A brachiopod fauna from the Spielkogel (Muerztaler Alpen, Styria): New data concerning the stratigraphic emplacement of *Tetractinella* (?) *dyactis* (BITTNER)

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Abstract

Thanks to a large new collection of *Tetractinella* (?) *dyactis* (BITTNER), not only was the specific description of this form redefined and enlarged by several important details, but also its stratigraphic emplacement (Cordevolian) determined.

Zusammenfassung

An Hand einer reichen Neuaufsammlung von *Tetractinella* (?) *dyactis* (BITTNER) konnte nicht nur die artliche Diagnose dieser Form neu gefaßt und um wichtige Details erweitert werden, sondern es wurde auch die Frage nach der stratigraphischen Stellung (Cordevol) dieser Art geklärt.

1. Introduction

In 1891 BITTNER found a spiriger-like species of brachiopods from the Preinerwand (southern flank of the Rax) which resembled no other species known at the time.

A year later, he described this species as *Spirigera dyactis* nov. spec. (1892:33). However, no exact indication of the find was made. Firstly, because the fauna did not come from an outcrop but from a block which had fallen off the Preinerwand, and secondly because the age of the Rax plateau limestone, from which the find was taken, was considered either as Middle Triassic (GEYER) or as Upper Triassic (BITTNER). Nor were any stratigraphical indications to be obtained from the accompanying fauna of *Sp. dyactis*, since one part of the brachiopods showed a close relationship to faunas of the Dachstein limestone, and the other proved to be similar to species from St. Cassian (BITTNER 1892:35).

Following the mapping of the area of the Rosskogelscholle (upper Muerz valley, Styria), a study designed to clarify local stratigraphical conditions, the region around the Spielkogel was investigated more closely by one of the authors (Dr. R. LEIN). In this connection, the presence of a collection of brachiopods supposedly originating from the Spielkogel and found by an earlier worker (G. SCHMITZ) in the Institute of Geology, Vienna University, was made known to him by Prof. Dr. A. TOLLMANN, the head of the Institute. A further field trip resulted in the collection, close to the point indicated by SCHMITZ, of a large number of brachiopods from the eastern of the summit, which consists of Wetterstein limestone.

This fauna, which proved to be rich in individual brachiopods although generally restricted to a single species, was passed on to the other author (Dr. M. SIBLIK) for paleontological study; the majority of the finds were recognized as *Spirigera (Tetractinella* ?) *dyactis* BITTNER.

Since for the first time there is now available a statistically relevant amount of exactly classified material whose point of origin has been the object of geological mapping and analysis (LEIN), and also since the material seems to indicate a large spectrum of variation within the species, it seemed appropriate to begin a review of this species according to recent-day paleontological criteria (SIBLIK).

The described fauna is deposited in the collection of the Institute of Geology, Vienna University.

2. Geological and stratigraphical emplacement of the locality

The fossiliferous localities described below are both in rocks of highest tectonic position; one of them, the Preinerwand, as part of the Rax plateau, belongs to the

Schneeberg nappe. The Spielkogel, on the other hand, lies in a tectonically isolated outlier (Rosskogel outlier; see fig. 1) which, however, according to KRISTAN-TOLLMANN & TOLLMANN (1962) is tectonically equivalent to the Schneeberg nappe. Thus, both localities belong to paleogeographically closely related areas, even if we have to consider the depositional area of the Rosskogel outlier, some of whose rocks exhibit a tendency towards Hallstatt development, as having been much farther south that of the Schneeberg-Rax plateau (see HOHENEGGER & LEIN 1977: fig. 3).

