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A new species of inarticulate brachiopods, *Discinisca zapfei* sp.n., from the Upper Triassic Zlambach Formation (Northern Calcareous Alps, Austria), and a discussion of other Triassic disciniscans

by Andrzej RADWANSKI[1] & Herbert SUMMESBERGER[2]

(With 1 text-figure and 2 plates)

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Abstract

A new species of inarticulate brachiopods, *Discinisca zapfei* sp.n., is established for specimens collected by the late Professor Helmuth ZAPFE from the Zlambach Formation (Upper Triassic, Norian to Rhaetian) of the Northern Calcareous Alps (Austria). The collection, although small, offers a good insight into the morphology of both the dorsal and the brachial valve of the shells, as well as into their mode of growth in clusters. The primary shell coloration is preserved, probably due to a rapid burial (? tempestite) of the clustered brachiopods in the living stage. A review and/or re-examination of other Triassic discinisсan brachiopods indicates that the newly established species, *Discinisca zapfei* sp.n., is closer to certain Paleogene-Neogene and/or present-day species than to any of the earlier described Triassic forms. The environmental requirements of the newly established species were characterized by shallow marine, tropical and/or subtropical conditions, which coincides with the formerly known life conditions of the Alpine Late Triassic (Norian and/or Rhaetian) communities, whose development was controlled by a general bioevolutionary turnover at the Triassic decline.

Zusammenfassung

Ein neuer inartikulater Brachiopode, *Discinisca zapfei* sp.n., wird aufgrund einiger weniger Stücke beschrieben, die Prof. Helmuth ZAPFE aus der Zlambach Formation (Obere Trias, Norium/Rhaetium) der Nördlichen Kalkalpen (Österreich) aufgesammelt hatte. Diese bieten guten Einblick in die dorsale und brachiale Klappe, wie auch in die Lebensweise in kleinen Clustern. Die erhaltene Farbzeichnung läßt auf rasche Einbettung (Tempestit ?) des Brachiopoden-Clusters schließen. Die Überprüfung anderer triadischer Discinisсidae ergab, daß *Discinisca zapfei* sp.n. manchen paläogenen, neogenen oder rezenten Arten näher steht, als den früher beschrieben triadischen Formen. Die ökologischen Ansprüche können als seicht-marin, tropisch bis subtropisch angenommen werden, was mit den älteren Ansichten über obertriadische Biozönosen, deren Entwicklung durch einen allgemeinen bioevolutionären Umschlag gekennzeichnet ist, in Einklang steht.

[1] Prof. Dr. Andrzej RADWANSKI, Uniwersytet Warszawski, Instytut Geologii Podstawowej, Al. Zwirki i Wigury 93, PL-02 089 Warszawa. – Poland.

[2] Dr. Herbert SUMMESBERGER, Naturhistorisches Museum, Burgring 7, A-1014 Wien. – Austria. – e-mail: herbert.summesberger@nhm-wien.ac.at

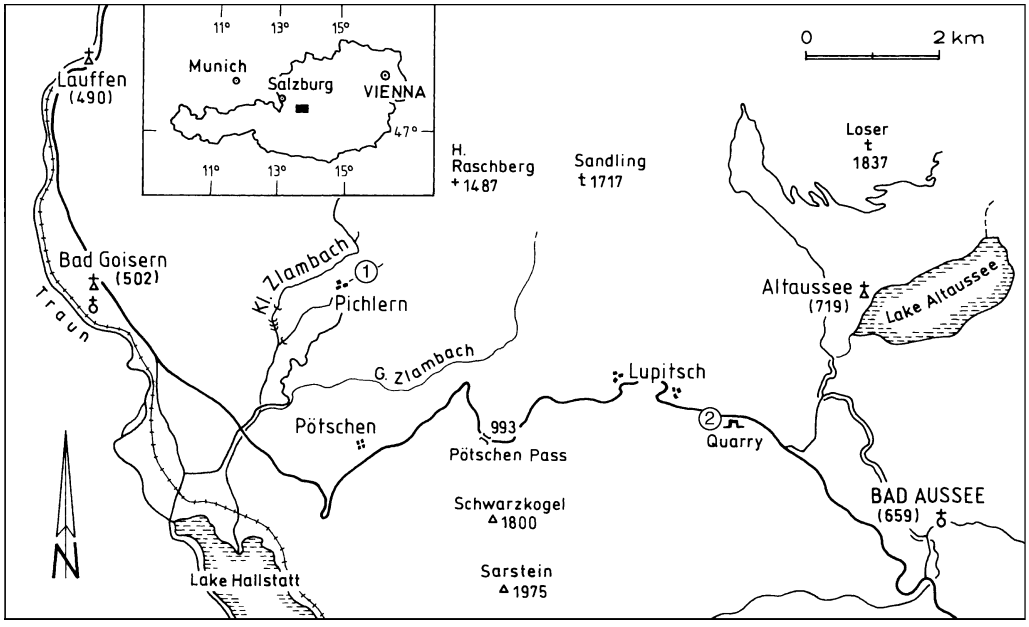
Introduction

The aim of this contribution is to describe a unique material of inarticulate brachiopods from the Late Triassic Zlambach Formation of the Northern Calcareous Alps. A few specimens that are rare in this formation, were collected by the late Professor Helmuth ZAPFE during his long-term studies of the Alpine Late Triassic sequences and their ubiquitous fossils (ZAPFE 1957, 1962-1967, 1964, 1969).

The studied specimens were labelled by Helmuth ZAPFE as the phyllocarid crustacean "*Aspidocaris triasica* REUSS" which is in fact an ammonoid anaptychus. The present authors' own studies both on the ammonoid aptychi of Upper Cretaceous age from Slovenia (SUMMESBERGER & al. 1996; 1999a,b) and on the inarticulate brachiopods from the Paleogene of Austria (RADWANSKA & RADWANSKI 1989) and the Neogene of Poland (RADWANSKA & RADWANSKI 1984) enabled us to recognize the fossils as inarticulate brachiopods.

