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Stratigraphic Position of the Triassic Sediments in the Upper Silesian Region

by

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Summary. On the ground of researches conducted on the Trias sediments of the Upper Silesian region 6 biostratigraphical indicator horizons can be distinguished, enabling correlation of these sediments with the Alpine Trias. Basing on this correlation, an Alpine scheme for a stratigraphic division of the Upper Silesian Trias was developed. This biostratigraphical scheme is of considerable significance in examining facial and palaeogeographical problems. It is important that in this new scheme a majority of the previous regional lithostratigraphic divisions have been maintained.

The Upper Silesian Triassic sediments have been divided according to a lithostratigraphic scheme. According to this scheme, hitherto applied to all the Triassic sediments of the Central European epicontinental facies, three stratigraphic stages have been distinguished. Each of these stages, in accordance with the theoretical assumptions, includes sediments corresponding to the specific facies whose succession is governed by the development of the sedimentation basin.

A detailed stratigraphic division of the epicontinental Trias consists in distinguishing the substages and levels, usually on lithostratigraphic basis only.

There already exist many separate regional and local detailed schemes of a lithostratigraphic division elaborated for various geographical regions. These schemes were developed from lithological criteria or, more rarely, from palaeontological criteria, and are most frequently characteristic only of the local areas. For that reason difficulties in mutual correlation are encountered.

For the Upper Silesian region a regional stratigraphical division of the Trias was made by Eck [6] and Roemer [17]. This division was further developed by Assmann [2—5] and extended by Siedlecki [21]. Later suggestions of further changes and additions concerning certain details of this division were put forward by Senkowiczowa, Szyperko-Sliwczyńska [20], Sliwiński [22], Alexandrowicz [1], Kopik [10], Marcinkiewicz [15].

The lithostratigraphic scheme of the Triassic sediments is of considerable practical significance for local or regional correlation, but proves to be unreliable for palaeogeographic problems. When related to larger areas a scheme of this type most fre-

quently appears to be heterochronous and as a result may lead to the mutual correlation of sediments of different ages.

An example of this inexact correlation is that in the Upper Silesian region the so-called "lower Keuper" has been distinguished. It is a fact that the sediments in this area which are called lower Keuper exhibit certain characteristics similar to those of the lower Keuper of the German Trias. In the lower part of the section through these sediments there usually occur gray schists and sandstones with flora, suggesting an analogy with "Lettenkhole". In the roof dolomitic schists and bright dolomites with fauna are found having a structure approximating that of "Grenzdolomit" from the Thuringian area. In research conducted up to now the fact that in the dolomites of Upper Silesia there are no signs of *Costatoria golfussi* Alberti, which is an indicator species for the "Grenzdolomit", has been totally disregarded. However, *Myophoria kefersteini* Münster appears there. Moreover, between the lower and upper parts of the profile one can easily observe a sedimentation gap with traces of weathering and erosion evidencing that there is a stratigraphic hiatus there. From the analysis of research data it results that this hiatus most probably includes the whole lower Keuper (according to the German division). Hence the lower part of the section through these sediments is older and the upper one younger than the lower Keuper.

In this case the former correlation has proved to be clearly erroneous, despiting the apparent analogy in the development of the sediments.

In other cases difficulties encountered in correlation of division schemes arise due to a lack of uniformity in the basic criteria assumed.

During the recent years certain difficulties have also been encountered in the correlation of general divisions of the profile such as substages and even stages. Certain names, such as Bunter sandstone, Muschelkalk and Keuper are by their very nature terms which refer to specific lithofacies and can only be used in this sense. Hence a need arises to work out a comparable, isochronic stratigraphic division of the Silesian Trias. The Alpine scheme would appear to be the most suitable for this purpose. This was actually elaborated on separate biostratigraphic criteria, but today it is correlated by many micro-remains occurring also in the epicontinental Trias.

The basic principles for correlation of the epicontinental Trias with the Alpine one have already been formulated [12—14, 23]. Some progress has also been made towards the biostratigraphic division of the Trias in the Upper Silesian region.

