

DATA FOR A PALEOGEOGRAPHIC RECONSTRUCTION OF TRANSDANUBIA, HUNGARY, AT THE END OF PALEOZOIC TIME

M. KASSAI

SUMMARY

In Mecsek Mts. and Balaton Highland a well studiable characteristic red sandstone group consisting of basic conglomerate with subjacent layers as well as cross-laminated red sandstone, covered by Seisian fauna-bearing formations can be found. In spite of some good criteria of the identifiableness, the conciliatory attempts have produced numerous contradictions during last hundred years. L. LÓCZY sen. and J. BÖCKH had agreed in the stratigraphic identity of both sequence, nevertheless they ranged them into Permian and Triassic, respectively.

E. VADÁSZ had chosen the Permian period, but he did not recognize the character of the main conglomerate of Mecsek Mts. therefore he was unable to do an acceptable comparison between both sequence.

Leaving the lithostratigraphic identity out of consideration lastly K. BALOGH and A. BARABÁS ranged the red sandstones of Balaton Highland and Mecsek Mts. into Permian and Triassic, respectively, similarly to L. LÓCZY Sen. and J. BÖCKH.

The author presents a paleogeographic sketch pointing out possibility of a lithostratigraphic and chronostratigraphic correlation in the mentioned region.

HISTORICAL REVIEW

Studying the history of paleogeographic recognition of Transdanubia regarding the end of Paleozoic, it can be established that there is an absence of comprehensive appreciation of particular data until the beginning of the last decade.

Among the great predecessors J. BÖCKH [1876] and L. LÓCZY SEN. had agreed in the ability of a comparison between red sandstones of Mecsek Mts. and Balaton Highland covered by Seisian fauna-bearing layers. "The Balaton-side red sandstone and Verrucano can be obviously compared with sandstone of Szentjakab Hill, near Pécs" [L. LÓCZY SEN., 1913]. The stratigraphic relation of them was guaranteed by discordantly settled basis conglomerate as well as even-aged covering strata (fauna-bearing Seisian layers) and that is right at present too (*Fig. 4*). However both of sandstones were ranged into Triassic by J. BÖCKH, [1876], whereas L. LÓCZY SEN., [1913] had accepted the Permian age for both of them.

E. VADÁSZ, [1912] stated that the Permian sandstone of Mecsek Mts. "...either tectonically or appearance is sharply bordered towards covering formation. Directly above follow banks of the conglomerate discordantly." Consequently he also observed the unconformity of conglomerate. It is very interesting and instructive to follow with attention the change of VADÁSZ's opinion about age of Mecsek red sandstone during a 25 years period. In the Report of Hungarian Geological Institute dated 1917 on the 26-th pages can be read that "...the lower sandstone shows any unconformity towards the conglomerate in most places", but contrasting with this obser-