Material

A small material of inarticulate brachiopods collected by Helmuth ZAPFE comprises three pieces of marly limestone containing: (1) one isolated dorsal valve, (2) one isolated ventral valve, and (3) a cluster of three specimens, probably of complete, bi-valved shells, strongly adhering each other. All the specimens are dorso-ventrally compressed, but the isolated valves are well preserved.



Text-fig. 1: Locality sketch-map: 1. Kleiner Zlambachgraben near Pichlern close to Bad Goisern (Upper Austria), 2. Abandoned quarry "Am Langenbichl" near Lupitsch (Styria).

This collection, probably gathered in the 1960s, was labelled as stemming from the Zlambach Schichten exposed at "Kleiner Zlambachgraben bei Pichlern", situated in the Hallstatt nappe of the Northern Calcareous Alps (Text-fig. 1). Lithologic affinities indicate that the specimens were embedded in the Norian "Pedata Schichten", occurring as slump structures (pers. comm. of Prof. Dr. Leo KRYSTYN, PIUW) in the Norian to Rhaetian Zlambach Formation.

The whole collection is deposited at the Department of Geology and Paleontology of the Naturhistorisches Museum in Vienna under the Catalogue Nos. NHMW 1999z0102/ 0001-3.

Abbreviations

GBA	Austrian Geological Survey, Vienna
NHMW	Museum of Natural History, Vienna
PIUW	Institute of Paleontology, University of Vienna

Taxonomy

The studied inarticulate brachiopods, based on the structure of their shells, belong evidently to the extant genus *Discinisca* DALL, 1871. Their two peculiar features, namely the size and the sculpture require some brief comments.

Firstly, the genus *Discinisca* DALL, 1871, as treated by ROWELL (1965), has credibly been reported since the Lower Jurassic, and the Triassic occurrences were marked with a question mark (ROWELL 1965: *H*286). However, if one follows the whole classification scheme used by ROWELL (1965), many of the Triassic taxa formerly classified either within the Paleozoic genus *Orbiculoidea* d'ORBIGNY, 1847, or present-day *Discina* LAMARCK, 1819, fall into that genus. Apart from the taxa assigned to the genus *Discinisca* in the present paper, all the stratigraphically older, and the formerly here-attributed taxa of low-Lower Jurassic age, are of very small size, measuring a few millimeters in diameter (review by MUIR-WOOD 1936: 473-474). Omitted herein is a vague taxon "*Discinisca langi*"; a sketch-drawing of its holotype (MUIR-WOOD 1936: Fig. 2) cannot be unequivocally interpreted (see comments on "*Aspidocaris triasica* REUSS" below). Within the taxa assigned herein to the genus *Discinisca* DALL, 1871, diameters of about 30 mm are not uncommon (see below).

Secondly, all but one Triassic and the majority of Jurassic and Cretaceous forms are completely smooth. The exceptions are the Upper Jurassic species *Discinisca humphresiana* (J. de C. SOWERBY, 1829) from the Kimmeridgian of England and France (DAVIDSON 1851; DESLONGCHAMPS 1862; MUIR-WOOD 1929; STENZEL 1965: 628), as well as one species of uppermost Maastrichtian age (RADWANSKA & RADWANSKI 1994). A well-advanced pattern of radial sculpture as a distinct feature appears in the lowest Paleogene (Danian) forms from Texas, classified by STENZEL (1965) as *Discinisca littigensis* STENZEL, 1965; this feature becomes typical of a larger group of Cenozoic *Discinisca* species (RADWANSKA & RADWANSKI 1984, 1989), distinguished by STENZEL (1965) as a separate subgenus, *Discradisca* STENZEL, 1965.

In conclusion the investigated disciniscan brachiopods, due to their size and sculpture, clearly at first sight resemble some Cenozoic forms more than any Mesozoic, particularly Triassic ones (see below). Nevertheless, they are not identical with any of the Cenozoic species (see review by RADWANSKA & RADWANSKI 1984, 1989). Consequently, the specimens, regarded to be conspecific, are herein classified as a separate species, new to science, *Discinisca zapfei* sp.n.

Systematic Paleontology

The systematic position of the new species is given according to the scheme presented by ROWELL (1965) and followed by RADWANSKA & RADWANSKI (1989: 71).

Phylum Brachiopoda DUMÉRIL, 1806

Class Inarticulata HUXLEY, 1869

Order Acrotretida KUHN, 1949

Suborder Acrotretidina KUHN, 1949

Superfamily Discinacea GRAY, 1840

Family Discinidae GRAY, 1840

Subfamily Disciniscinae SCHUCHERT & LEVENE, 1929

Genus *Discinisca* DALL, 1871

Type species: *Discinisca lamellosa* (BRODERIP, 1834); *OD* DALL, 1871 [*Orbicula lamellosa* of BRODERIP (1834: 142); not "1833: 124", as given by ROWELL (1965: *H*286)]

Discinisca zapfei sp.n.

(Plates 1-2)

Holotype: The specimen (dorsal valve) illustrated in Pl. 1, Fig. 1 (NHMW 1999z0102/0001).

Paratypes: The specimen (ventral valve) illustrated in Pl. 1, Fig. 2 (NHMW 1999z0102/0002), and a cluster of 3 specimens illustrated in Pl. 2 (NHMW 1999z0102/0003).

Derivation of the name: To commemorate Helmuth ZAPFE (1913-1996), the prominent Austrian paleontologist, outstanding monographer of Triassic and Cenozoic faunas, and collector of the specimens.

Type locality: Zlambach Formation; Kleiner Zlambachgraben near Pichlern.

Type horizon: Upper Triassic (Norian to Rhaetian).

Diagnosis: A relatively large *Discinisca* (diameter up to 30 mm); dorsal valve wrinkled all-over, more distinctly posteriorly around the subposterior apex; ventral valve almost smooth, with obsolete wrinkles, and with a large pedicle-area indented at the mid-line posteriorly.

Description: The monospecific material is described individual by individual, each adhering to the rock slab. All the specimens are very fragile, being compressed and

fractured during diagenesis. They are thus cracked and scarred with the minute calcite-veinlets to such an extent that their extraction is impossible. All are exposed with their outer surface and, thus, their inner sides are not accessible. The shells are corneous (organo-phosphatic), blackish, with their tint grading variably; their thickness is estimated at 0.1 - 0.2 mm.