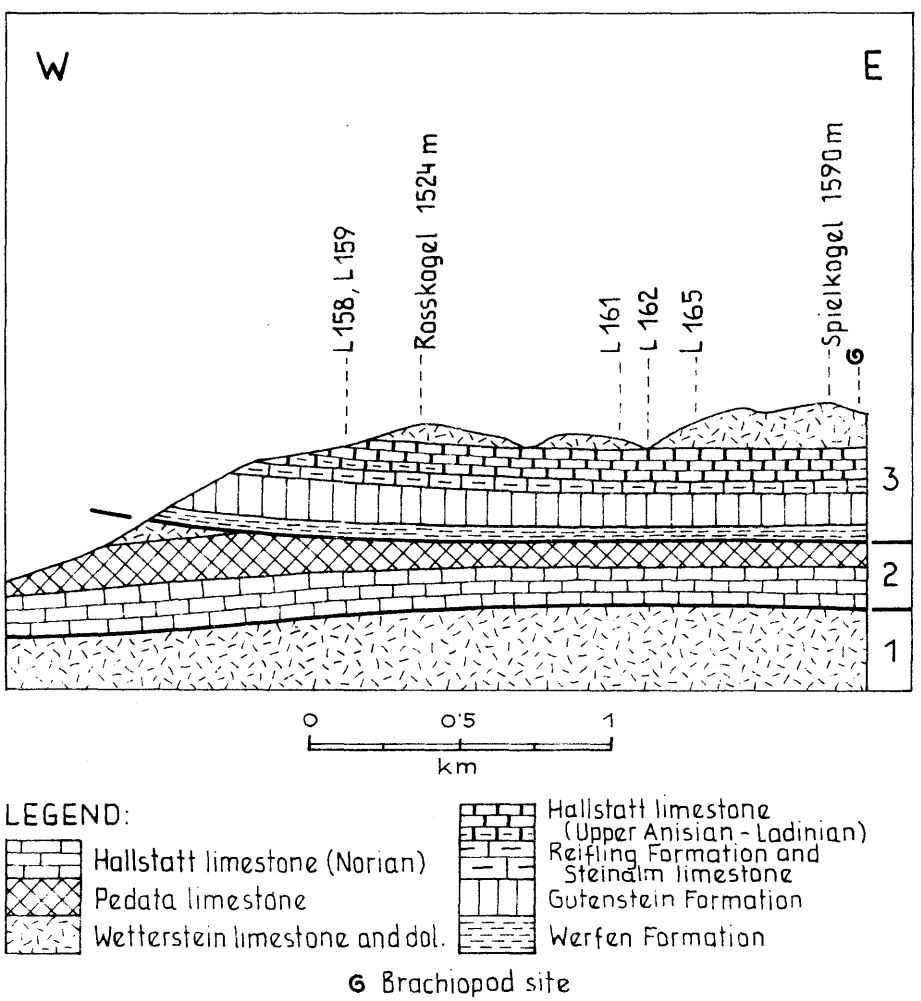

Fig. 1: Simplified cut through the Hinteralm plateau. The following main tectonic elements are represented in the structure of this massif: 1) The Muerzalpen nappe, containing here only Lower and Middle Triassic, 2) the inverted sequence of the imbricated Proles unit and 3) the Rosskogel outlier which contains the fossiliferous sites described in the text.

2.1 Spielkogel

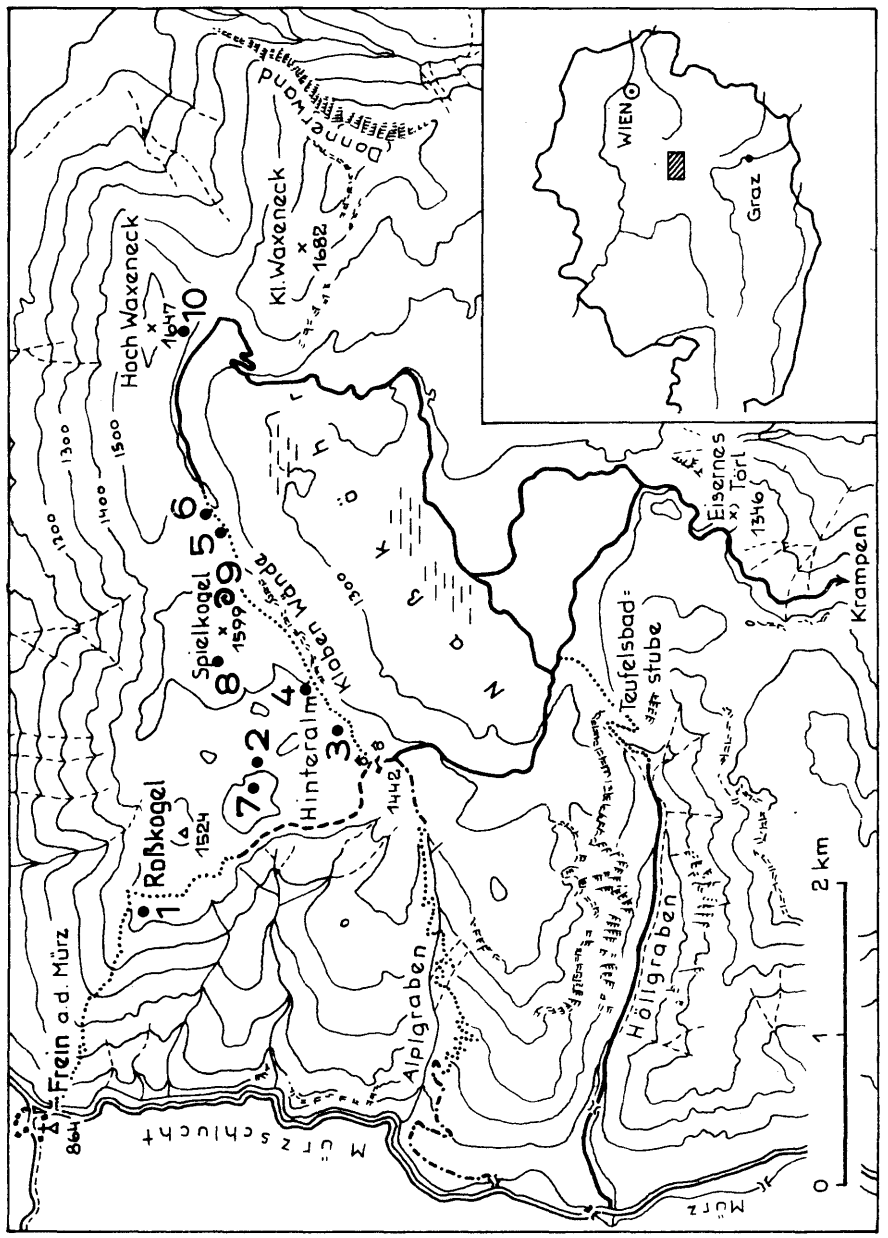

Fig. 2: Sketch showing the fossiliferous sites in the area of the Spielkogel (north of Hinteralm, Styria). Sample sites in the Hallstatt limestone: 1) L 158 – L 159, 2) L 162, 3) L 166 – L 167 and *Daonella faunule* of SCHMITZ, 4) L 168, 5) L 169, 6) L 170. Samples sites in the Wetterstein limestone: 7) L 161, 8) L165, 9) Site of brachiopod findings, 10) H 55.