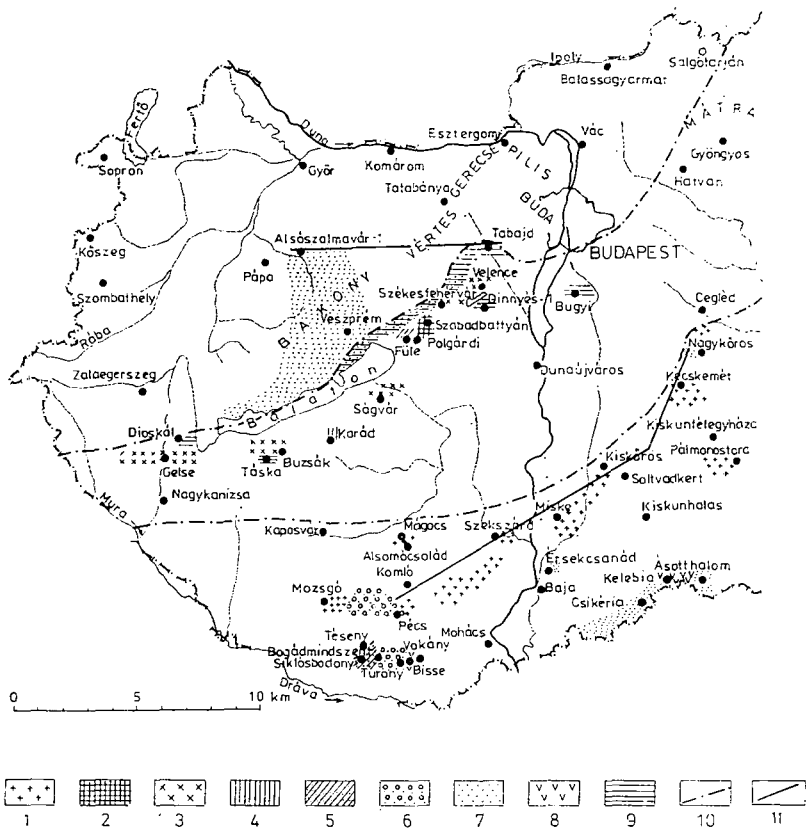


Fig. 1. Review of the occurrences of the Carboniferous and Permian strata and the presumable extension of the sea at the end of the Permian in Hungary by K. BALOGH [1972]. (Part) Legend: 1. Migmatic granite (Breton phase?). 2. Early Carboniferous in marine facies. 3. Granite plutons (Sudetic phase?). 4. Upper Carboniferous marine facies. 5. Middle and Upper Carboniferous in continental and marine facies. 6. Lower and Upper Permian continental facies. 7. Upper Permian, transgressing over Oldpaleozoic. 8. Quartz porphyry and quartz porphyry tuff. 9. Upper Permian in continental-lagoonal, in continental-marine facies, respectively. 10. Upper Permian shoreline. 11. Profiles of Fig. 2a, 2b.

vation in monography of Mecsek Mts. produced by E. VADÁSZ, [1935] it can already be seen that "...The sandstone belonging to the lower member... is passing over gradually into coarse conglomerate without any sharp boundary". Referring to the age of the Jakabhegy sandstone (directly above the coarse conglomerate) in one of the same papers from 1917 (p. 390) one can be read that "...it is possible to range the conglomerate and overlying red sandstones either into Triassic or Permian arbitrary...". Twenty years later "...the coarse conglomerate and red sandstones represent the Upper Permian epoch..." [1935, pp. 28].

Taking back of the unconformity by E. VADÁSZ had been a serious error involved some trouble in the South Transdanubian Late Paleozoic stratigraphy during a fairly long period. Giving too much freedom for geologists in the judgement of age-questions on the one hand, breaking up certain correlation criteria between Balaton Highland and Mecsek sandstones on the other, which led to a resignation, namely: in spite of

a considerable thickness and development difference it is sufficient to know the existence of Permian strata in both of area and not any more. Due to this chronostratigraphic generalization on the paleogeographic schemes of Hungary made by Gy. WEIN [1969] and others, both of area are presented without any difference.

The study of the same topic by K. BALOGH, A. BARABÁS [1972] is already produced any deviation from the above-mentioned view. Although we are obliged to state that the authors used an arbitrary ranging instead of systematic analysis of criteria of the correlation. It led to disappearance of the Jakabhegy sandstone from their paleogeographic sketch (Fig. 1) because it was ranged into Triassic period. Consequently, it is impossible to draw any acceptable geological profile between Balaton Highland and Mecsek Mts. or Nagykőrös and Mecsek Mts. based on paleogeographic scheme of the authors (Fig. 2).

