

## A REVIEW OF THE TRIASSIC IN HUNGARY

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Most of the Triassic sequences, making up the bulk of the Hungarian Highlands and widespread in the basement of the Tertiary basins of the Pannonian Mass as well, are characterized by purely Alpine facies. "Germanic features" in the Middle, terrestrial and lacustrine sedimentation in the Upper Triassic can be proved alone in the Mecsek Mountains. To an early and lasting break of sedimentation, however, it came in the Villány Mountains only.

The Early Triassic transgression in Hungary started from that relatively narrow, latest Permian sea-branch extending from the junction of the Southern Alps and Dinarides northeastwards across central Transdanubia, the northern Great Hungarian Plain and the Bükk Mountains up to the northern Gömörídes. Accordingly, the Lower Triassic of this belt overlies the purely marine respectively lagoonal-hyperhaline Upper Permian with more or less distinct changes in lithology and palaeontology, but without any detectable unconformity. The former is the case in the Bükk Mountains, the latter in the northern part of the Balaton Highland respectively in the southern foreland of the Vértes Mountains. On the contrary, both in the southwestern part of the Balaton Highland and in the Villány and Mecsek Mountains, the two systems are set apart by a striking unconformity. Very strongly that is expressed in the latter ranges by the coarse basal conglomerate of the widely transgressing Jakabhegy sandstone complex. Unfortunately, the separation of the Lower Triassic and Late Permian sequences is not perfectly solved either in the Hungarian stretch of the Southern Gömörídes or in the Great Hungarian Plain as yet. This is partly due to the similarity and the poor fossil content respectively to the deficiency of information on the sequences in question.

In Hungary the upper boundary of the Triassic system is drawn between the Rhaetian and the Lias on the following grounds:

a) The Rhaetian, wherever detectable, is closely interconnected, in all facies, with the deeper member of the Upper Triassic.

b) It is true that the Rhaetian of the Bakony and Mecsek does not show up a sharp boundary with the Lias. On the other hand, the Triassic is separated from a little higher level of the Lias both in the northeastern parts of the Transdanubian Central Mountains and the northern part of the Gömör Karst by an erosional unconformity due to light epirogenetic uplift. This unconformity falls everywhere unambiguously between Norian-Rhaetian and Liassic formations documentable by fossils. And the Rhaetian stage, either complete or incomplete, has not in a single case been observed above this overlap.

In accordance with the transgression that invaded the Latest Permian emergent land portions characterized by erosion and terrestrial sediment accumulation, the Seisian substage of the Vértes, Gömör-Rudabánya and the middle and southern Great Hungarian Plain as well as of the Mecsek and Villány Mountains is announced by the predominance of red and green detrital sediments whose source may have been formed first — at least in part — in the Permian as an unconsolidated detrital material which was subsequently redeposited and resedimented in a shallow-water environment.

On the contrary, the Lower Triassic of Central Transdanubia begins with dolomitic-marly sediments, that of the Bükk Mountains, in turn, with light-grey oölitic limestone banks. Reddish or purple sandstone beds in this belt appear in the lower or middle part of the Campilian substage only. Traces of this inflow of Campilian coarse detrital material occur otherwise farther north in the Lower Triassic of the Gömör Karst as well. It seems, however, a general rule that in whole Hungary the topmost of the Lower Triassic consists of grey to dark-grey, thin-bedded or laminated limestones covering ever finer marls, anhydrite-bearing beds or early-diagenized dolomites.

The Middle Triassic is dominated everywhere by diversified dolomite and limestone facies interbedded with several levels of submarine volcanic products. The highest volcanic masses are known to occur in the Bükk Mountains (porphyrite sequence of the Szent Istvánhegy in the Middle Anisian; diabase of Óhuta and quartz-porphyry of Bagolyhegy in the Ladinian-Carnian). Here the volcanism seems to extend well into the Carnian stage. Minor quartz-porphyry bodies of Ladinian age occur in the Rudabánya Mountains, too. Elsewhere (Gömör Karst, Balaton Highland, Mecsek), just relatively thin intercalations of tuffite could only be identified (e.g. the “Pietra verde beds” of the Balaton district).

