Zoltán Utasi

Some outstanding geomorphological values of the Upper Tarna region

1. The position of the Upper Tarna region

The Upper Tarna region involves the catchment areas of the Cered- and Lelesz-Tarna streams up to their joining at Pétervására (Fig. 1.). Three hilly areas that are connected by the Tarna (see map) are involved in this region. These three areas are the followings: western part of the Heves-Borsod Hills, eastern part of the Upper Tarna – Zagyva Hills and the northeastern zone of the Pétervására Hills. The scientific exposition of this picturesque hilly region is far from complete as it is one of the marginal areas of Hungary hiding in the shadow of the Mátra and Bükk Mountains. The main goal of this paper is to highlight the values hiding in its landscape and to present the most important geomorphological values. Despite its large extent, the region exhibits a rather uniform petrological and geomorphological picture. Its morphology becomes divers only in its western part. (The settlements to which the certain forms belong are found in brackets after the name of the forms as many forms bear similar names.)

2. Geological framework

Geological heterogeneity is similar to that of the surrounding mountains. Its exposed rocks present the history of 30 million years. The oldest is the Szécsény Schlieren Formation which is a grey, unbedded fine sandy – clayey siltstone with small micas and fishxxx. It has a general thickness of 400-800 m. It is exposed to the surface in the western part of the area. Its superposition on the Pétervására Sandstone can be studied South of Pétervására. The majority of the area is built up by the Pétervására Sandstone Formation formed in the Upper Oligocene – Lower Miocene period. Its thickness is between 500-700 m and it can be subdivided into two parts. Its lower, larger part is a coarse, medium and fine grained sandstone with varying hardness and with a colour ranging from grey to yellowish green. It is frequently glauconitic with muscovite and biotite. It can be cross-bedded or thinbedded with clay stripes. Large concretions with regionally different apperance are also characteristic. The upper thinner part is the 50-80 m thick Ilonavölgy Formation, which is, separated from the underlying formation by the occurrence of coarse gravel, tuff, tuffite intercalations and bentonite fragments and lenses. Major outcrops of the sandstone are associated with larger valleys and with the middle part of the Pétervására basin (for more detail see later). Its surface is eroding rapidly, however, it can form steep walls due to its strong cement. Younger Miocene schlieren may be studied in outcrops that are situated closer to valley floors (Váraszó).

Volcanism also left prints in the landscape: The Lower Rhyolite Tuff is exposed on the tops (Fehér-kő) near the watershed West of the Ceredi-Tarna. This rhyolite tuff is also known from a deeper site the former bentonite quarry in Istenmezeje. However, the Miocene lava rocks so characteristic in the Mátra Mountains are completely missing. The forms of the younger basaltic volcanism occur like islands in the western parts forming the so-called “remnant hills” that are elevated 100-120 m above the surrounding sandstone surfaces (Nagy-kő near Bárna, Kis-kő, etc.). The united basalt mass of the Medves region and the Ajnácskő Mountain in the northwest border the Cered Basin that hides the source area of the Tarna and Gortva streams. Younger Holocene alluvia are accumulated on the floors of the larger valleys. Outcrops from here reveal the periodically repeated accumulation and cutting.

