Budurovignathus mungoensis* (DIEBEL), upper view, sample ZG 2, Langobardian, *B. mungoensis* A.-Z., section NW Zimpaserkogel (SW Eisenkappel), x 100, rep.-no. 15–3/28/5/1993.

Figs. 3–5: *Neogondolella longa* BUDUROV & STEFANOV, adult specimen, sample Z 14, section W Zimpaserkogel (SW Eisenkappel), Fassanian, rep.-no. 6-13/27/5/93, Fig. 3: lower view, x 100, Fig. 4, upper view, x 100, Fig. 5: lateral view, x 80.

Fig. 6: *Paragondolella excelsa excelsa* MOSHER, lateral view, x 100, sample Z 5, section W Zimpaserkogel (SW Eisenkappel), Fassanian, rep.-no. 1-5/27/5/93.

Figs. 7–9: *Mesogondolella mesotriassica* (KOZUR & MOSTLER), oblique lateral, upper and lower views of an broken adult specimen (posterior part preserved), posterior platform ridge partly with small teeth, x 100, sample PR 1 (see Pl. 2), rep.-no 7-13/27/5/93.

Figs. 10, 11: *Paragondolella inclinata* (KOVÁCS), upper and lateral views of a juvenile specimen, sample ZG 2 (see Figs. 3–5), x 100, rep.-no. 16-3/27/5/93.

Figs. 12, 13, 15: *Neogondolella constricta* (MOSHER & CLARK), upper, lower and lateral views of a medium ontogenetic stage, carina of *constricta* type, x 100, sample SD 1/1, western flank of Gösing Mt., near Siedig Eastern Alps (Austria), Illyrian *N. constricta* Zone, rep.-no 7–3/27/5/93.

Figs. 14, 17, 20: *Neogondolella constricta* (MOSHER & CLARK), upper, lower and lateral view, main cusp indistinct, basal cavity almost terminal with respect to the keel end, x 100, sample SD 1/1 (see above), rep.-no. 4-3/27/5/93.

Figs. 16, 18, 19, 21: *Neogondolella cornuta* BUDUROV & STEFANOV, lateral view of different ontogenetic stages, only the medium ontogenetic stages and adults can be subdivided in subspecies level, x 80, sample P 7, Karwendel, condensed upper Illyrian and lower Fassanian, Fig. 16, juvenile stage (*constricta* stage), inseparable from the most other Illyrian and Fassanian *Neogondolella* species, rep.-no. 21-6/27/5/93, Fig. 18: late juvenile stage of *constricta* type, transitional to *mombergensis* type (penultimate tooth is the cusp, but not much larger than the denticles in front of it), rep.-no. 20-6/27/5/93, Fig. 19: medium ontogenetic stage, *mombergensis* type without cusp, rep.-no. 18-6/27/5/93, Fig. 21: adult specimen of a primitive *N. cornuta ladinica* with distinct terminal cusp, fused with the posterior platform margin, its anterior margin is posteriorly inclined, its posterior margin is erect, rep.-no. 12-6/27/5/93.

