"KOBILINI STENI" ("MARE'S WALLS") GEOSITE IN WESTERN BALKAN MOUNTAIN

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ABSTRACT. The present article represents the results from investigation of "Kobilini Steni" ("Mare's Walls") geosite (the nomination for a geosite is proposed here) located in the Beglichki Part of Vratsa Mountain, 1.3 to 4 km north of the village of Opletnya (Western Balkan) in the frames of "Vratsa Balkan" Natural Park. The geosite consists of three parts. The most impressive of them represents series of WNW-ESE exposed stepped rock cliffs and steep rock walls located between 900 and 1400 m altitude at the southwestern slope beneath Parshevitsa and Beglichka Mogila Peaks. They are formed mainly in the limestones of the Opletnya and Lakatnik Members of the Mogila Fm (Olenekian – Anisian) and partly in these of Babino Fm (Anisian). The combined activity of the paleorivers, modern streams, and karst processes has led to the formation of a cirque-like view of the slope. In addition, rock crest and rock pinnacles formed in the Opletnya Member beneath the cliffs and impressive recent proluvial deposit along the valley north of the village of Opleynya could be observed. The rocks have not been described yet as geological phenomena and they are not included in the "Register and cadastre of the geological phenomena of the Republic of Bulgaria" as well as in the State Register of Natural Sites. According to the classification of the geological phenomena, "Kobilini Steni" geosite is referred to the geosites of aesthetic value (geomorphologic class), and according to the original Bulgarian methodology for estimation of geological phenomena, it is of local importance.

Keywords: geological heritage, "Kobilini Steni" ("Mare's Walls") geosite, Western Balkan mountain.

ГЕОТОП „КОБИЛИНИ СТЕНИ" В ЗАПАДНА СТАРА ПЛАНИНА

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РЕЗЮМЕ. Настоящата статия представя резултатите от изучаването на геотопа „Кобилини стени" (номиниран тук), намиращ се в Бегличкия дял на Врачанска планина между 1,3 и 4km северно от с. Оплетня (Западна Стара планина) в рамките на природния парк „Врачански Балкан". Геотипът се състои от три части. Най-впечатляващата от тях представлява поредица от стъпаловидно разположени скални венци и стръмни скални стени, разположени между 900 и 1400 m надморска височина в склона югозападно под върховете Пършевица и Бегличка могила. Те са с посока ЗСЗ-ИЮИ и са оформени главно във варовиците на Оплетненския и Лакатнишкия член на Могилската свита (Оленек–Аниз) и отчасти в Бабинската свита (Аниз). Образувани са под комбинираното действие на палеореките, временните потоци и карстовите процеси, което е придало амфитеатрален изглед на склона. Непосредствено под скалните венци могат да се наблюдават скален гребен и скални пирамиди, оформени в скалите на Оплетненския член, а по дола северно от с. Оплетня се разкриват впечатляващи съвременни пролувиални наслаги.Скалните образувания не са описвани като геоложки феномени и не фигурират в „Регистър и кадастър на геоложките феномени в Република България", както и в Държавния регистър на природните забележителности. Съгласно класификацията на геоложките феномени, геотопът „Кобилини стени" попада в групата на обектите с естетическа стойност (клас геоморфоложки), а според оригиналната българска методика за оценяване на геоложки феномени, той е с локално значение.

Ключови думи: геоложко наследство, геотоп „Кобилини стени", Западна Стара планина.

Introduction

The Triassic carbonate successions are broadly distributed in the Western Balkan Mountain and they form impressive rock cliffs and rock walls especially along the Iskar Gorge between the villages of Tserovo and Opletnya. The most famous amongst them are developed in "Lakatnik Rocks" geosite (Ajdanlijsky, 2004), as well as these near the villages of Tserovo, Bov (Valchev, Nachev, 2015) and Zasele (Sinyovski, Sinyovska, 2009). The area north of the villages of Opletnya and Ochindol reveals a picturesque view in a Triassic carbonate terrain with long rock cliffs and steep rock walls, combined with rock pinnacles and crests that are not so popular because of the lack of direct view from the road Sofia – Mezdra in the Iskar Gorge.

The present article aims to represent the results from the field investigation of "Kobilini Steni" ("Mare's Walls") geosite located in the Beglichki Part of Vratsa Mountain, 1.3 to 4 km north of the village of Opletnya (Western Balkan) in the frames of "Vratsa Balkan" Natural Park (Fig. 1). The rocks have not been described yet as geological phenomena and they are not included in the "Register and cadastre of the geological phenomena of the Republic of Bulgaria" as well as in the State Register of Natural Sites. Short notes on the geological setting are also given.

Geological Setting

Stratigraphy

The area of "Kobilini Steni" ("Mare's Walls") geosite is composed predominantly of Triassic terrigenous, carbonate, and terrigenous-carbonate rocks (Fig. 2), which are well exposed. Upper Paleozoic volcanic and terrigenous sedimentary deposits, as well as Jurassic terrigenous and carbonate-terrigenous successions also crop out here.

The oldest rocks are represented by *Upper Carboniferous volcanics* (effusive and explosive facies - Angelov et al., 2008) and they crop out in the south part of the studied area along the Iskar valley south of the villages of Opletnya and Ochindol. This complex is covered by *Upper Carboniferous* (the Stephanian Ochindol Formation (Fm) – Tenchov, 1973) and *Lower Permian terrigenous succession* (Zverino, Buk and Vranska Formations – Yanev, Tenchov, 1972, 1978) cropping out in the outskirts of the village of Ochindol. *Lower Permian volcanics* (subvolcanic facies - see Angelov et al., 2008) are also represented here.