The Rosskogel outlier, as already indicated by GEYER (1889) and CORNELIUS (1939: Pl. 3/section 5), consists of a sequence which begins with Werfen beds and ends with Wetterstein limestone, from the uppermost layers of which the brachiopods are to be found.

Since CORNELIUS, the presence of a Hallstatt-like limestone beneath the level of the Wetterstein limestone has also become known; it was named „Pseudo-Hallstatt limestone" by him.

Since it could not be expected that the Wetterstein limestone would contain sufficient useful data for the stratigraphical classification of the site where the brachiopods were found, the stratigraphical range of the underlying Hallstatt limestones was also studied so that at least the beginning of the Wetterstein development could be determined more exactly. For a better understanding of what follows, the sites of all samples which contained useful data for the classification of both formations are grouped in fig. 2.

2.11 Hallstatt limestone

The Hallstatt limestones are restricted to the southwestern and southeastern flanks of the Rosskogel plateau and rarely exceed an overall thickness of 30–40 m. At their base one finds well-bedded (3–7 cm), wavy-surfaced, greyviolet limestones, while the top consists mainly of reddish limestones of irregular bedding (10–60 cm). Locally the limestones show signs of intensive flaser formation caused by pressure, especially in the bottom parts, while there are absolutely no signs of subsolution. No chert was observed in the Hallstatt limestone sequence.

The microfacial structure, too, changes from bottom to top. At the bottom we find domination of (bio-) pelmicrites in whose matrix there are floating spheres of 0,2 mm maximum size (radiolarians?). Upper regions, on the other hand, consist of pure biomicrites with filamentary layers. In most cases signs of sedimentary layering structure have been effaced by strong bioturbation.

The Wetterstein development which overlies the Hallstatt limestone does not begin abruptly. A transitional zone several meters thick, consisting of limestones with a skeleton made up of large-grained reef detritus (with sponges), the cavities of wich are filled with red micrite of the Hallstatt limestone type, sometimes causes difficulties in mapping efforts to separate Hallstatt and Wetterstein limestone in the field.

While CORNELIUS (1939, 1952) defines the Middle Triassic Hallstatt limestone as a stratified link clearly separate from the Wetterstein limestone, and is followed in this by SCHMITZ (1960), who introduced the term „Klobenwand limestone" for these colored limestones, this nomenclatural definition is set aside by FLÜGEL & PETAK (1964) and FLÜGEL (1967). In any case these two authors have combined Hallstatt limestone and parts of the Wetterstein limestone under the name Klobenwand limestone. This error can be explained on the one hand by the wide transitional zone between Hallstatt and Wetterstein limestones and on the other hand by impregnation by Gosau sediments which caused secondary reddening of parts of the Wetterstein limestone, which was erroneously taken for Hallstatt limestone. In any event, the colospongia shown by FLÜGEL (1967, pl. 1) are definitely from the Wetterstein limestone.

Stratigraphical discussion:

The beginning of the Hallstatt limestone development can be determined by means of conodonts (predominance of *Gondolella excelsa* (MOSHER) along with *G. constricta* MOSHER & CLARK) as being definitely Upper Anisian. For the upper boundary of the Hallstatt limestone development the conodonts [e.g. sample L 167 with a pre-

dominance of *Gondolella foliata* (BUDUROV) along with *Epigondolella mungoensis* (DIEBEL) and *Gladiogondolella tethydis* (HUCKRIEDE)] show an Upper Ladinian age, which is confirmed by pelecypods *(Daonella indica* BITTNER) and can even be set precisely in the Upper Langobardian. The rare ammonites which are obtainable only with difficulty and are poorly preserved due to the absence of manganese coatings, also indicate an upper Ladinian age.

In any event, the stratigraphic range of the Hallstatt limestones described can be considered as from Upper Anisian to highest Ladinian, which finding is in complete agreement with indications from other occurrences of Hallstatt limestones which originally belonged to the northernmost edge of the Hallstatt trough and are now to be found scattered between the Gosaukamm and the Schneeberg.

Because of an error in conodont fauna determination, FLÜGEL & PETAK (1964, Tab. 2) described the Klobenwand limestones as Carnian. Later FLÜGEL (1967) attempted to supplement this original classification by claiming a Cordevolian age, besed on a sphinctonzoan fauna (occuring in the Wetterstein limestone!); this, however, was strictly contradictory to the range of the originally published conodont fauna with *G. abneptis* (= Upper Tuvalian–Norian).

Stratigraphically important fossil findings:

Ammonites:

L 169: Hinteralm plateau, path 350 m west-southwest of the Waxeneck hut; Hallstatt limestone, higher Upper Ladinian:
Joannites cf. *cymbiformis* (WULFEN), *Proarcestes* sp.

Pelecypods:

L 166: 250 m northeast of the Hinteralm huts, near the marked path; Hallstatt limestone (transitional zone), Ladinian:
Veldidenella sp.

L 166a: (SCHMITZ' material): 60 m northeast of the Hinteralm huts; Hallstatt limestone (transitional zone), Upper Langobardian:
Daonella indica BITTNER, *Daonella* cf. *dieneri* ALMA.