Isolated **dorsal valve** (Pl. 1, Fig. 1), the holotype of the species and the largest of all specimens, is nearly circular in outline, slightly widened laterally, but symmetric to the mid-line, with the apex located subposteriorly. Its profile may be estimated as low-conical, not being heavily changed due to compression. The topmost apical part, *i.e.* the larval shell (protegulum), is damaged. The valve ornamentation consists of more or less distinct corrugations resembling diffused wrinkles rather than true ribs. The wrinkles germinate at the lower boundary of the postlarval, *i.e.* the brephic shell (CHUANG 1977; RADWANSKA & RADWANSKI 1984: 255-256), and they continue all over the adult, *i.e.* the neanic shell, being more pronounced posteriorly. They are of variable length and width, in places discontinuous, spreading from the brephic-shell boundary to the ultimate margin of the valve and increasing in number due to growth of intercalatory wrinkles.

The growthlines are distinct over the whole valve. They tend to gather into 4 or 5 bands, whose lower margin is marked by a thicker growthline. The bands, developed at almost equal distances from the brephic-shell boundary, probably correspond to seasonal (? annual) growth of the shell (PAINE 1962; RADWANSKA & RADWANSKI 1989: 77).

Isolated **ventral valve** (Pl. 1, Fig. 2), the first paratype of the species, belonged to a specimen smaller than the holotype dorsal valve. It is of rather poor preservation, cracked throughout and crushed along the anterior margin, but with the well-preserved posterior part having a *V*-shaped pedicle-area extended up to the apex and indented posteriorly. The pedicle slit is highly elongated, with parallel margins.

The general outline of the valve is circular to oval, symmetric to the mid-line. The ornamentation wrinkles are hardly discernible, obsolete, so that the valve is almost smooth. The growth-lines, less distinct than those of the dorsal valve, gather into bands varying in darker and lighter tint of the blackish color; the interpretation is given below.

Note, that this is a very rare case of preserved ventral valves in fossil *Discinisca* species: only few examples have been reported earlier because the shells adhere to the substrate (usually mollusk shells), thus having their ventral valve unexposed (DAVIDSON 1851; MUIR-WOOD 1929, 1939; RADWANSKA & RADWANSKI 1984: 259).

Complete (two-valved) shells, with their ventral valves exposed were reported in the following four fossil species only:

1. *Discinisca townshendi* (DAVIDSON, 1851) [= *Discinisca townshendi* (FORBES, in collectione)], possibly identical with *Discinisca babeana* (d'ORBIGNY, 1849) from the Rhaetian of England and France (DAVIDSON 1851; DESLONGCHAMPS 1862; MUIR-WOOD 1929: 467);
2. *Discinisca humphresiana* (J.de C. SOWERBY, 1829) from the Kimmeridgian of France (DESLONGCHAMPS 1862; MUIR-WOOD 1929: 467);
3. *Discinisca bosniaca* (KITTL, 1904) from the Triassic of Bosnia (KITTL 1904);

4. *Discinisca sibirica* (MOISSEIEV, 1947) from northern Siberia, stratigraphically ranging widely in the Triassic sequences of that region (DAGYS 1965: 16-17; Pl. 1, Figs 17 and 19).

Moreover, isolated ventral valves, regarded to be conspecific with the co-occurring isolated dorsal valves, have been reported twice in the literature, firstly by HERTLEIN & GRANT (1944: 36 and Pl. 2, Fig. 15) in their Miocene species *Discinisca perrini* HERTLEIN & GRANT, 1944, from the western United States, and recently by BIERNAT (1995) in her *Discinisca spitsbergensis* BIERNAT, 1995, from the Lower Jurassic of Spitsbergen.

The nature and/or significance of the Triassic species listed above, that is of *Discinisca townshendi, D. bosniaca,* and *D. sibirica,* will be commented below in the review of the Triassic forms assigned to the genus *Discinisca* DALL, 1871.

The **cluster of three specimens** (Pl. 2), being further paratypes of the species, is composed of presumably complete shells, all of which are exposed with their dorsal valves upwards. All three of these exposed dorsal valves are morphologically identical with the holotype, although smaller in size. The cluster is slightly damaged due to compression and cracking. Of the three specimens in the cluster (numbered 1-3 in a sketch inserted in Pl. 2), the two larger ones (No. 1 and 3) are regarded as adult, the smallest one (No. 2) as a juvenile growing at the top of the elder one (No. 1). In two specimens (No. 1 and 2), the indistinct, darker stripes arranged radially from the apex are visible (arrowed in Pl. 2). The occurrence in a cluster, the primary coloration, and some taphonomic observations are described in separate chapters below.

Banding of Growthlines (Alleged Primary Coloration)

An indistinctly lighter tint in the blackish color of some bands of the growthlines, especially in the paratype valve of the newly established species, *Discinisca zapfei* sp.n. (Pl. 1, Fig. 2), probably corresponds to the primary structure (? porosity) of the shell material. The presence of such darker and lighter bands has been noted only twice in fossil species of *Discinisca* DALL, 1871. It was firsty recognized, as a pattern of 4 or 5 bands, by MUIR-WOOD (1929: 465, Fig. 42/4-5) in her *Discinisca ferroviae* MUIR-WOOD, 1929, from the Eocene of England; the interpretation was primary pigmentation.

Thereafter, it was reported and discussed by RADWANSKA & RADWANSKI (1994: 256) in topmost Maastrichtian *Discinisca* (*Arquinisca*) *vistulae* RADWANSKA & RADWANSKI, 1994; here its primary color-pattern nature was rejected.