Plate 1

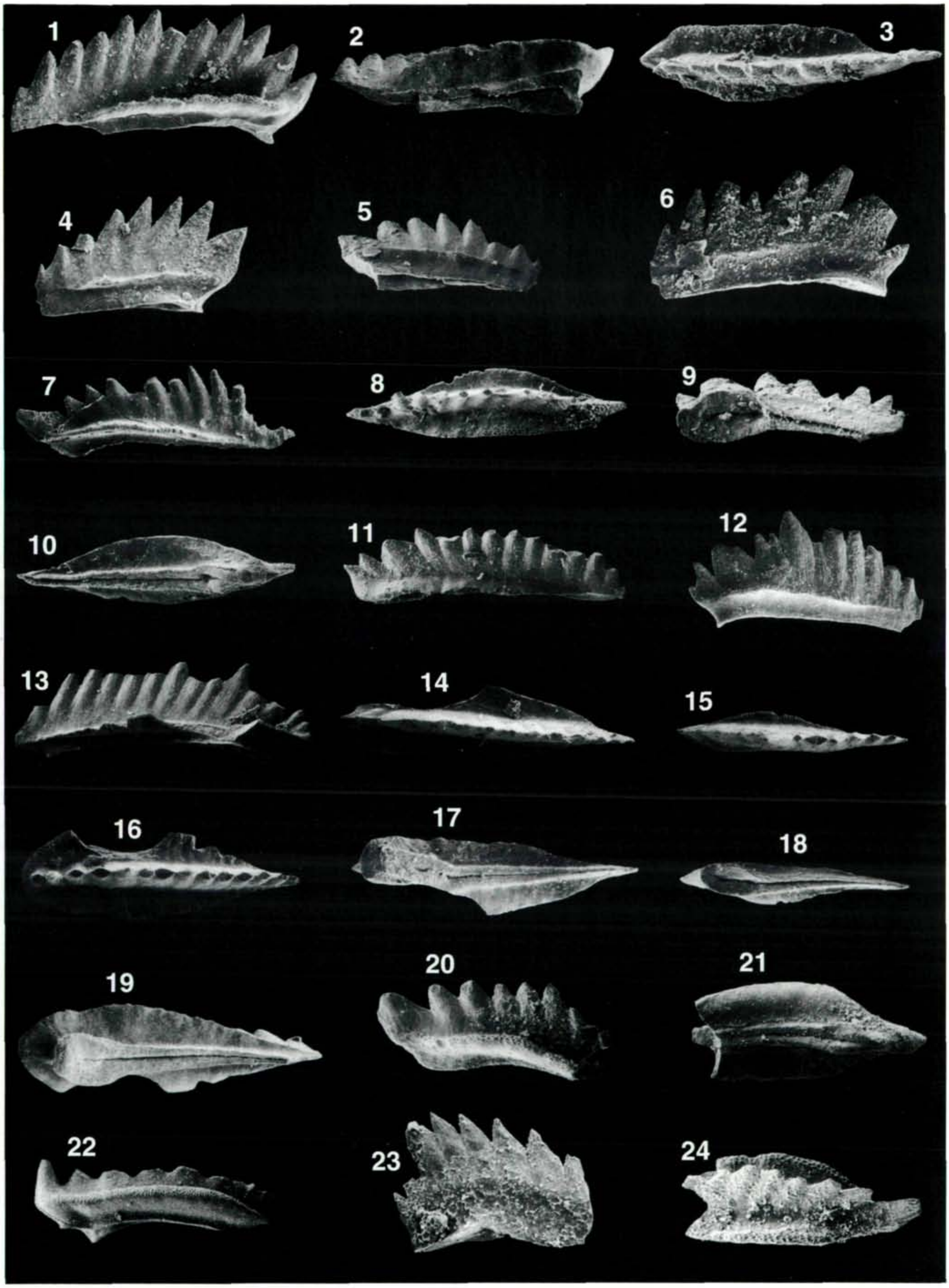

Plate 2

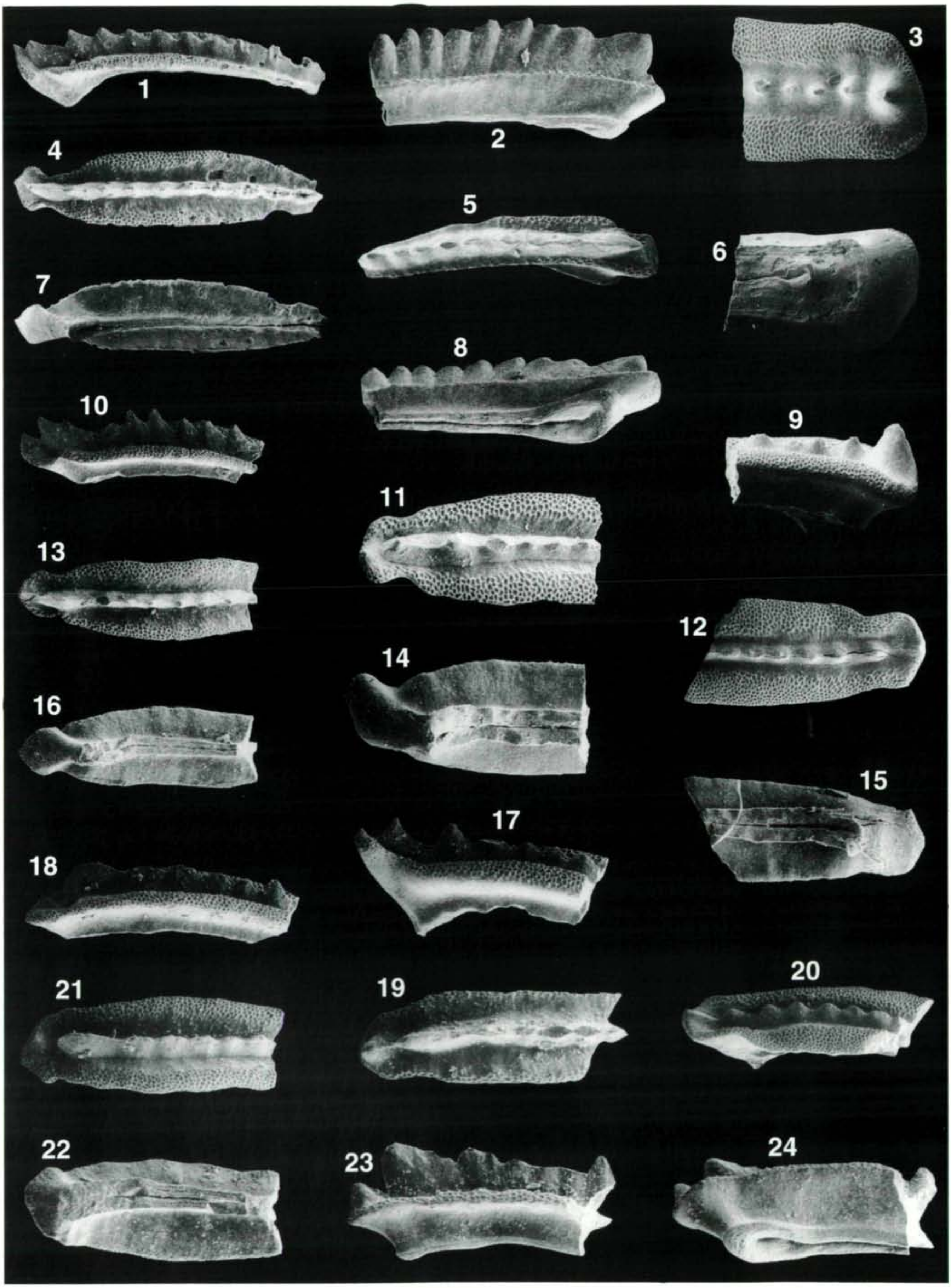

Plate 3