L 169: Hinteralm plateau, path 350 m west-southwest of the Waxeneck hut; Hallstatt limestone, Ladinian:
Daonella cf. *caudata* FRAUENF.

Conodonts:

L 158: West-northwest of the Rosskogel, 20 m east-southeast of the marked path; Hallstatt limestone, Lower Ladinian:
Gladigondolella tethydis (HUCKR.), *Gondolella navicula* HUCKR.; compound forms of the *Gladigondolella tethydis* multi-element, *Metaprioniodus suevica* (TATGE), *Neohindeodella triassica* (MÜLLER).

L 159: Path west-northwest of the Rosskogel; Hallstatt limestone, Lower Ladinian:
Gladigondolella tethydis (HUCKR.), *Gondolella excelsa* (MOSHER); compound forms of the *Gladigondolella tethydis* multi-element, *Metaprioniodus suevica* (TATGE).

L 162: Hill 250 m south-southeast of the Rosskogel; Hallstatt limestone, Langobardian:
Gladigondolella tethydis (HUCKR.), *Gondolella constricta* MOSHER & CLARK, *G. excelsa* (MOSHER); compound forms of the *Gladigondolella tethydis* multi-element, *Metaprioniodus suevica* (TATGE), *Prioniodina muelleri* (TATGE).

L 167: Path 250 m northeast of the Hinteralm huts; Hallstatt limestone, Langobardian:
Epigondolella mungoensis (DIEBEL), *Gladigondolella tethydis* (HUCKR.), *Gondolella foliata* (BUDUR.); compound forms of the *Gladigondolella tethydis* multi-element.

L 168: Path 620 m east-northeast of the Hinteralm huts; Hallstatt limestone, Lower Ladinian:
Gladigondolella tethydis (HUCKR.), *Gondolella constricta* MOSHER & CLARK, *G. excelsa* (MOSHER), *G. navicula* HUCKR.; compound forms of the *Gladigondolella tethydis* multi-element.

L 170: Path 200 m west-southwest of the Waxeneck hut; Hallstatt limestone, Upper Anisian: *Gondolella excelsa; Cornudina tortilis* KOZUR & MOSTLER, *Enanthiognathus petraeviridis* (DIEBEL), *E. ziegleri* (DIEBEL), *Hibbardella magnidentata* (TATGE), *Metapriniodus suevica* (TATGE), *Neohindeodella triassica* (MÜLLER), *Prioniodina muelleri* (TATGE)

Foraminifera:

L 167: Path northeast of the Hinteralm huts; Hallstatt limestone, Langobardian: *Glomospirella* sp., *Trochammina almtalensis* KOEHN-ZANINETTI.

L 168: Path 620 m east-northeast of the Hinteralm huts; Hallstatt limestone, Lower Ladinian: *Nodosaria sinemuriensis* (TERQUEM), *Ophthalmidium tricki* (LANGER).

2.12 Wetterstein limestone

Although the exact thickness of the Wetterstein limestone overlying the Hallstatt limestone cannot be determined exactly since its highest parts have been removed by erosion, a minimum thickness of 150 m is certain. The brachiopod fauna is from the upper part of this sequence.

The medium grey, mainly unbedded limestones consist for the most part of reef detritus. Calcisponges are not rare, but their state of preservation is usually deficient, due to spotty dolomitization of the Wetterstein limestone.

Stratigraphical discussion:

The stratigraphical range of the Wetterstein limestone is well known thanks to conodont faunas. The lowest parts, such as the foot of the Hochwaxeneck [sample H 55 with *Gladigondolella malayensis* NOGAMI and *Gl. tethydis* (HUCKR.)] still belong to the uppermost Langobardian. The higher reaches, amongst which is the Spielkogel with the brachiopod fauna, show that they belong to the lowermost Carnian (Cordevolian) by reason of the appearance of *Gondolella polygnathiformis* BUDUROV & STAFANOV.

The sphinctozoan genera of the Klobenwand described by FLÜGEL (1967:63) are also a part of the classical fauna of St. Cassian, which is a further indication of Cordevolian age.

Stratigraphically important fossil findings:

Conodonts:

H 55: Southwestern foot of the Hochwaxeneck, 1530 m above sea-level; Wetterstein limestone, Upper Langobardian:
Epigondolella hungarica (KOZUR & VEGH), *Gladigondolella malayensis* NOGAMI, *Gl. tethydis* (HUCKR.). *Gondolella excelsa* (MOSHER); compound forms of the *Gladigondolella tethydis* multi-element, *Lonchodina posterognathus* (MOSHER).

L 161: Hill 250 m south-southeast of the Rosskogel; Wetterstein limestone, Cordevolian: *Gondolella polygnathiformis* BUD. & STEF.; *Enanthiognathus ziegleri* (DIEBEL), *Neohindeodella triassica* (MÜLLER).

L 165: Area of the peak of the Spielkogel; Wetterstein limestone, Cordevolian: *Gondolella polygnathiformis* BUD. & STEF.; *Enanthiognathus ziegleri* (DIEBEL), *Neohindeodella triassica* (MÜLLER).

Brachiopods:

L 165a: Slightly below the peak of the Spielkogel (corresponds to SCHMITZ' site); Wetterstein limestone, Cordevolian:
Caucasorhynchia aff. *altaplacta* BÖCKH, *Tetractinella* (?) *dyactis* BITTNER.