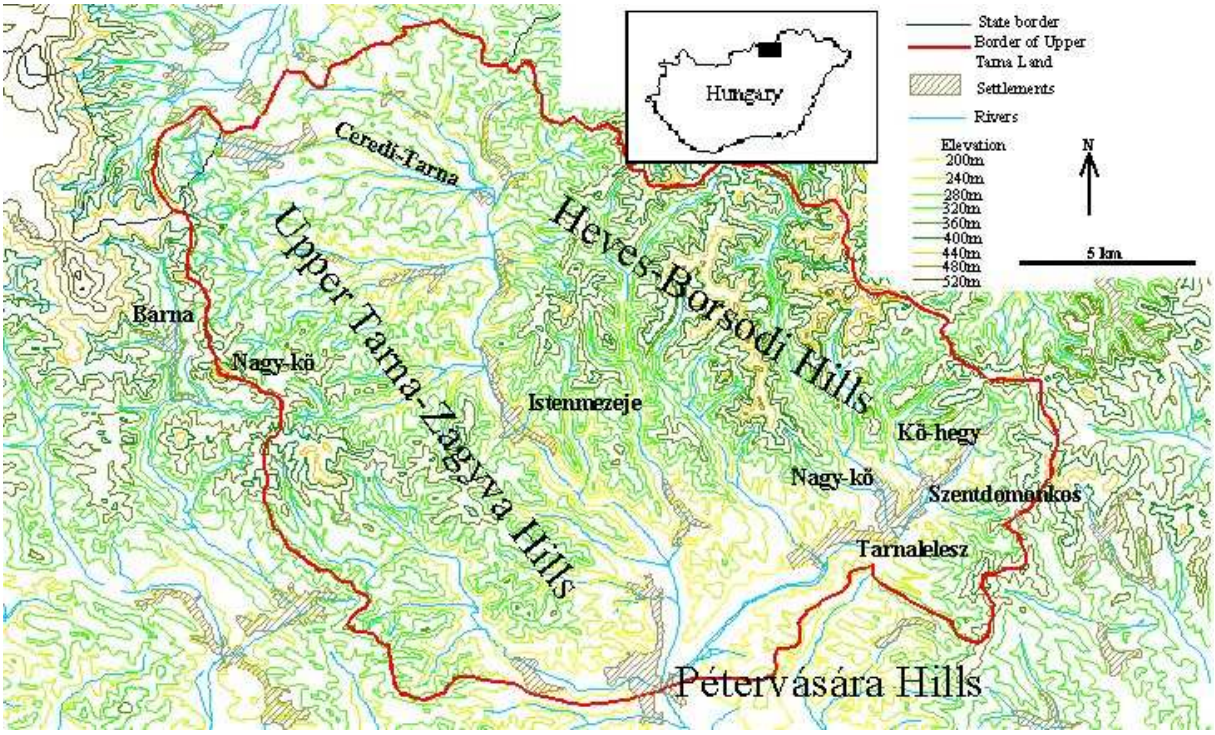

Fig. 1.: General map of the Upper Tarna Region

Fig 2:. Upper part of the Lelesz Tarna stream with the middle morphological level in the foreground and with the lower hilly level in the background while the surrounding mountains can be seen at the back

3. General morphology of the area

The three hilly regions forming the Upper Tarna region express great similarity in their geomorphology as in the case of their geological conditions. The landscape may be described as a multi basin hilly region. The bordering mountains are the Mátra and the Bükk from the South the highest parts of which may reach 900-1000 m. The Medves Region and the Ajnácskő Mountain from the northewest are much lower with ridges elevating up to 500-600 m. The next (middle) elevation surfaces are the tops of the hills on which runs the watershed of the two Tarna streams. The third (lower) elevation level is presented by the Cered and Pétervására Basin the low ridges of which are directly connected to the hilly regions, however, they represent a lower surface with an average elevation of 180-250 m. The basins are separated from the hills by a characteristic step. This paper intends to describe the two latter elevation levels.

The forms of the landscape are determined by the characteristic duality of the sandstone: on the one hand it is very resistant, strongly cemented thus frequently forming steep sometimes several hundred metres high near vertical walls, on the other hand it weathers rapidly when exposed to the surface, its upper layer can be easily eroded. Therefore relative relief values are very significant in Hungarian terms as on more that 60 % of the area the slope gradient is greater than 25 % (Utasi Z. – Szabó G., 2002.).

The most closed and highest hilly region is the Heves-Borsod Hills that is bordered by the (Ceredi) Tarna from the West, the Hangony stream from the North, the Hódos stream from the East and the Lelesz Tarna from the South. The watershed runs in the central region of the Hills with a more-or-less East-western orientation. Considering its geology, it might be the most uniform of the Hills built up nearly entirely by glauconitic sandstone. Its major valleys are oriented North-South with slight curves. The two largest valleys are the Hosszú valley (Szalajka valley) near Váraszó and the Nagy valley near Tarnalelesz. Both valleys are 10 km long so-called floored valleys. The largest ones of their tributaries are also oriented North-South. The ones perpendicular to these extend for only a few km and are formed mostly by derasional processes. The central part of the Hills is 500-5200 m high, the highest is the Ökör-hegy (541 m). The height of the tops is gradually decreasing from the centre except for to the South and they lower to a height of 300-350 metres in the margins of the area. While the southern edge is connected to the main mass by a step as a 220-250 m high zone for a width of 2-3 km accompanies the Lelesz Tarna. The area characterised by wide flat intervalley ridges is the well-preserved terrace of the Lelesz Tarna stream. The most beautiful and largest sandstone rock walls (Kő-hegy, Nagy-kő near Tarnalelesz) are formed along the border of this two surfaces on the edge of the higher surface facing South.