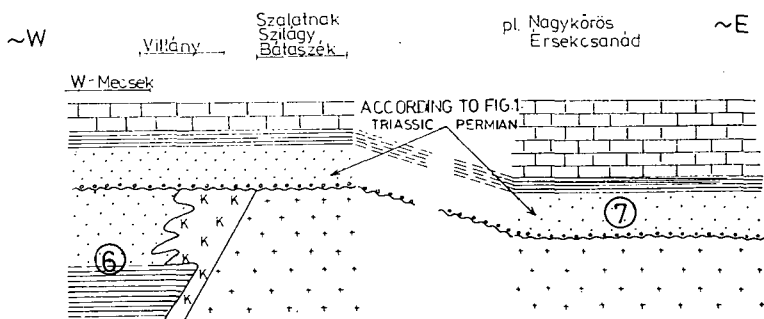


Fig. 2a. Geological profile plotted in Fig. 1 Legend from the Fig. 1

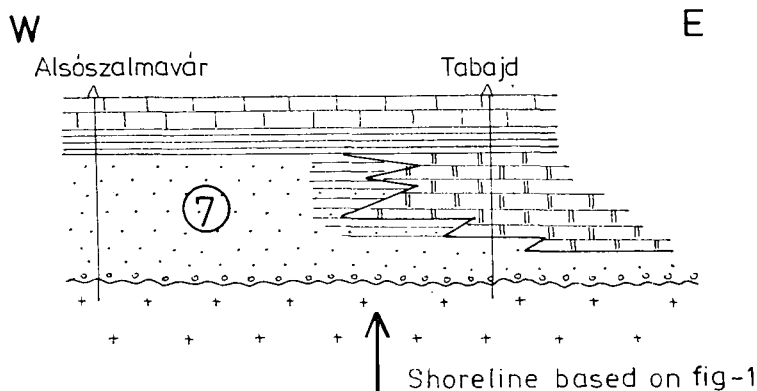


Fig. 2b. Geological profile plotted in Fig. 1 Legend from the Fig. 1

Studied this question historically it should be stated that stratigraphic publications regarding Permian of Balaton Highland since 1913 have been absence from the Hungarian geological literature.

SOUTH TRANSDANUBIA

The paleogeographic reconstruction of Transdanubia in respect to the end of Paleozoic and the beginning of Mesozoic can be carried out well, due to appropriate exploration. The main features of its:

- There was a trough on the western side of so called “Villány–Szalatnak Deep Fracture Zone” filled by a few thousand meters thick Upper Carboniferous–Permian sandstone sequence, while on the eastern side of the fracture zone existed a broad denudation area in the same time [M. KASSAI, 1976].
- With the appearance of the main conglomerate, the eastern area also became trough. Following a sharp unconformity and showing some typical stamps of marine transgression, the main conglomerate buried eastward the extinct quartz-porphyric volcanoes and the “old basement”. Based on numerous statistical data of the Jakabhegy sandstone it seems belonging to marine main facies developing from the conglomerate and passing over gradually into fauna-bearing Lower Triassic red sandstones and aleurolites [M. KASSAI, 1976].

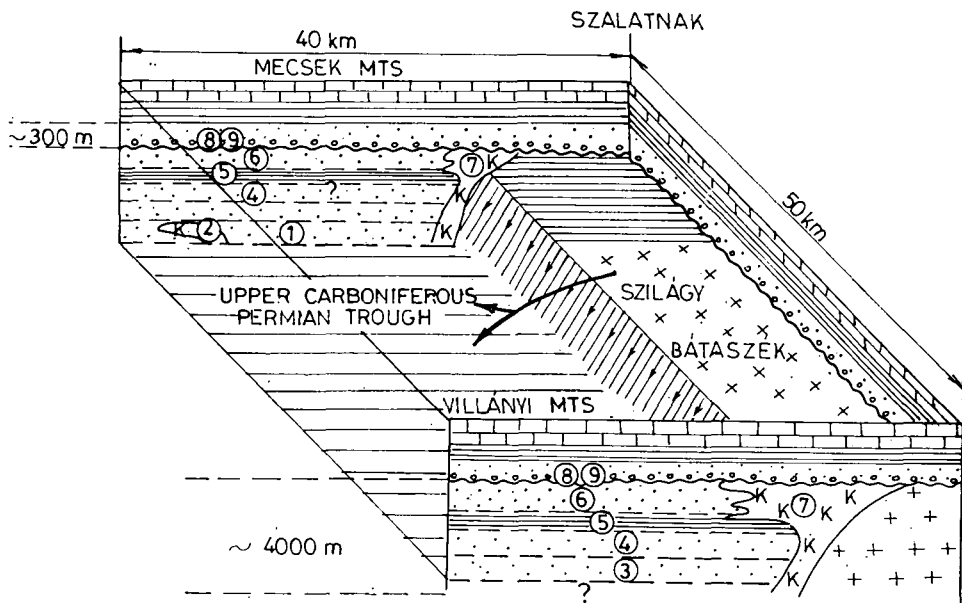


Fig. 3. Paleogeographic setting of the Jakabhegy sandstone of South Transdanubia [M. KASSAI, 1976].
Legend: see Fig. 4

This profile is expansible to Nagykőrös boreholes located Duna–Tisza Interfluve without any difficulty. The stratigraphic identity is guaranteed by basic conglomerate (main conglomerate) underlying the “old basement” and the superincumbent Seisian fauna-bearing layers as well as identity of the sedimentation.