The Ladinian stage is characterized by the grading of the lithofacies into more and more variegated types of sediment. In the Villány Mountains the sedimentation was stopped for a considerable span of time. In the Mecsek Mountains an upwards more and more sandier slate sequence with plant remains leads through into the regressive Upper Triassic. As a contrast, the Ladinian shales of the Bükk and Rudabánya Mountains are indicative of a deepening sea.

In genetic relation with the volcanic intercalations radiolarites, respectively limestones and dolomites with nodules of chert appear here. On the other hand the dolomite with *Diplopora annulata* in the Vértes and Buda Mountains, respectively the Wetterstein limestone and dolomite in Gömör and Rudabánya signifies extensive fields of lime-secreting algae, on some places coral-reefs, too.

The Upper Triassic of the Balaton region begins with the Upper Marl sequence of Carnian age, whose members (Füred limestone, Marls with *Estheria*, Limestone with *Trachyceras austriacum*, Marls with *Nucula* and *Lima*, Sándorhegy limestone) are enumerated also on the Table 1 in detail. Apart from this, however, the Upper Triassic sequence of the Central Transdanubian Mountains is filled up by “Hauptdolomit” (Main dolomite) or Dachstein limestone. From Vértes toward NE they are underlaid by the Mátyáshegy limestone, respectively Mátyáshegy dolomite, both bearing nodules of chert. The Dachstein limestone, however, that fills up only the Rhaetian in the Western Bakony, appears toward NE in more and more deeper horizons. Thus it pushes out the “Hauptdolomit” showing still to be Carnian or Norian in the Bakony and Vértes, already nearly totally in the Buda Mountains.

The Kössen facies that appears in the Western Bakony in form of intercalations

and lenses between the Norian "Hauptdolomit" and the Uppern Rhaetian Dachstein limestone, refers to locale deepening of basin. In consequence of the formation of the Dachstein limestone in a shallow water environment, a minor uplift was already sufficient to produce the breaks of sedimentation on the boundary Triassic Lias in the NE parts of the Central Transdanubian Mountains.

The Carnian stage in the Bükk Mountains is filled up by several varieties of limestone (with and without chert-nodules, or built up by corals) that are joined with the volcanic products mentioned above. Here the Norian is represented by grey limestones with *Monotis salinaria*. The same in Gömör is represented by red Hallstatt limestones overlaying the *Halobia*-bearing Carnian limestones of Szöllösárdó.

Irrespective of some parts of the Bakony, Vértes, Gerecse and Pilis, the youngest part of the Triassic, together with the Jurassic, was subsequently eroded. Probably, the age of denudation is undergone a change from area to area.

Unlike the limestone facies predominating the more northern areas, the Upper Triassic of the Mecsek is made up entirely of a thick fluvial-lacustrine sequence of the Karolinavölgy sandstone. This regression, however, was followed, from the Hettangian on, by a paralic sedimentation whose scene deepened after several oscillations gradually causing repeatedly the formation of coal-beds of excellent quality. In the Mecsek bay, however, landlocked as it was in the W, S and N, the sedimentation did continue even after complete isolation from the seas, whereas in the Villány Mountains a break in sedimentation encompassing the interval from the Middle Ladinian up to the Middle Jurassic can be observed.

The Triassic sequence which is proved as the most particularly divisible by biostratigraphic methods, appears in the Balaton Highland and the Bakony Mountains. Since 1913, however, the rich collections of fossils published in the famous Balaton-monography avoided a complete revision despite of the large numbers of the artificial outcrops made in the last years. That is all the more to regret, because there is a possibility in whole Hungary only here to lean on an uninterrupted succession of ammonites in the interval Middle Campilian/Carnian.

Among the ammonite zones appearing in Hungary that of the *Tirolites cassianus* has the widest extension. Outside the Balaton district it occurs, that is to say, in whole Hungary. In the Mecsek Mountains the zones of *Paracerasites bi-* and *trinodosus* present oneself that are besides proved only in the Balaton Highland till now: the reason for this fact is evidently to look for the conditions of sedimentation.