The interpretation by MUIR-WOOD (1929: 465) cannot be accepted because in present-day *Discinisca* species the color pattern, if present, is displayed not by concentric bands but by radial stripes; this is clearly shown on the original illustration of *Discinisca strigata* (BRODERIP, 1834) from Guatemala by BRODERIP (1834: Pl. 23, Fig. 1-asterisked; re-figured *in* HERTLEIN & GRANT 1944: 37; Pl. 2, Fig. 10). Note that another re-illustration of BRODERIP's original by DAVIDSON (1888: Pl. 26, Fig. 26) does not present these colored radial stripes: they have been retouched from the figure, still referenced as "after BRODERIP" (sic! DAVIDSON 1888: 239). The pattern of color stripes in *Discinisca strigata* (BRODERIP, 1834) varies in particular biotopes, as reported by HERTLEIN & GRANT (1944: 37 and Pl. 16, Fig. 17) for specimens dredged off Taboga Island, Panama.

Primary Coloration

Keeping in mind the above-quoted original illustration of BRODERIP (1834), it is apparent that the more or less diffused and/or discontinuous, "chipped" darker radial stripes can be interpreted as primary coloration. They are much more strongly pronounced in the clustered shells (Pl. 2: specimens numbered *1* and *2*) than in the isolated valves, in which they almost fade. The course of these chipped stripes, as if slightly independent of the course of sculptural wrinkles, is reminiscent of the present-day Pearly Nautilus, in which color bands similarly cross the growthlines (COWEN & al. 1973: especially Fig. 1). As interpreted by COWEN & al. (1973), such a mode of pigment insertion produces a camouflage pattern, either defensive against enemies or offensive to become invisible to potential prey. Regardless to the nature of the camouflage, which in suspension-feeding *Discinisca* species may only be defensive, more important is the presence of protective coloring itself: it indicates an environment in which color vision is possible (BOUCOT 1990: 444), *i.e.* at depths in the photic zone.

Growth in Clusters

The small cluster of *Discinisca zapfei* sp.n. (Pl. 2) indicates that this species lived, or tended to live, in groups. Such behavior is known in only two present-day *Discinisca* species, namely *Discinisca sowerbyi* MUIR-WOOD, 1936 [= *Discinisca laevis* (G.B. SOWEBRY, 1822); distinct from the Liassic form *Discinisca laevis* (J. SOWEBRY, 1816)], and *Discinisca lamellosa* (BRODERIP, 1834). The latter one, confined to rocks, shells, and/or their own clusters at subtidial offshore depths, was briefly reviewed by RADWANSKA & RADWANSKI (1989: 76), who made a connection with the similar life requirements, but solitary mode of growth and gregarious occurrence, of the Oligocene species *Discinisca steiningeri* RADWANSKA & RADWANSKI, 1989, restricted to the ancient rocky shore of the Linz Sands (Linzer Sande) exposed at Plesching near Linz, in Austria.

Taphonomy

The preservation of primary coloration in clustered specimens (Pl. 2) of *Discinisca zapfei* sp.n. is thought to have resulted from their burial in the living state. Any longer, *post mortem* setting of the shells on the sea bottom causes complete decomposition of their organic matter. Experimental studies on the taphonomic loss, recently undertaken on selected invertebrates, *e.g.* certain echinoids (KIDWELL & BAUMILLER 1990), polychaetes (BRIGGS & KEAR 1993), or stomatopod crustaceans (HOF & BRIGGS 1997), show that the total decay of organic tissues is a matter of days or weeks rather than months. Consequently, we suggest a rapid burial of the cluster by a stormy agitation and tempestite deposition. This explains the preservation of the cluster itself, which otherwise should have quickly disintegrated. This interpretation is supported by the observation that those isolated valves (Pl. 1, Figs 1-2) that rested longer on the sea bottom lost their pigmentation almost completely or retained only its "ghosts".

The preservation of primary pigmentation in *Discinisca zapfei* sp.n. in the Zlambach Formation may have also been favored by the lithology of that formation. Note that in

similar marly lithologies of Middle/early-Late Triassic age in the southern Alps (St. Cassian Formation, WENDT & FÜRSICH 1980), the color preservation in many common gastropods has been known for over a century (KLIPSTEIN 1843 *and* a comprehensive review by TICHY 1980).

A Review of the Triassic *Discinisca*

As stated above, many taxa of Triassic age, and classified formerly as inarticulate brachiopods of the genera *Orbiculoidea* d'ORBIGNY, 1847, or *Discina* LAMARCK, 1819, may or do belong to the genus *Discinisca* DALL, 1871. Most of these taxa were established in the 19th or early 20th century, usually based on single specimens of isolated dorsal valves whose descriptions and/or sketch-drawings only poorly comply with modern taxonomic requirements. Since most of these valves are smooth, the only distinctive features are the general outline (circular or elongated) and position of the apex (central or eccentric). Although these two features, when combined, do not allow separation of more than four distinct categories, the number of formerly established taxa amounted to almost 20 (!!!). Another dozen or so have been described from Jurassic sequences (including the Rhaetian) of Great Britain (DAVIDSON 1851, 1852, 1856, 1874-1882). It should also be noted that the sculpture in the disciniscan shells is confined to the external layers of the valves; these external layers easily peel-off, exposing the completely smooth internal ones, as evidenced by relatively numerous Cenozoic specimens (RADWANSKA & RADWANSKI 1984, 1989).

As judged from illustrations, almost all the small-sized Jurassic specimens/taxa of discinisca brachiopods (DAVIDSON 1851, 1874-1882) were epibiontic, having been attached to hard substratum (e.g. shells). The same has been stated for most of the Muschelkalk specimens from Germany (Dr. h.c. Hans HAGDORN, pers. comm. 1998; also SEILACHER 1954, LINCK 1956). In contrast, the large-sized taxa have mainly been illustrated as isolated, not attached; moreover, none of them have been noted to live in clusters.

The discussed Triassic taxa have been established primarily from the Muschelkalk sequence of Germany and Poland, and from the Alpine (Tethyan) regions of present-day Austria and adjacent countries, which in the 19th and/or early 20th century still constituted the Austrian or the Austro-Hungarian Monarchy. Some of the type materials of these taxa survived in the collections, others were lost. A smaller group of morphologically similar taxa has also been reported from the Arctic regions of Europe and Asia.