BALATON HIGHLAND

Used also rock-column descriptions made by K. BALOGH, A. BARABÁS, [1972] it can be established that the red sandstones of Balaton Highland are identical with the Jakabhegy sandstone of South Transdanubia based on well parallelizable underlying and overlying rocks. The basis conglomerate settled down discordantly on the "old basement" rocks similarly to the eastern part of South Transdanubia. This stratigraphic situation as well as regional developmental identity characterize a typical marine transgression which is moreover supported by a general experience, namely: the rivers do not prefer to occupy denudation areas.

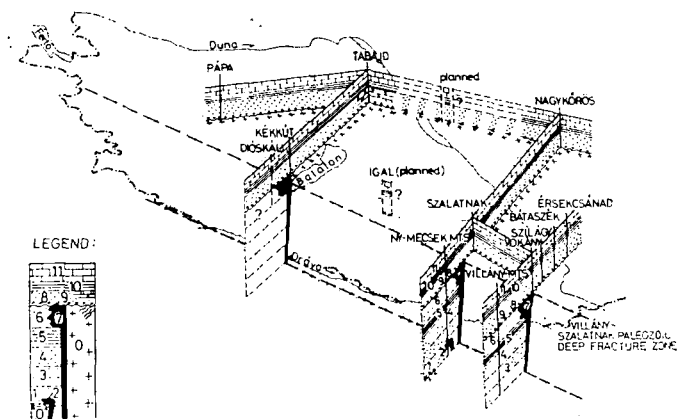


Fig. 4. Geological structure of the Late Paleozoic—Early Triassic in Transdanubia and Danube—Tisza Interfluvium. Legend: 1—2. Gyűrűfű Variegated Sandstone, Congl. and Quartzporphyry Formation. 3. Tésény Sandstone Formation. 4. Cserdi Variegated Sandst. and Congl. Formation. 5. Boda Red Aleurolite Formation. 6—7. Kővágószőlős Sandst. and Vókány Quartzporphyry Formation. 8—9. Jakabhegy—Balaton Highland Red Sandstone Formation. 10. Seisian fauna bearing layers. 11. Anisian limestone-dolomite

Belonging to the marine main-facies of the red sandstone is proved by heteropic gypsum and marl layers of Tabajd profile. The opinions about continental origin and belonging to the fluvial main-facies of red sandstones, as well as the statement the "...continental facies in the southern foreland of the Vértes Mountains grades into a gypsum-bearing, lagoonal-marine facies..." K. BALOGH, A. BARABÁS [1972, pp. 201] include some serious contradictions.

AREA BETWEEN BALATON HIGHLAND AND MECSEK MOUNTAINS

There is no an established rock-column available about the area between Balaton Highland and Mecsek Mts. regarding the mentioned period, and this lack of the data can not be substituted by any theoretical consideration.

AGE QUESTIONS

It can be seen from the historical review that chronostratigraphic ranging of the sequences were carried out for themselves, instead of search of the stratigraphic identifiableness criteria. It is a generally known fact that the afore-mentioned sequences

have not acceptable fossils for dating at all, moreover the red sandstones are "totally empty" in fossils.

It seems to be clear to draw the Permian-Triassic boundary at the fauna-bearing Seisian layers. In relation to this proposition one could remark of two different considerations:

- Drawing the paleogeographic face of this border, it shows a monotonous area consisting of fine grained sandstones, aleurolites and marls. The geologic frame of the Paleozoic trough (which was fairly smaller than Mesozoic one) as well as direction of the Mesozoic transgression, etc. are effaced by this look.
- In many places of the Alpine-Carpathian-Balkan region the red sandstone sequence covering an "old basement", is regarded as the beginning of the large Lower Triassic marine transgression cycle.

Consequently, to the interpretation of paleogeographic setting at the end of Paleozoic, it is necessary a collective presentation of the period ranging from Carboniferous-Permian up to Anisian emphasizing the marks of main lithostratigraphic identifiableness. A standpoint in the age-questions of this topic can be formed only parallelly with the opinions about Alpine-Carpathian-Balkan region.