The Upper Tarna – Zagyva Hills involves the area West of the (Ceredi) Tarna. This area bears a slightly more varied landscape both in terms of geology and geomorphology. Its average height is between 300-400 m from which only some basalt cones protrude (Nagy-kő near Bárna – 518 m, Kis-kő, etc.). Considering the characteristics of the valleys the are can be divided into two parts: the southern part is characterised by northwest-southeast oriented slightly curved valleys similar to that of the Heves-Borsod Hills, while the northern part is dominated by west-east oriented valleys. Therefore here the lower hilly region with an average height of 180-250 m is not directly connected to the central area as the west-east oriented valleys separate them. The hill ridges formed in this way are strongly asymmetric, gently sloping to the North and steep to the South.

The Pétervására Hills considering its height and geology is a transition between the former two Hills as it is a small hilly region lacking outcrops and geomorphological values. Its economic importance is given by its bentonite formations. It is characterised by wide and flat hill ridges and extended valleys. The Upper Tarna Region contains only its margin that is

situated along the Lelesz Tarna stream as the waters of its northern part are driven away by the hanging valley like Boja stream.

Fig. 3:. Kő-hegy near Szentdomonkos

Fig. 4.: Surface of the Kő-hegy

Fig 5.: Natural erosional depressions on the Kő-hegy

Fig 6.: Nagy-kő near Tarnalelesz

Fig. 7.: The surface of the Nagy-kő

Fig. 8.: Vállóskő near Istenmezeje

4. Outstanding forms

4.1. Rock walls

4.1.1. Forms developed along the border of the middle and lower hilly region

The common characteristic of these forms is that they are formed along the border of the middle (300-500 m) and lower (180-250) hilly levels along the edge of the terrace (fig. 2.). The exposed sandstone belongs to the lower (Pétervására) member of the Pétervására Sandstone Formation. Two of these surpass by their size and form.

Kő-hegy (Szentdomonkos)

This is a characteristic rock wall divided in three in one of the side valleys on the left of the Hosszú valley near Szentdomonkos. Its highest parts elevate up to 400 m. Its bottom is situated 350-360m asl. Its walls facing South, reach 30-40 m (fig. 3.). Its surface is strongly weathered. Braking the dark outer crust, the characteristic yellowish brown colour of the sand can be seen. Due to its relatively high position we can observe the last moment of deposition. Sedimentation was relatively slow and periodical in undisturbed environment. This is suggested by the well-preserved thin beds that slope (30°) to the North (15°). Due to the varying petrology the more erodable parts are denuded and extended 1-2 m deep holes were left in their places (fig. 4.). Its concretions are small and thin comparing to that of the other wall rocks (fig. 5.). Unfortunately it is situated just outside the Tarna Region Landscape Protectional District and it is not easily accessible from the settlement.

Nagy-kő (Tarnalelesz)

One of the best rock walls of the Upper Tarna Region is found west of the Kő-hegy near the valley head of the Mocsolyás stream (fig. 6.). Its average height is between 300-700 m. The greatest height of its nearly vertical wall is 70 m. It is situated lower from the Kő-hegy considering both topography and tectonism and it is reflected in both its petrology and forms. The thick-bedded glauconitic sandstone is characterised by flat loaf-like concretions that are aligned in parallel rows (fig. 7.). Possessing an even surface it erodes less than the Kő-hegy forming steeper and more united walls. The beds slope to the North (10°) as well by 30°. Upper layer of the rock wall is red due to its higher iron content. It is part of the Upper Tarna Region Landscape Protectional District and it is accessible from Bükkszenterzsébet.

4.1.2. Forms developed near the valley floors

These forms are widespread throughout the area at the joining of major valleys. Their size is a few 10 m. They are covered by vegetation and only soil degradation by antropogeneous effect lead to the exposition of the sandstone in some places. The glauconitic sandstone of the Pétervására (lower) member of the Pétervására Sandstone Formation is older than the former group. Its bedding is usually more significant and occurrence of concretions is frequent.