In the Villány region the ammonites (and the conodonts, too) are totally missing. Both in the NE parts of the Central Transdanubian Mountains and in northern Hungary the ammonites of certain zones occur in lenses only. Therefore one had already long no choice but to use also other fossil-groups (e.g. dasycladacees, brachiopods, pelecypods and gastropods, newest sporomorphes, foraminifers and conodonts, too) to the subdivision of the Triassic sequences. On support of all these fossils the stratigraphy of the Bükk, and Gömör, further the Mecsek and Villány complexes was elaborated at last time. The greatest results, however, were achieved by the treatise of E. VÉGH--NEUBRANDT on the *Megalodonts* of the Transdanubian Dachstein-limestones and "Hauptdolomit"-es.

On the Table I we attempt to summarize the valid names of the most important stratigraphic units of the Triassic in Hungary with their chronological and territorial distribution, that way they were compiled for the new edition of the Stratigraphical Lexicon of Hungary.

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REVIEW OF THE TRIASSIC SEQUENCES IN HUNGARY

System, member, stage		BALATON - HIGHLAND BAKONY, ISZKA-HILL	VÉRTES, GERECE, PILIS, BUDA MOUNTAINS	TRIASSIC HILLS NE FROM THE DANUBE	M E C S E K	V I L L Á N Y	BÜKK - MOUNTAINS	RUDABÁNYA - MOUNTAINS	G Ö M Ö R K A R S T	System, member stage
JURASSIC		Dachstein-Lias	Sinemurian limestone		Coal-bearing sequence /Hettangien/					JURASSIC
U P P E R	Rhaetian	Dachstein limestone	Dachstein limestone		Karolinavölgy sandston					Rhaetian
	Norian	Kössen beds limestone	Main limestone	Bauenstein limestone					Hallstatt limestone	Norian
M I D D L E	Carnian	Tuval	Main dolomite	Nézsó limestone	Kantavár beds		Bükkfennsík limestone		Szöllőssardó limestone	Tuval
		Jul	Remetehegy limestone	?		Felsőtárkány li-mestone	Nagyged limestone	Wetterstein limestone with Halorella and Cephalopoda	Jul	
M I D D L E	Ladinian	Cordeval	Feketehegy limestone	Csövár beds	Siderite of Mánfa		Felsővár li-mestone		?	Cordeval
		Langobard	Fazekashegy limestone	Dolomite with Diplopoda annulata?	Trigonodus limestone	Templomhegy dolomite	Repashuta limestone	Telekes-völgy slate complex	Langobard	
		Fassan	Mátyáshegy dolomite	Dolomite with Diplopoda annulata?	Kozár limestone		Bervavölgy limestone	Wetterstein limestone	Fassan	
			Dolom. of the Apáthy-crag	Dolomite with Diplopoda annulata?	Dömörkapu limestone		Subalyuk limestone	Reifling limestone	Illyr	
M I D D L E	Anisian	Illyr	Mátyáshegy lim.	?	Bertalanhegy limestone		Kisgyőr slates	Vecsempatak limestone	Illyr	
		Pelson			Tubes limestone	Zuhánya limestone				
		Hydasp			Lapis limestone	Tenkes limestone	Szent Istvánhegy porphyrite complex			
L O W E R	Werfenian	Upper			Báránytető limestone		Hámmor dolomite			
		Middle			Vöröshegy dolomite	Gyüd dolomite	Gutenstein limestone and dolomite			
		Lower			Viganvár limestone	Campilian beds	Gutenstein limestone and dolomite			
		Upper			Hetvehely dolomite	Seisian beds				
		Lower			Magyarürög beds					
LATE PERMIAN		Red sandstones	Dolomit, gypsum, siltstone		Patacs beds					LATE PERMIAN
Whole thickness of the Triassic sequences /m/		2300	> 2000		~ 2000	800	3500	> 1200	1200	Whole thickness of the Triassic sequences /m/