SHORTNESS IN THE DATA OF PRESENTED PALEOGEOGRAPHIC SKETCH

The presented paleogeographic sketch (*Fig. 4*) contains some lack of the geological data in numerous places. First of all at the marked part of Tabajd-Nagykörös profile as well as near Igal village can be found cardinal points where from should be gain satisfactory data for an eventual paleogeographic appreciation. In the lack of these data the variegated ideas having a harsh contrast between abundance of them and poverty of the available data, are unacceptable. These cardinal points have also certain economic importance. E.g.: for elaboration of regional hydrocarbon prospecting conditions and conceptions it may be important to know the existence of coal-bearing or organic material-rich Upper Carboniferous and Permian rocks. For the uranium prospecting is outstanding the research of clastic Permian rocks, thus first of all at surroundings of Dióskál, Balaton Highland.

FURTHER CONNECTIONS OF THE PRESENTED PALEOGEOGRAPHIC SKETCH

The presented paleogeographic sketch has appreciable connections within the Carpathian Basin. Same geological rock-columns can be found at Pápa and Little Carpathians as well as Inovec, or Nagykörös and East- and South Carpathians. It is rightful to look for any connection between Upper Carboniferous-Permian located on the western side of Villány-Szalatnak Paleozoic Deep Fracture Zone and Dinaric Geosyncline as it has already been raised by numerous authors.

Finally it can not be avoided the question of contact with Late Paleozoic development of Bükk Mountains. It is practically insoluble without suggested drillings near Igal and between Tabajd and Nagykörös.

REFERENCES

- BALOGH, K., BARABÁS, A. [1972]: The Carboniferous and Permian of Hungary. *Acta Miner. Petr. Szeged*, XX/2, 191—207.
- BARABÁS, A. [1955]: A mecseki perm időszaki képződmények földtana, (Geology of Mecsek Mts.) *Cand. Dissert., MTA Library, Budapest.*