A study of all the available data from palaeontological research on macrofauna, microfauna and flora makes it possible to distinguish at least 6 biostratigraphic indicator horizons. These provide a basis for correlation between the Upper Silesian and Alpine Trias.

1) *Costatoria costata* Zenk., occurring in the Roethian, in Upper Silesia as well as in other parts of the epicontinental Trias, has long been recognized as the biostratigraphic indicator correlating Roethian sediments with the highest part of the Alpine Scythian.

2) The occurrence of *Decurtella decurtata* Girard and conodonts of the species

TABLE

Stratigraphical scheme of Upper Silesian Triassic deposits and its correlation with Alpine Triassic

Lithostratigraphical scheme by Assmann and Siedlecki			Kotlicki 1974					
			stage	sub-stage	Beds	Lithological units	Litho-facies	Biostratigraphic indicator horizon
Keuper	rhaetkeuper	"Steinmergelkeuper"	RHAETIAN		Wielichowo beds	? sandstones and red--brown slimestones and clays	Keuper facies	*Trilites pinguis* (Harris) *Polonie*
					Gorzow beds	variegated clays with "Wozniki limestones"		*Rhaetavicula contorta*
					Wozniki beds			
			NORIAN		Lisow beds	variegated clays with "Lisow breccia"		
						lack of sediments (erosion)		
	middle	upper gypsum keuper	CARNIAN	Tuval		red clays with gypsum spheroides		
		reedy sandstone		Jul		sandstones and slimestones, somewhere with shed poor coal		*Narkisporites harrisi* Kozur *Aulisporites astigmosus* *Karnocythere germanica*
		lower gypsum keuper		Cordero'		dolomitic schists and dolomites with evaporites		
	lower	Boundary dolomites				bright dolomites with fauna and dolomitic schists		*Myophoria kefersteini* Münster
		grey schists and sandstones with flora	LADINIAN	Langobard		lack of sediments (erosion)		*Maexisporites meditecatus* (Reinh) Kozur
					Miedary beds	grey schists and glauconitic sandstones with flora		
Muschelkalk	upper	Boruszowice beds		Fassan	Boruszowice beds	grey dolomitic and sandy schists		*Gondolella haslahensis* Tatge
		Wilkowice beds			Rybna beds	dolomitic limestones, limestones and conglomerate	Muschelkalk facies	*Gondolella mombergensis* Tatge
		Wilkowice Conglomerate						
		Tarnowice beds	ANISIAN	Illyr	Tarnowice beds	marly dolomites with gypsum and anhydrite		
	middle	*Diplopora* dolomites			Jemielnica beds	dolomites and limestones		*Diplopora annulatissima* Pia
	lower	Karchowice beds *Terebratula* beds Gorazdze beds		Pelson	Karchowice beds *Terebratula* beds Gorazdze beds (Olkusz beds)	reef limestones, partly recristallized marls and limestones with *terebratula*, colitic and pizolitic limestones (dolomites or limestones)		*Decurtella decurtata* Girard *Neaspathodus kockeli* Tatge
		Gogolin beds		Hydasp	Gogolin beds	marls and limestones with *Dadocrinus*		
Bunter	Roethian	Roethian limestones (Roethkalk)			Blotnica beds	limestones with *Myophoria vulgaris*		
		Roethian dolomites	SCYTHIAN		Roethian beds	dolomites, dolomitic marls and limestones with evaporites		*Costatoria costata* Zenk
	Older	Sand sandstones and variegated clays			Świerklaniec beds	sand, sandstones and variegated clays	Bunter facies	

in the E part area red green clays with "Wozniki limestones" and "Lisow breccia"

Neospathognatus kockeli Tatge in the Gorazdze *Terebratula* and Karchowice beds [13] is a clear indication that these beds may be stratigraphically classified as belonging to the Pelson.

3) Conodonts of the species *Gondolella mombergensis* Tatge occurring in the Rybna beds and also *Gondolella haslachensis* Tatge found in the Boruszowice beds, while correlating the position of these beds as related to the ceratite beds, *Compresus-evolutus* and *Spinosus-Enodis /laevigatus*, simultaneously correlate these beds with the lower Ladinian-Fassan stage. Such a correlation is confirmed by the ceratites found up to now.