The Triassic Alpine forms have been reported i.a. by prominent authors as SUESS, GÜMBEL, BITTNER, and GOETEL, although some have never been illustrated. An attempt at their classification was offered by GOETEL (1917: 92-93) and, more recently, by SIBLIK in the Fossilium Catalogus Austriae (1988: 10-11); both authors took only a part of the published material into consideration.

The Triassic taxa from present-day Austrian territories, accepted by SIBLIK (1988) and examined by the present authors, as well as those from other countries, should briefly be commented as follows.

Discinisca cellensis (SUESS, 1854)

The taxon established by SUESS (1854: 63, Pl. 2, Fig. 18) based on one isolated dorsal valve from the Rhaetian (Kössener Schichten) of Styria (Steiermark) is still present in the GBA (Collection Number GBA 1854/6/19). It is a small valve, posteriorly depressed, ca. 7 mm in diameter, with delicate wrinkles continuing almost to the subcentral apex, which is peeled-off, exposing the smooth inner layers. A very small brephic part of the valve suggests that this specimen was stunted (dwarfish). The taxon is known solely from the holotype.

Discinisca suessi (GÜMBEL, 1861)

The taxon was established by GÜMBEL(1861: 274) for a dorsal valve illustrated as "*Discina*" sp. by SUESS (1854: Pl. 4, Fig. 24). GÜMBEL labelled it as "*Discina insignis*" (GBA Collection, the specimen itself is lost; SIBLIK 1988: 11). To this specimen, GOETEL (1917) compared four specimens from the Rhaetian of Poland and Slovakia, designated by him as "*Discina* (*Orbiculoidea*) *insignis* SUESS in coll. nov. spec.". Only one survived in GOETEL's original collection kept in the Geological Museum of the Polish Academy of Sciences in Cracow (Catalogue Number A-I-15/61). It stems from Hybe (=Hybbe, formerly) in Slovakia (MICHALIK 1977), described but not illustrated by GOETEL (1917: 92). It is poorly preserved, large and smooth (30 mm in diameter, 10 mm high), cracked and filled with two calcite veinlets. It is apparently a complete shell, with its ventral valve hardly discernible through the cracked portion of the compact limestone. Its taxonomic interpretation is suggested below.

Discinisca sp.
(*Discina* sp. and *Discina* aff. *discoides* SCHLOTH. spec. of BITTNER, 1890)

The material, partially preserved in the collections of the Austrian Geological Survey consists of three isolated dorsal valves from three different localities. All three specimens were classified originally by BITTNER (1890: Pl. 39; Figs 23, 24, 25) in his plate description as *Discina* sp.

The specimen from Frein (Anisian, Styria; BITTNER 1890: Pl. 39; Fig. 23; GBA not registered; seen by SIBLIK 1988: 11) is nearly circular in outline (diameter slightly over 10 mm), damaged at the posterior part, with the shell almost completely peeled off. It was assigned by BITTNER, contradicting his own plate description, by the caption of the chapter (l.c., p. 36) to "*Discina* aff. *discoides* Schloth. spec." and somewhat ambiguously in the second paragraph as: "Eine andere *Discina*". It remains unclear if BITTNER wished to have understood this specimen as a taxon different from the above-described *Discina* aff. *discoides* or as a further specimen of the same taxon.

The same name, *Discinisca* sp., should be ascribed to the minute specimen figured and mentioned correspondingly as *Discina* sp. by BITTNER (1890: Pl. 39; Fig. 25; p. 154; not seen by SIBLIK 1988: 11; apparently lost). It is from the Carnian Opponitz Formation of Windischgarsten (Upper Austria).

Both specimens are internal moulds of the valves, which might have been smooth, as ascertained from pieces of the adherent shell. They are to be classified only as *Discinisca* sp. without any further subdivision, that is into species A and B distinguished by SIBLIK (1988: 11).

The small (diameter 6 mm) and poorly preserved specimen from Rothstein near Ramsau/Hainfeld (Lower Austria; BITTNER, 1890: Pl. 39; Fig. 24; GBA 1890/2/30) is of middle Triassic age. It was classified by BITTNER (l.c., p. 36) in the text, contradicting his own plate description (see above), as "*Discina* aff. *discoides* SCHLOTH. spec.".

(?) *Discinisca* sp., *discoides* of SCHLOTHEIM (1820)

The above-indicated species taxon *discoides* of SCHLOTHEIM (1820), regardless of its genus attribution, cannot be precisely defined, although it is usually used for various (?) discinis-can brachiopods from the Muschelkalk of Germany and Poland (see references in ASSMANN 1915; KIRCHNER 1933; SCHMIDT 1937: 137-138 *and* 1938: 21; SIBLIK 1988: 10-11).

Other (?) Disciniscan Taxa from the Triassic of the Austrian Alps

The other taxa reviewed by SIBLIK (1988: 10-11) will need a thorough revision when (or if) their type materials are found. This concerns both the species taxon *calymene* of KLIPSTEIN (1843) and *ovoides* of GUGENBERGER (1930), as well as the other forms described with a question mark by GUGENBERGER (1930: 49).

Disciniscans from other Tethyan Regions

A revision is also needed for the taxon *pascui,* based by KITTL (1908: 33 and Pl. 1, Fig. 1) on a single, tiny, partly damaged specimen from Dobrudja in Romania, as well as for the formerly mentioned large, smooth specimens classified as the species taxon *bosniaca* by KITTL (1904: 687 and Pl. 22, Figs 5-7) based on complete, two-valved shells from Suha Cesma near Sarajevo in Bosnia.

Disciniscans from the Epicontinental Triassic Muschelkalk and Rhaetian of Europe

Besides the above-commented taxon *discoides* of SCHLOTHEIM (1820), the other disciniscan taxa from the German and Polish Muschelkalk are also hardly interpretable: all are poorly illustrated by sketch-drawings of smooth dorsal valves, and all are rather arbitrarily diagnosed (SCHMIDT 1937: 138; *and* 1938: 21). Note that the taxon *major* of WAGNER (1913) from the Upper Muschelkalk of Franconia (Germany) is reported to attain a remarkably large size, 43 mm in diameter (antero-posterior length; SCHMIDT 1937: 138, Fig. 274).