- BARABÁS, A. [1964]: A Délkelet-Dunántúl Paleozoós Képződményei. Az I. Jugoszláv—Magyar Geológus Találkozó kiadványa. (Paleozoic Formation of Southeast Transdanubia. Edited by I. Yugoslav—Hungarian Geological Meeting).
- BARABÁS—STUHL, Á. [1962]: Jelentés a mecseki permii képződmények palinológiai vizsgálatáról. (Report about palinological examination of Permian formations of Mecsek Mountains.) Manuscript, Mecsek Ore Mining Co., Pécs.
- BARABÁS—STUHL, Á. [1969]: A Mecsek hegységi permii üledékek tagolása ciklusos kifejlődésük alapján. (Division of Permian deposits of Mecsek Mountains based on cyclic arrangement of theirs.) Földt. Közl., 99, 66—80.
- BÖCKH, J. [1876]: Pécs városa környékének földtani és vízi viszonyai. (Geological and hydrogeological relations of Pécs and its environment.) M. Áll. Földt. Int. Évk. 4,
- JÁMBOR, Á. [1964]: Lower Permian formations of Mecsek Mountains. Manuscript, Mecsek Ore Co., Pécs.
- JÁMBOR, Á. [1967]: Karbon képződmények a Mecsek és Villányi-hegység közti területen. (Carboniferous formations between area Mecsek and Villány Mountains.) Földt. Int. Évi Jel. 1967-ről, 215—221.
- KASSAI, M. [1969]: A jakabhegyi homokkő fácies és korkérdései Dokt. Ért. (Facies and age questions of Jakabhegy sandstone. Doc. Diss.) NME Miskolc.
- KASSAI, M. [1971]: A Délkelet-Dunántúl nagyszerkezeti vázlata és a perm-, alsó triász törmelékes öszszletek beszállítási irányai. (Regional tectonic sketch of Southeast Transdanubia and transport directions of Permian-Lower Triassic sedimentary complexes.) Manuscript, Mecsek Ore Mining Co., Pécs.
- KASSAI, M. [1972]: A Délkelet-Dunántúl mélyszerkezeti viszonyai és vázlatos vízföldtani és geotermikus jellemzői. (Deep structural relations and schematic hydrogeological and geothermal characteristics of Southeast Transdanubia. M. Hidr. Társ. Pécsi Csup. Évk.
- KASSAI, M. [1973]: A Villány-szalatnaki paleozoós mélytörés. (The Villány-Szalatnak Paleozoic deep fracture.) MTA X. Oszt. Közl., 6/1—4.
- KASSAI, M. [1973]: A délkelet-dunántúli paleozoós rétegsorok fáciesmeghatározásának problémái. (Problems of facies determinations of Paleozoic sequences on Southeast Transdanubia.) Földt. Közl., 103, 389—402.
- KASSAI, M. [1976]: A Villányi-hegység északi előterének perm képződményei. (The Permian formations of northern foreground of Villány Mountains.) Geol. Hung. 171, 14—86.
- LÓCZY, L. SR. [1913]: A Balaton környékének geológiai képződményei és ezeknek vidékek szerinti települése. (Geological formations of Balaton environs and setting of theirs according to territories.) A Balaton Tud. Tan. Eredményei I, Budapest.
- MAJOROS, GY. [1963]: A Balaton-melléki permii rétegösszlet üledékföldtani vizsgálata. (Sediment-geologic investigations of Balaton-side Permian complex.) Doct. Diss., ELTE, Budapest.
- NAGY, E. [1968]: A Mecsek-hegység Triász képződményei. (Triassic formations of the Mecsek Mountains.) Földt. Int. Évk., 51, 3.
- NAGY, E., NAGY, I. [1976]: A Villányi-hegység triász képződményei. (Triassic formations of the Villány Mountains.) Geol. Hung., 17, 111—197.
- PETROVIC, K., MARKOVIC, E. [1961]: Mesozoic of Yugoslavia. Beograd.
- SZEDERKÉNYI, T. [1963]: Földtani vizsgálatok a Mecsek-hegység déli előterében. (Geologic investigations in southern foreground of Mecsek Mountains.) Doc. Diss., ELTE, Budapest.
- SZEDERKÉNYI, T. [1964]: A baranyai dunamenti mezozoós szigettrögök földtani viszonyai. (Geological relations of Mesozoic island-masses along Danube river from Baranya County.) Földt. Közl., 94, 27—32.
- VADÁSZ, E. [1912]: Földtani megfigyelések a Mecsek-hegységből. (Geological observations from Mecsek Mountains.) M. Kir. Földt. Int. Évi Jel., 67—74.
- VADÁSZ, E. [1917]: A Mecsek-hegység nyugati része. (The western part of Mecsek Mountains.) M. Kir. Földt. Int. Évi Jel. 1916, I, 389—398.
- VADÁSZ, E. [1935]: A Mecsek-hegység. Magyar tájak földtani leírása. (The Mecsek Mountains. Geological descriptions of Hungarian lands.)
- VADÁSZ, E. [1954]: Magyarország földtani nagyszerkezetének vázlata. (Regional geological-tectonic sketch of Hungary.)
- VADÁSZ, E. [1960]: Magyarország Földtana. (Geology of Hungary.) Akad. Kiadó Budapest.
- VADÁSZ, E. [1964]: Bizonytalan életnyom-alakulatok a permii rétegekből. (Uncertain traces of life manifestations from Permian layers.) Földt. Közl., 94, 3, 382—384.
- VÁRSZEGI, K. [1961]: Levéllábú rák maradványok a mecseki permii öszszletből. (Phyllopora remnants from Permian complex of Mecsek Mountains.) Földt. Közl., 91, 226—227.
- VÁRSZEGI, K. [1971]: Öszszefoglaló jelentés a szalatnaki területeken végzett kutatásokról és azok földtani eredményeiről. (Summary report about investigations of Szalatnak area and its geological results.) Manuscript, Mecsek Ore Mining Co., Pécs.

- VÁRSZEGI, K. [1972]: A szalatkai terület földtani értékelése. (Geological evaluation of Szalatnäk area.) Manuscript, Mecsek Ore Mining Co., Pécs.
- WEIN, Gy. [1967]: Délkelet-Dunántúl hegységszerkezeti egységeinek összefüggései az óalpi ciklusban. (Relationships of mountain-structural units of Southeast Transdanubia in the Early Alpine Cycle.) Földt. Közl. 97, 286—293.
- WEIN, Gy. [1969]: Tectonic review of the neogene-covered areas of Hungary. Acta Geol. Sci. Hung. XIII, 399—436.
- Manuscript received, July 20, 1977*

DR. MIKLÓS KASSAI
Hungarian Geological Institute
H-7621 Pécs, Déryné u. 9.
Hungary