One of the best representatives of these forms is the Válloskő near Istenmezeje. It is also called Noah’s grape (fig. 8.) elevating 50-70 m above the valley floor that has an average elevation of 220 m. The history of this striking rock wall situated at the joining of the Tarna and the Kovaszó valleys is the easiest to follow among the similar sandstone outcrops. The steep mountain side lost its soil cover due to deforestation in the 1700s and it faced over the village as a barren rock surface for centuries. Its protection was coming from the presence of vegetation associations representing the different stages of succession with special regard to its lichens. Its natural reforestation started from the top and the increase of the area covered by forest is visible year-to-year. Besides its botanical value its geomorphological importance is

also significant. The name Noah's grape comes from the interesting alignement of its concretions. These some 10 cm big protrusions not only give horizontal lines resulting from the bedding of the glauconitic sandstone but they are aligned in vertical columns as well. From distance this really seems like vine-stocks. However, there is no explanation for this alignement of the concretions up to today. The name Vállóskő is also expressive: the Palóc dialect calls the drinking trough as 'válló' and in fact in the upper protruding part of the rock wall a 0,5 m deep depression with a diameter of 2-3 m was formed in which small 'lake' occur after rainfall. There are other places in the Country where small holes are formed on the horizontal surface of sandstone outcrops (Kővágóörs) but they are rare in such height and on slopes. The protected are is part of the Landscape Protectional Area and it is easily accessible.

4.2. Sandstone gorges

These valleys are usually small in their size. Their height is not more than 10 m and width is not more than 20-30 m. They were formed in glauconitic sandstone in the upper or middle part of the smaller (maximum a few km long) valleys opening to the larger valleys. We may find a few on the left side of the (Ceredi) Tarna between Istenmezeje and Váraszó but the largest one is found West of Istenmezeje in the upper part of the Csengős valley (fig. 9.). This obsequens valley of the Upper Tarna – Zagyva Hills West of the Tarna exposes a different sandstone. Its glauconite content is greater it is well-bedded and concretion poor. The beds slope to the North by 10°. Its head is in a height of 280 m but after about a kilometre in a height of 203 m the valleys turns into floored valley without any transition. The lack of valley floor at the head of the valley and the occurrence of hanging valleys ending in a height of 2-3 m indicate rapid linear erosion.

4.3. Basalt volcanic forms

In the central part of the Upper Tarna – Zagyva Hills around the watershed small basalt volcanic cones occur that are elevated above the surrounding sandstone surface. This rock type becomes dominant further North in the Medves region. The highest of the lonely mountains is the Nagy-kő near Bárna (519 m) that is situated virtually in the centre of the Hills (thus giving an excellent viewpoint) (fig. 10.). The outcrop on the top of the mountain exposes the onionskin-like curved structure of the basalt. To the East, a few km above the Cikorád valley the Kis-kő (379) is found which, however, showing similar structure is – nomen est omen (kis means small) – significantly smaller than the Nagy-kő (nagy means great). Its importance is given by a small cave.

Fig. 9.: The gorge of the upper section of the Csengős valley

Fig. 10.: Nagy-kő near Bárna

5. Summary

The geomorphological values of the Upper Tarna Region are dominated by forms associated with the sandstone. These values are primarily rock walls and gorges, however, some basalt volcanoes also occur. The protection of these values is carried out by the Tarna Region Landscape Protection District formed in 1993. However, this protection do not involve all of the significant sites, therefore the extension of the protection seems to be inevitable. This region hiding in the shades of the surrounding mountains is a marginal area receiving little attention, however, considering its values and opportunities it could be one of the touristic destinations in Hungary. Certain rock walls are unique alone, however, it would be possible to create geological-geomorphological study-paths especially in the western parts. The establishment of a suggested route in the vicinity of Istenmezeje is currently under construction: Fehér-kő (rhyolite tuff outcrop) – Csengős valley (sandstone gorge) – Nagy-kő near Bárna (basalt volcano).

References:

Báldi T.: 1983. Magyarországi oligocén és alsó-miocén formációk. Akadémiai Kiadó, Budapest, p. 293
Schréter Z.: 1948. A Mátrától ÉK-re eső dombvidék földtani viszonyai. Földtani Közlöny, Nehézipari Könyv- és Folyóiratkiadó Vállalat, pp. 111-119
Sztanó O.: 1986. The tide-influenced Pétervására sandstone, early miocene, northern Hungary: sedimentology, palaeogeography and basin development. Geologica Ultraectina, Utrecht, p. 155
Tomor J.: 1939-40. Ózd-Hangony-Domaháza-Zabar és környékének földtani viszonyai. Földtani Közlöny, Magyar Állami Földtani Intézet, pp. 765-775
Utasi Z. – Szabó G.: 2002. Térinformatikai módszerek összehasonlító elemzése a Cserehát példáján, Acta Geographica Debrecenia p.
Vass, D.: 1970. Genéza pieskovcov v okolí obce Tachty. Geologické Práce, pp. 173-186