4) *Myophoria kefersteini* Münster [2] from the dolomites of the so-called lower Keuper is an indicator fossil from Riable in the Eastern Alps, classified in the lower cordevol, and thus determines the lower limit of the Carnian in the Upper Silesian area. This correlation is also confirmed by the spore-pollen association [8].

5) The ostracods *Karbocythere germanica* Wienh. *et* Kozur, and also the spore--pollen association and the megaspores *Narkisporites harrisi* Kozur [8, 9], occurring in the reedy sandstone (Schilfsandstein) sediments of the upper Keuper should be recognized as stratigraphic indicators sufficient to correlate these formations with the Alpine Jul.

6) A further stratigraphic datum is provided by the stratigraphic Rhaetian-Lias boundary and the stratigraphic position of our upper Rhaetian having *Rhectavicula contorta* Portl. and *Trilites pinguis* [10, 15].

These indicator points connect the section of the Upper Silesian Trias, with the Alpine division, although they do not solve all the problems of the Trias in the Upper Silesian region. It would appear most reasonable to deal with these problems taking into account all the available information on biostratigraphic criteria and also sedimentological and palaeogeographical ones.

Basing on these assumptions and on the biostratigraphic indicators specified a new stratigraphic scheme for the Trias of the Upper Silesian region has been developed. This scheme includes all the lithostratigraphic sectors which come within the limits of biostratigraphic units.

The stratigraphic profile of the Trias of the Upper Silesian region and its correlation with the previous division are shown in the Table.

Scythian

In this stage have been included all the sediments previously classed as variegated sandstones, that is both the terrigenous sediments and the Roethian. Two lithostratigraphic zones are proposed, i.e.

Świerklaniec beds. They include the whole of the terrigenic sediments of the variegated sandstones which have not as yet a precisely established stratigraphic position.

Roethian beds. These beds include sediments where the indicator fossils *Costatoria costata* Zenk. occur, corresponding to the highest Scythian [18]. However, the so-called Roethian limestone ("Rotkalk") which does not exhibit Roethian indicator fossils should be excluded [11].

Anisian

Lower Anisian — (Hydasp?). It includes two lithostratigraphic zones, that is:

Błotnica beds with Myophoria vulgaris (Rotkalk). These are sediments corresponding to the so-called "Myophorienschichten" Trias of Germany, where they are placed in the lower Muschelkalk.

Gogolin beds. For these beds the criteria proposed by Assmann [5] and Siedlecki [21] in their schemes are maintained.

Middle Anisian — Pelson. Three bed complexes are included here, that is:

Górazdze beds
Terebratula beds } defined as previously.
Karchowice beds

In each of these bed complexes are found brachiopods of the species *Decurtella decurtata* Girard which is an indicator species for the Alpine Pelson, and its vertical range of occurrence in the Upper Silesian Trias appears to be similar.

These beds exhibit strong mutual lithological similarities, which is proved by the fact that in the eastern parts of Upper Silesia they were classed together in the so-called *Olkusz* beds [22].

The position of the *Terebratula* beds is documented by the presence of *Neospathodus kockeli* Tatge.

Ceratites trinodosus [4] noted as being found in the *Górazdze* beds cannot be recognized as an indicator of the Illyrian age of these beds, as was suggested by Senkowiczowa [19], since Assmann found *Ceratites binodosus* Hauer [4], an indicator species for the Pelson, in the *Terebratula* beds.

Upper Anisian — Illyrian.

Jemielnica beds. These are the sediments hitherto called the *Diplopora* dolomites. Since 1944 [5] these sediments were correlated with Ladinian by the presence of *Diplopora annulata* Schafn. In the last years a certain revision has been made in the stratigraphic range of occurrence of the *Dysycladaceae* in the Alpine Trias [16], and thus of the *Diplopora annulata* Schafn. which has been found to occur also in the Illyrian. Moreover, Ott, after examining specimens of *Diplopora* from Jemielnica, stated that they represent a species of *Diplopora annulatissima* Pia appearing in the Pelson and exhibiting their maximum development in the lower Illyrian. In consequence it seems most reasonable to place the *Diplopora* dolomites in the lower Illyrian.