Sponges:

According to Dr. B. SENOWBARI-DARYAN (University of Erlangen), to whom we sent our collected material for determination, the sponge fauna consists mainly of Inozoa. The following sphinctozoa were described by FLÜGEL (1967) from the area of the Klobenwand:
Amblysyphonella n. sp. A, *Dictyocoelia manon minor* H. FLÜGEL, *Colospongia* n. sp. aff. *dubia* (MÜNSTER).

2.2 Preinerwand (Rax)

In view of the successful proof of the Cordevolian age of the *Tetractinella dyactis* faunule of the Spielkogel, the question of the stratigraphical position of the type-locality of this species arises.

The above-mentioned *T. dyactis* was first discovered by BITTNER (1891:57) in rocks of the Preinerwand and described as a new species in 1892. The site of the finding (= type locality) cannot be exactly determined from BITTNER's fragmentary indications but one is surely not wrong in assuming it to be in the upper reaches of the Preinerwand.

The emplacement of this site has always been the subject of diverging opinions. BITTNER himself (1890:301–302) placed the limestones of the locality – in analogy with what he assumed to be similar sections in the Hochschwab area – in the Upper Triassic, while GEYER (1889) described these rocks as Wetterstein limestones (= Middle Triassic). Neither of these two scientists had any conclusive fossil data to support their theories. It was CORNELIUS (1937) who, on the basis of a rich dasycladacean flora, was able to demonstrate a Middle Triassic age for these limestones.

Meanwhile, however, we know not only that many dasycladacean species, contrary to earlier assumptions, have a larger stratigraphical range (for which reason many classifications based only on dasycladacean appear due for revision), but also that the Wetterstein limestone development in some parts of the Eastern Calcareous Alps has continued well into the Upper Triassic without interruption by siliciclastic Lunz or Raibl Beds. In any case, it has been proven from the evidence of ammonites and halobiids that the upper 100 m of the Schneeberg, built up in the same way as the Rax plateau, although also formed by algal limestones (with a marked lithological similarity to Wetterstein limestone), already belong to the Upper Carnian (and maybe even to the Lower Norian). The same assumption may be made for the Rax, even if at present there is no indication in this direction. However, even if this hypothetical case should be verified and the uppermost parts of the Rax plateau belong to the Tuvalian, BITTNER's type locality from the Preinerwand must be in the Cordevolian–Julian part of this massif.

We are therefore able, without relying on new stratigraphical data in the case of the Preinerwand, to assume that the type locality *T. dyactis* (Preinerwand, Rax) and the new locality of this species (Spielkogel, Muerztal Alps) belong for all practical purposes to one and the same level in the upper Wetterstein limestone and that both are of Cordevolian age.

3. Paleontological description of the Spielkogel brachiopod fauna

Description of brachiopods:

Order: Spiriferida WAAGEN, 1883
Superfamily: Athyridacea M'COY, 1844
Family: Spirigerellidae GRUNT, 1965
Genus: Tetractinella BITTNER, 1890 a
Tetractinella (?) *dyactis* (BITTNER, 1892)
(Pl. 3, figs. 1–5; Text-figs. 3–5)

1892 *Spirigera dyactis* nov. spec. – BITTNER, p. 33, pl. 2, figs. 8–11.

Type specimen: The lectotype here selected is the well-preserved specimen figured by BITTNER (1892: pl. 3, fig. 10) and coming from Preinerwand, Raxalpe. It is deposited in BITTNER's collection in the Geologische Bundesanstalt in Vienna (Mu-