ANDREAE (1893: Fig. la) based the taxon *rhaetica* from the Rhaetian of Malsch near Karlsruhe in Baden-Württemberg (Germany) on a single damaged dorsal valve. Its

sketch-drawing allows to recognize its smoothness, sub-central apex, and a larger size of 32 mm in length (SCHMIDT 1937: Fig. 276).

Relatively well documented is *Discinisca townshendi* (DAVIDSON, 1851), although its stratigraphic provenance and relation to other taxa has long been debated. The taxon was established upon one complete shell of the largest size then known, 42 mm in diameter (DAVIDSON 1851: Pl. 1, Figs 2, 2a-2b). It was labelled in the collection of the Geological Survey of Great Britain as "*Orbicula townshendi*, FORBES", without age and locality data. Originally DAVIDSON (1851: 10) was certain that it originated from the Oxford Clay. Later he corrected his opinion (DAVIDSON 1852: 98, and Appendix 1856: 14) believing it being from the Middle Lias. He regarded the species as being separate from the taxon represented by a specimen from the Rhaetian of France that was shown to him by A. d'ORBIGNY, who classified it as his own taxon *babeana* d'ORBIGNY, 1849. The latter taxon, as introduced by d'ORBIGNY (1849: 221), is a *nomen nudum*, as is its later registration by d'ORBIGNY himself (1852). Subsequently, these two taxa were accepted and regarded either as separate (DESLONGCHAMPS 1862: 270-271) or identical (DAVIDSON 1874-1882: 87-88; MUIR-WOOD 1929: 467); they are concordant with regard to the stratigraphic age of the holotype, claimed to be Rhaetian (DESLONGCHAMPS 1862: 270) and indicated as stemming from Gloucestershire in England (MUIR-WOOD 1929: 467). The specimens reported by DESLONGCHAMPS (1862: Pl. 4, Figs 1-4) as "*Discina babeana* d'ORBIGNY" from the Rhaetian of Central France (Langres in Haute-Marne) seem not to be identical with that one illustrated by DAVIDSON (1851). Note for example the presence of fine striation laterally in one specimen (DESLONGCHAMPS 1862: Pl. 4, Fig. 2) recorded as very large, 40 mm in length, and being a complete shell. Note also that this species probably also occurs in Austria, as reported by MOORE (1861: 99; see also DAVIDSON 1874-1882: 88), who had personally been informed by E. SUESS about such a finding.

Disciniscans from the Arctic Triassic

Little comment may be given to the poorly documented taxa of smooth disciniscans from variously aged Triassic sequences of the Arctic regions of Europe, and of Siberia (BÖHM 1903; KITTL 1907; DAGYS 1965: 16-17). Their relation to the taxa established upon materials from the Tethyan and epicontinental regions of Central Europe remains unknown.

Concluding Remarks

The above-presented review and discussion of Triassic disciniscan brachiopods shows that most of them require a modern revision. A bibliographic analysis, as done herein, leads to the conclusion that the taxa comparable with *Discinisca zapfei* sp.n. are those of a larger size and exhibiting the respective sculpture. Note that an indistinct sculpture appears in *Discinisca cellensis* (SUESS, 1854) and *Discinisca babeana* (d'ORBIGNY, 1849), both from the Rhaetian, of the Austrian Alps and of Central France, respectively.

The larger size, in the order of 30 to over 40 mm, is characteristic either of such Rhaetian taxa as *Discinisca townshendi* (DAVIDSON, 1851), *Discinisca babeana* (d'OBRIGNY, 1849), *Discinisca rhaetica* (ANDREAE, 1893), or of slightly (?) older Triassic forms distinguished as *Discinisca bosniaca* (KITTL, 1904), *Discinisca major* (WAGNER, 1913),

and *Discinisca sibirica* (MOISSEIEV, 1947), all of which may actually represent biologically conspecific populations. This group encompasses the above-reported single specimen preserved in GOETEL's collection, from the Rhaetian of Hybe in Slovakia, labelled by GOETEL (1917: 92) as "*Discina* (*Orbiculoidea*) *insignis* SUESS in coll. *nov. spec.*"

A Comment on "*Aspidocaris triasica* REUSS, 1867"

A peculiar fossil, first described by REUSS (1867) under the name "*Aspidocaris triasica* REUSS" from the Upper Triassic (Norian) "Pedata Schichten" of Lupitsch near Bad Aussee in Styria (Steiermark), is herein briefly discussed and illustrated (Pl. 1, Fig. 3). This is necessary in order to avoid any confusion with the studied disciniscan brachiopods, especially as it originates from the same lithostratigraphic unit exposed at the neighbored abandoned quarry "am Langenbichl" (Text-fig. 1). The better one of REUSS' originals (1867: Pl. 1, Fig. 2), preserved in the GBA collections and re-figured by TRAUTH (1936: Pl. 1, Fig. 1) is herein designated as the lectotype of the species.

The delicate fossil measures about 30mm, is composed of black carbonaceous material (? conchyoline in life) and contrasts well against the gray, shaly rock. Its more or less circular outline, distinct growthlines and indistinct radial striae (REUSS 1867: Pl. 1, Figs 1-5), yield a striking similarity to the fragmented (and/or partly exposed) disciniscan shells; the distinguishing feature, however, is a deeply incised notch with smooth, natural margins.

It was regarded by REUSS (1867) as a crustacean (phyllocarid *sensu* modern systematics) and has been quoted and/or re-figured in several monographs and textbooks (see synonymy reviews by TRAUTH 1936: 458 and by ROLFE 1969: *R*329). It has been interpreted since the early 1930s (TRUSHEIM 1930: 12; TRAUTH 1930: footnote, p. 335) as an anaptychus-like part of the ammonoid shell and labelled as "*Anaptychus* (?) *triasicus* (REUSS)" by TRAUTH (1936: 458-462 and Pl. 1, Fig. 1). The latter assessment was probably overlooked by ARKELL (1957: *L*437-*L*441) and MOORE & SYLVESTER-BRADLEY (1957: *L*456-*L*469) in the ammonoid Part *L* of the *Treatise on Invertebrate Paleontology*, in which the discussed fossil is cited in the arthropod Part *R* by ROLFE (1969: *R*329), who put *Aspidocaris* REUSS, 1867, into the group of nonphyllocarid and uncertain genera and under synonymy with *Discinocaris* Henry WOODWARD, 1866, of the family Discinocarididae ETHERIDGE, WOODWARD & JONES, 1885.