Tarnowice beds. This name is given only to the lower part of the so-called Tarnowice Stare beds, that is marly dolomites.

Ladinian

Lower Ladinian — Fassan. In this stage all the formations classed as belonging to the Upper Muschelkalk have been included. Its stratigraphic position is documented by the conodonts [13, 14].

Rybna beds. They include the lower part of the Ladinian developed in the facies of the Muschelkalk (the upper part of the beds from Tarnowice Stare and the Wilkowice beds).

Boruszowice beds. This zone is distinguished in accordance with its previous definition. Over the Upper Silesian territory the cycle of Keuper sedimentation begins with it.

Upper Ladinian — Langobard. In this division schists and sandstones with flora, previously placed in the lower Keuper are classed. The sediments were described first from Miedary [5, 6] so we can call them Miedary beds.

Carnian

This stage includes the whole of the sediments previously placed as belonging to the Keuper (*sensu polonico*), except for the lowest parts of the lower Keuper, described above as schist and sandstone with flora. Within the Carnian three substages are distinguished.

Lower Carnian — Cardevol. These are dolomites with *Myophoria kefersteini* Münster, sometimes called incorrectly "boundary dolomites", which mark the lower stratigraphic boundary. Also included here are dolomitic schists and dolomites with evaporites, called the lower gypsum horizon of the Keuper or lower gypsum Keuper.

Middle Carnian — Jul. The reedy sandstone sediments in their entirety. The stratigraphic position of these sediments is determined by the presence of the spores *Narkisporites harrisi* (Reinhard, Fricke) Kozur and *Aulisporites astigmosus* (Leschik) Klaus.

Upper Carnian — Tuval. These are the so-called upper gypsum series of the Keuper. These sediments are not yet satisfactorily biostratigraphically documented. They contain a spore-pollen association somewhat similar to those appearing in the Julian sediments. Moreover, there is a sedimentation conformity between these Tuval sediments and the Jul.

Norian

The problem presented by this stage in the Upper Silesian Trias will almost certainly be a controversial matter for some time, since the sediments lying on the Tuval in Poland, i. e. the so-called *Unionites posterus* horizon, were earlier assigned to the Rhaetian. If this classification were to be true there would have to be in our territory a stratigraphical hiatus comprehending the whole Norian. A stratigraphical hiatus certainly exists. It is indicated by the non-conformable deposition of the *Unionites posterus* sediments, lying so as to encroach on various stratigraphic zones of the Trias, and even on the Palaeozoic sediments. Nevertheless, classing these sediments as belonging stratigraphically to the Rhaetian is still questionable [13, 10]. Hence it would appear that the stratigraphical gap comprehends only the lower parts of the Norian, while the upper parts of this stage can correspond entirely or partially to the sediments of the *Unionites posterus* horizon. This refers particularly to the so-called large cyclothem R. I. [8] or Lisów beds.

Rhaetian

In the stratigraphic scheme put forward here the Rhaetian is taken to include the sediments previously assigned to this stage as proposed by Kopik [10] and others [8, 15] except for the *Unionites posterus* horizon. The Gorzów beds and Woźniki beds are included here, even though the correlations between them are not yet satisfactorily explained.

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С. Котлицки, **Стратиграфическая позиция осадков триаса в области Верхней Силезии**

Содержание. Результаты палеонтологических исследований триаса области Верхней Силезии дают возможность в настоящее время выделить в профиле триаса 6 опорных биостратиграфических горизонтов дающих основание для корреляции эпиконтинентального триаса Верхней Силезии с альпийским морским триасом. В работе представлено новое стратиграфическое деление триаса области Верхней Силезии. Как основание принято схему альпийских ярусов и подъярусов, с которыми синхронизованы отдельные региональные литостратиграфические выделения.