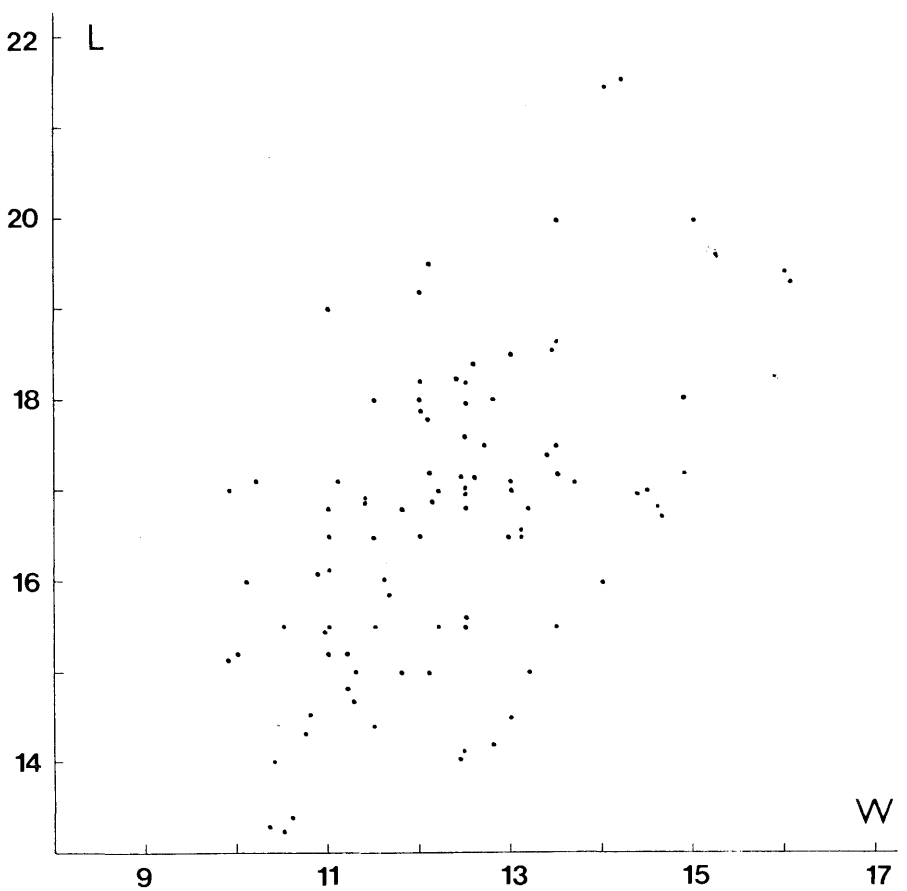

Fig. 3: *Tectractinella* (?) *dyactis* (BITTNER); Spielkogel. Scatter diagram: L – length, W – width; in mm.

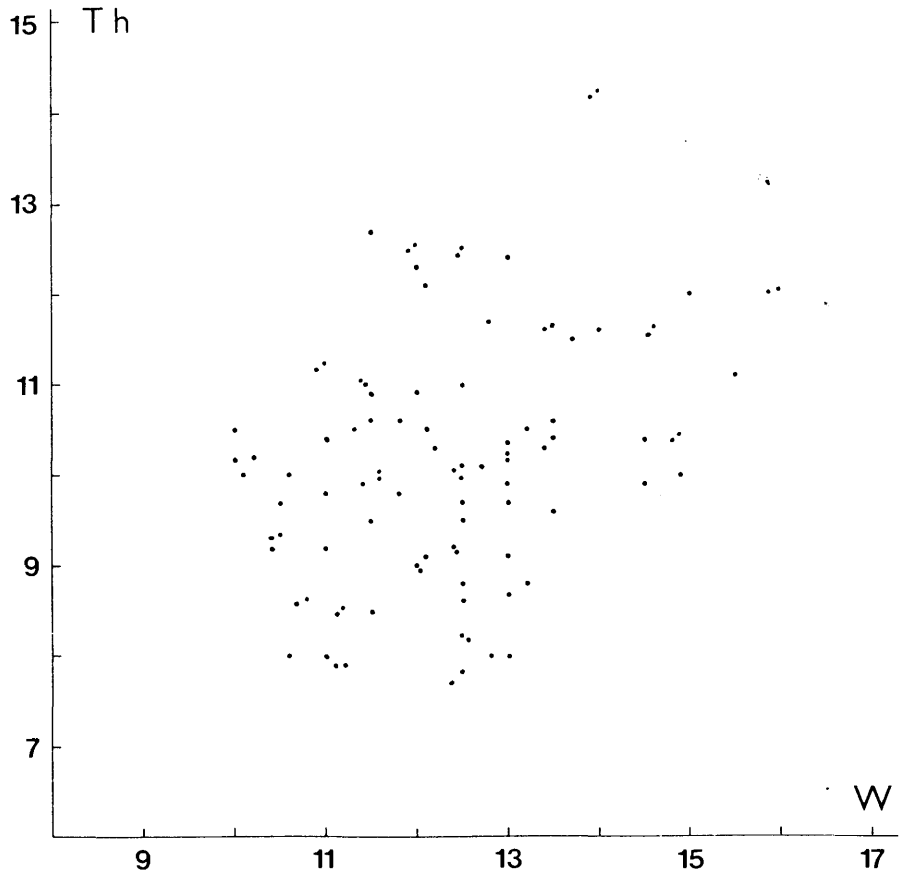

Fig. 4: *Tetractinella* (?) *dyactis* (BITTNER); Spielkogel. Th – thickness, W – width; in mm.

seum). Dimensions of lectotype: Lenth 13,1 mm, thickness 7,3 mm, width 10,7 mm.

M a t e r i a l : 138 partly fragmentary specimens preserved as internal moulds with shell remains.

D e s c r i p t i o n : Medium sized biconvex shells, up to 21, 5 mm long, 16,0 mm wide and 14,0 mm thick. The large range of variation within this species includes forms which are trigonal to subpentagonal in outline, and regularly convex or carinate in transverse profile. There is neither a well-developed dorsal fold nor a ventral sulcus present. Anterior commissure plane is and emarginate in some specimens. Shell surface smooth or with 2 cusplike plications (ribs) in corresponding positions on each valve, both types being connected by a series of variants showing more or less tendency to ribbing. Growth-lines usually to be seen near the commissure. Pedicle umbo high, strongly developed. Shell impunctate. Muscle-scars and mantle canals have not been observed in specimens examined.