Note that the earlier surmises or suggestions on either the cephalopod or the inarticulate brachiopod nature of the forms referred to as *nonphyllocarid and uncertain* by ROLFE (1969), as well as the history of their investigation, have been comprehensively reviewed by FRYE & FELDMANN (1991). In fact, many of these forms, especially those of Late Devonian age (*e.g.* FRYE & FELDMANN 1991: Fig. 6/1-7), are morphologically almost indistinguishable from certain inarticulate brachiopods, particularly their ventral valves. [This calls for extreme caution when studying verbal documentation or schematic sketch-drawings in papers published earlier than the first photographic documentation.].

Environment and Evolutionary Trend

A general statement on the environmental requirements of the genus *Discinisca* DALL, 1871, is that all its present-day species are confined to very shallow marine habitats, up

to the subtidal zone, or even intertidal at the extreme low tides (DALL 1920; and a review by RADWANSKA & RADWANSKI 1989, p. 76). The preferred climatic conditions are evidently tropical and/or subtropical (DALL 1871, 1920; DAVIDSON 1888; MUIR-WOOD 1929; HERTLEIN & GRANT 1944; RADWANSKA & RADWANSKI 1989: 77; 1994: 257).

The above-indicated environmental conditions comply well with those ascertained from the presence of other biota in the Late Triassic sequences (Zlambach Formation, Kössener Schichten) of the north-Alpine regions, typified i.a. by the development of coral reefs and their associated communites (ZAPFE 1957, 1962-1967, 1964 and 1969).

It must be stated, that the diversified and ubiquitous communities of latest Triassic (Rhaetian) age of the Alps (ZAPFE, l.c.) and Carpathians, primarily the Tatra Mountains (GOETEL 1917; RADWANSKI 1968; GLAZEK & RADWANSKI 1968; GAZDZICKI 1974, 1983; MICHALIK 1977) should be regarded as direct fore-runners of modern communities. Their burst at the Triassic decline, indicative of a bioevolutionary turnover, gave rise to their extensive progression through the rest of the Mesozoic, the Paleogene and Neogene, to the Recent. Under such environmental and bioevolutionary conditions the newly described inarticulate brachiopod, *Discinisca zapfei* sp.n., has acquired morphological patterns (sculpture) and life behavior which, through the successive species, have remained functional up to the present day.

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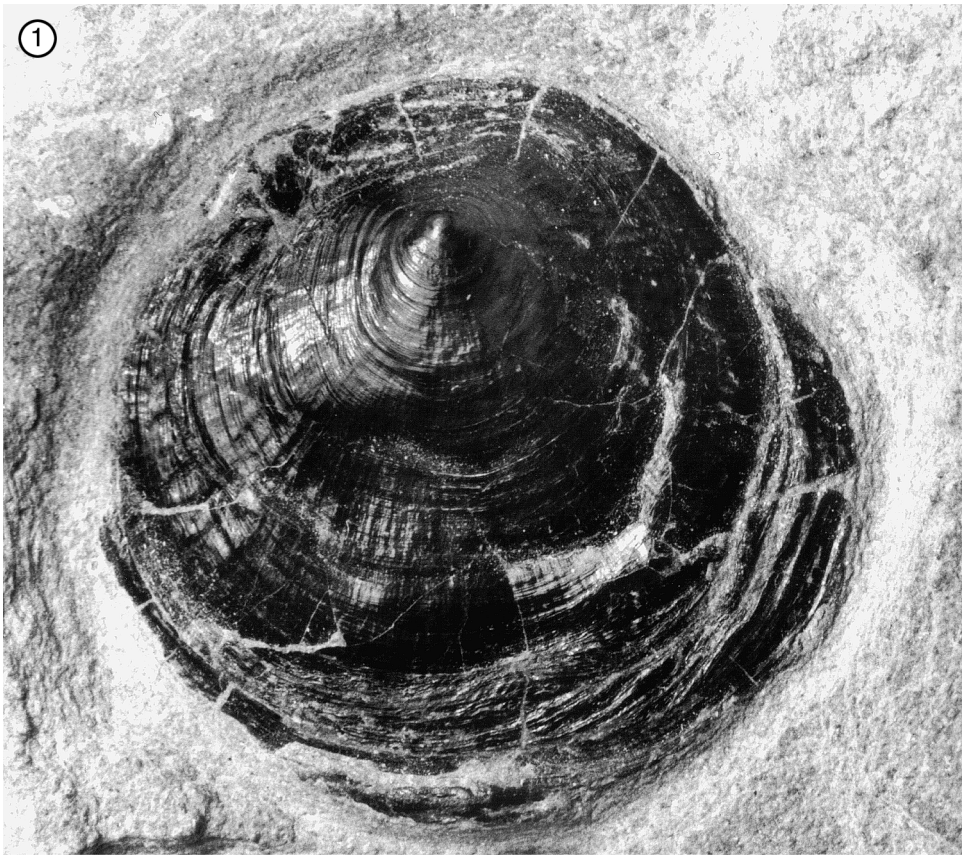
Plates

Plate 1

Fig. 1. *Discinisca zapfei* sp.n.; **Holotype**: dorsal valve, ×5. – NHMW 1999z0102/0001.

Fig. 2. *Discinisca zapfei* sp.n.; **Paratype**: ventral valve, ×5. – NHMW 1999z0102/0002.