Pedicle valve with short subparallel dental lamellae and relatively narrow lateral ca-

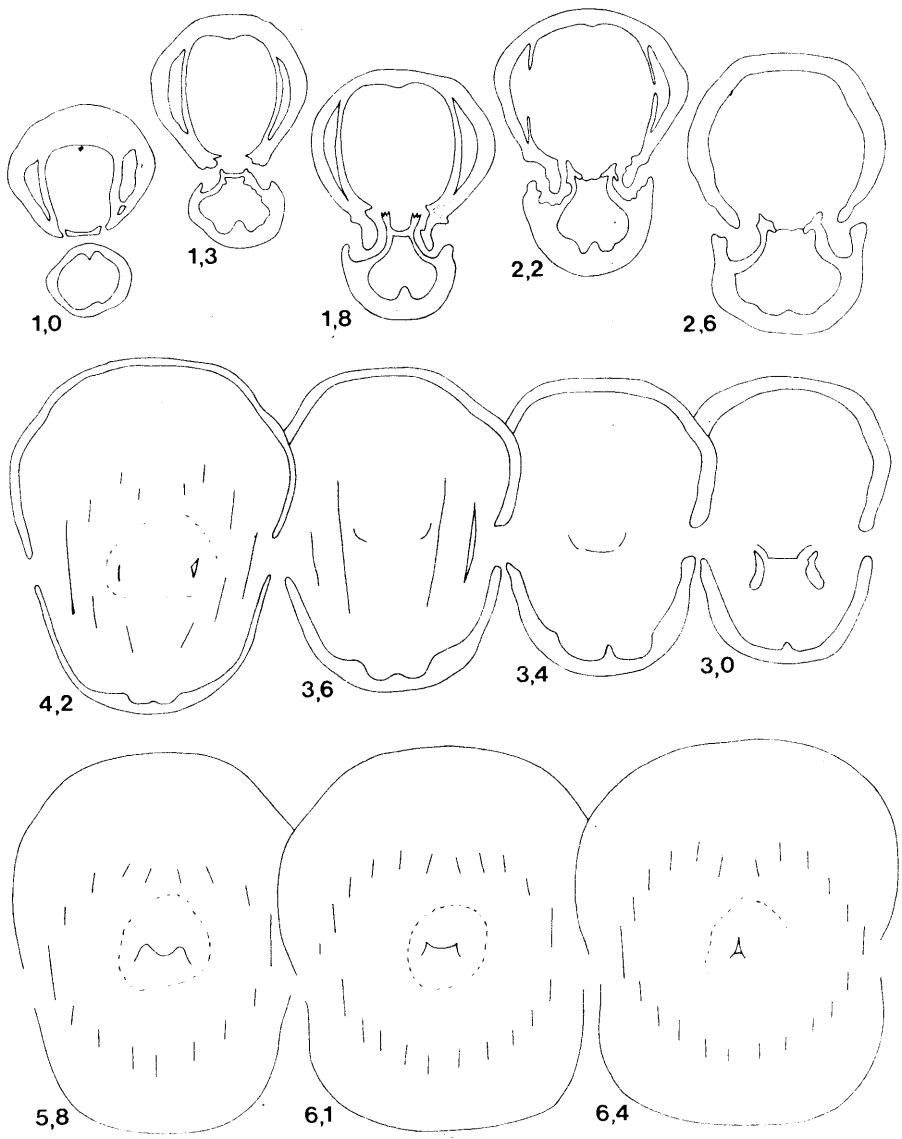

Fig. 5: *Tetractinella* (?) *dyactis* (BITTNER); Spielkogel. Transverse serial sections through the posterior part of the shell.
Original length ca. 17,5 mm. The last four sections showed partial recrystallisation of the shell interior.
Numbers indicate the distance in mm. from brachial umbo.
Magnif. x 5 approx.

vities. The hinge-teeth are simple in shape and lacking in crenulation. The lateral denticula usually small (one specimen showed much stonger development of both the teeth and denticula in comparison with text-fig.). In the brachial valve there is a relatively thin cardinal plate without any posterior perforation. Bilobed cardinal process present. The sockets are large, without crenulation and with strongly developed outer socket-ridges. Dorsal septum lacking. A low septoidal ridge visible posteriorly (a high dorsal myophragm was ascertained in 1 specimen). Crura diverge towards the pedicle valve. Saddle-shaped jugum present. Spiralia with few volutions directed laterally. Secondary calcite infilling the interior made the more detailed elucidation of the internal characters impossible in specimens sectioned.

R e m a r k s : The species under consideration shows an extremely high variation in external characters. About 20 specimens of our material agree well externally with those figured by BITTNER (1892) from Raxalpe. They are trigonal in outline, emarginate and with 2 narrow, sharpened plications on each valve. However, most of our material is represented by subpentagonal, more rounded, smooth specimens. Such differences might constitute an argument in favour of taxonomic separation. Nevertheless the fact that both these extreme types are linked by a complete range of morphologically intermediate variants, makes any separation groundless. Moreover, the serial sections made of both „ribbed" and smooth variants have not shown any remarkable differences in the internal characters.

The species under consideration is tentatively referred to as *Tetractinella* BITTNER. This determination is based on the external morphology of „ribbed" variants, following BITTNER's opinion (1892:33). The smooth variants that represent most of our material remind one of the genera *Dioristella* BITTNER, 1890 a and *Spirigerellina* DAGYS, 1974 that include a series of both externally and internally similar species. Because the taxonomy of the Alpine Triassic *„spirigerids"* is greatly in need of elucidation and revision and no more recent data of their internal structures is available, the definite generic attribution of *„dyactis"* is, for the present, not considered possible.

Order: Rhynchonellida KUHN, 1949
Superfamily: Rhynchonellacea GRAY, 1848
Family: Wellerellidae LIKHAREW, 1960
Genus: Caucasorhynchia DAGYS, 1963
Caucasorhynchia aff. *altaplecta* (BÖCKH, 1873)
(Pl. 31, fig. 6, Text-fig. 6)

M a t e r i a l : 5 specimens preserved as fragmentary and deformed internal molds.

D e s c r i p t i o n : The medium sized rhynchonellids of widely subpentagonal outline with the maximum-width situated near the mid-length. Brachial valve convex with moderately well-developed median fold. Pedicle valve less convex with shallow sulcus. Large planareas situated posterolaterally and developed equally on both valves. Beak straight with acute apical angle. Anterior commissure uniplicate with trapezoidal linguiform extension. Each of the valves with 6–8 rounded costae (4 of them confined to the anterior margin of the fold). The inequality of the ribs and bifurcation of the median costa distinct. Posterior parts of the valves smooth.

Pedicle valve interior with long subparallel dental lamellae, non-crenulated teeth and distinct lateral denticula. Brachial valve interior with flat, fused hinge-plates,

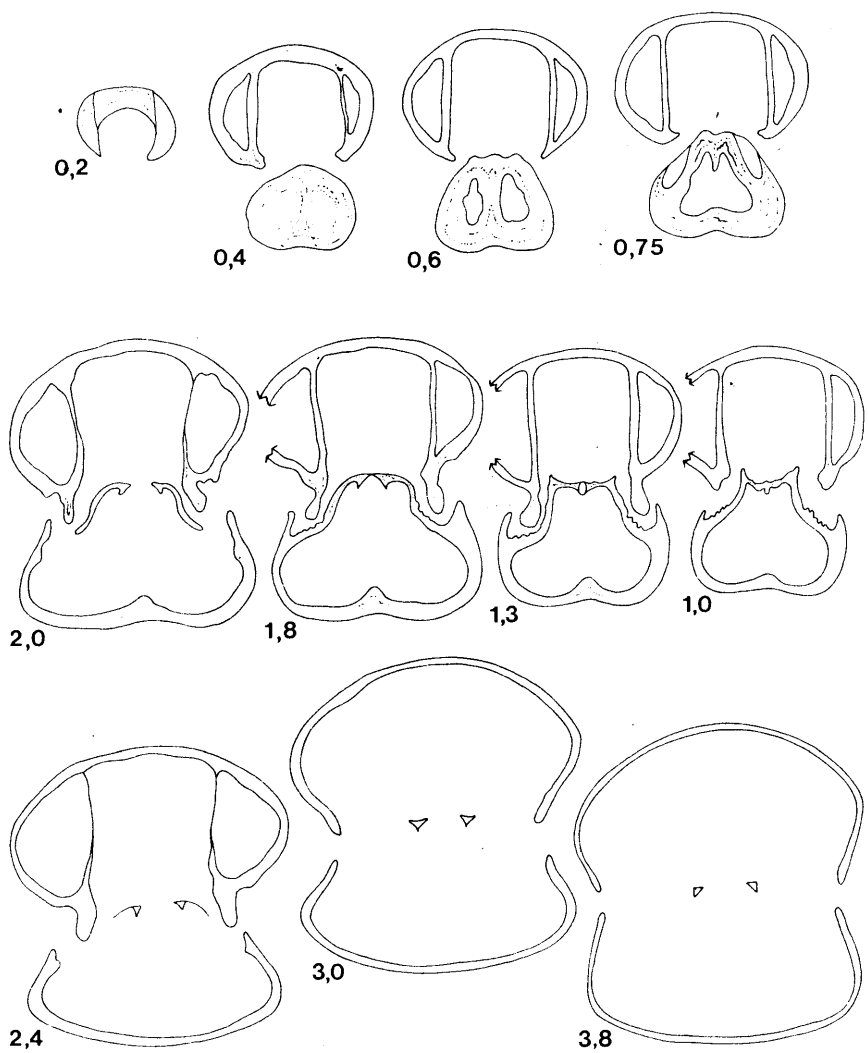

Fig. 6: *Caucasorhynchia* aff. *altaplecta* (BÖCKH); Spielkogel. Transverse serial sections. Original length 17,4 mm. Numbers indicate the distance from pedicle umbo. Magnif. x 5 approx.

with well-developed outer and inner socket ridges, and with deep, crenulated sockets. There is no septalium developed. Septoidal ridge very short. Radulifer crura posteriorly trigonal in cross-section.

R e m a r k s : The specimens show considerable external and internal resemblances to *Caucasorhynchia altaplecta* (BÖCKH, 1873) from the Hungarian Middle Anisian. They differ, however, apart from the larger dimensions of the shell, in having much less convexity of the pedicle valve, a straight beak and higher plication. Exer-

nally, our specimens agree well with *Decurtella* aff. *vivida* (BITTN.) figured by KOCHANOVA–MELLO–SIBLIK (1975) from the Ladinian-Cordevolian (?) strata of Slovakia. The later study of the internal characters showed, however, the presence of septalium and high dorsal septum in the Slovakian specimens. This enables me better to associate those specimens with *Volirhynchia* DAGYS, 1974 than with *Decurtella* GAETANI, 1966. Further comparisons are, for the present, made difficult owing to the scarcity of our better preserved specimens.

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Plate 31

Fig. 1– 5: *Teractinella* (?) *dyactis* (BITTNER, 1892)
Fig. 6: *Caucasorhynchia* aff. *altaplecta* (BÖCKH, 1873)

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