Fig. 3. An ammonoid anaptychus, originally described by REUSS (1867) as a crustacean, *Aspidocaris triasica* REUSS, 1867, and shown for comparison; the herein designated **lectotype** (REUSS 1867: Pl. 1, Fig. 2; re-illustrated by TRAUTH 1936: Pl. 1, Fig. 1), ×2. – Geologische Bundesanstalt, GBA 1867/3/1/1.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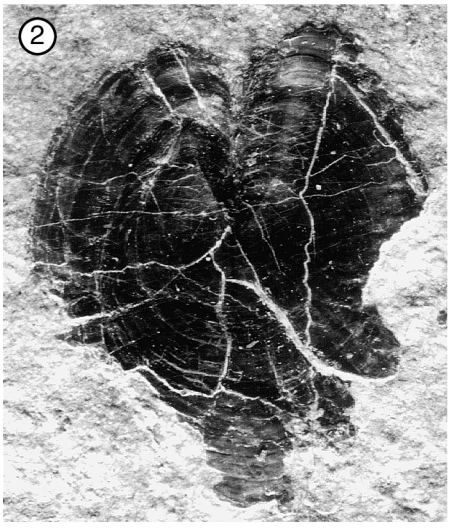
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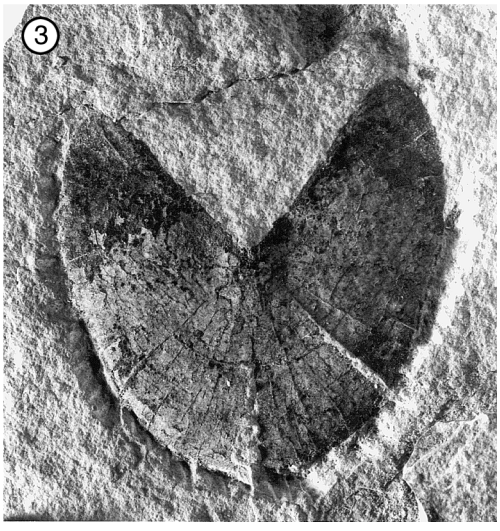
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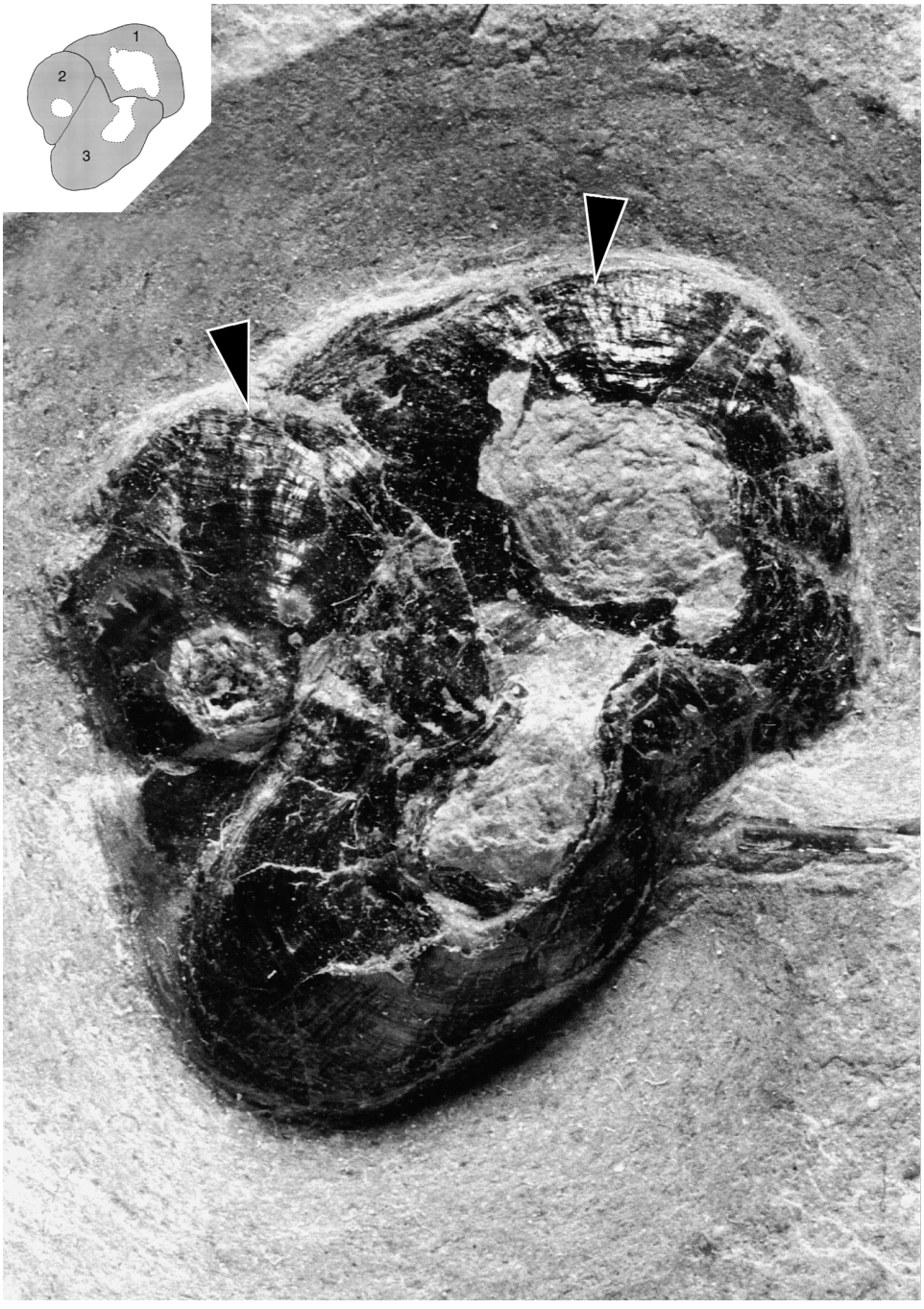
Plate 2

Fig. 1. *Discinisca zapfei* sp. n.; **Paratypes**: Cluster of three specimens, ×5; the inserted sketch-drawing, of actual size, shows the outlines of particular specimens, numbered as in the text (in specimens 1 and 2 arrowed are parts with discernible color stripes). – NHMW 1999z0102/0003.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