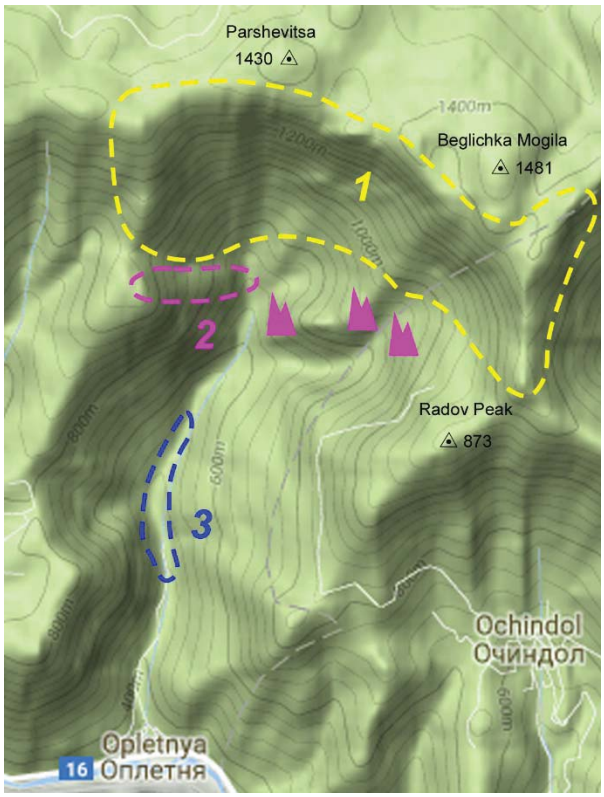

Fig. 1. Location of "Kobilini Steni" ("Mare's Walls") geosite
1, rock cliffs and walls in Kobilini Steni locality, *2*, rock crest and rock pinnacles, *3*, proluvium

The *Triassic* includes Petrohan, Iskar and Miziya Groups that are wide spread in the Western Balkanides.

The *Petrohan terrigenous Group* (Tronkov, 1981; Lower Triassic) covers transgressively varied levels of the Paleozoic section and it crops out as three northwest-southeast oriented strips.

The *Iskar carbonate Group* (Tronkov, 1981; Olenekian – Carnian) covers the terrigenous succession with gradual transition and it could be observed in almost the whole investigated area. It includes five units: *Svidol Formation* (Чаталов, 1974; Olenekian), *Mogila Formation* (Ассерето et al., 1983; Olenekian-Anisian) subdivided into two members (*Opletnya* and *Lakatnik* introduced as Formations by Tronkov, 1968), *Babino* (Anisian), *Milanovo* (Ladinian), and *Rusinov del* (Ladinian-Carnian) Formations, all of them introduced by Tronkov (1968). The boundaries between all carbonate units are distinct - sharp or gradual.

The *Miziya Group* (Chemberski et al., 1974) is represented here only by the *Komshtitsa Formation* (Tronkov, 1969; Carnian-Norian), covering with sharp boundary the Rusinov del Formation. It crops out in three separate localities in the western and eastern part of the area.

The *Jurassic* forms a narrow strip north of Beglichka Mogila Peak and includes *Kostina* (Hettangian-Sinemurian)and *Ozirovo* (Sinemurian-Aalenian) Formations introduced by Sapunov (in Sapunov et al., 1967).

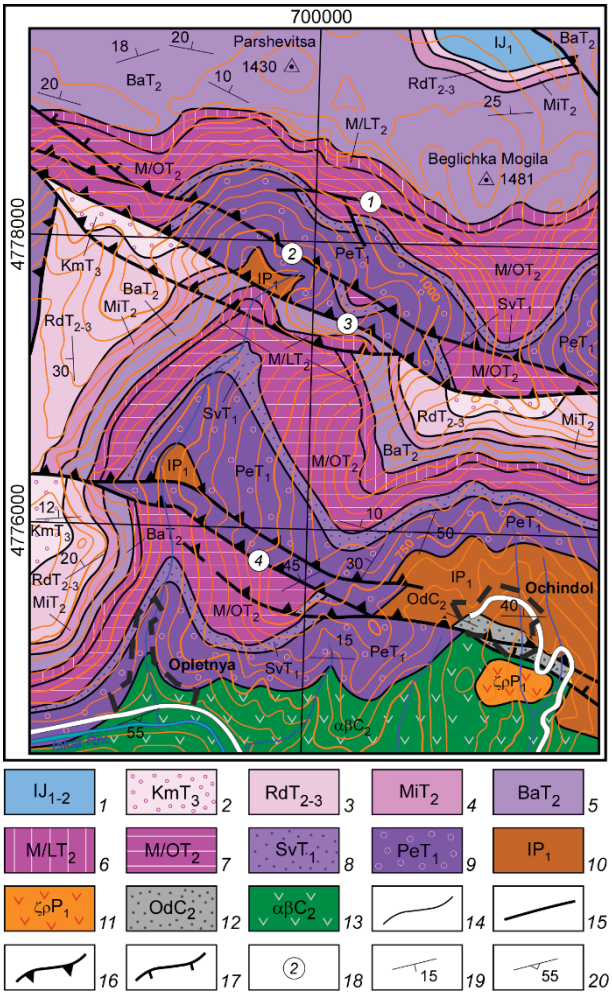

Fig. 2. Geological map of the area of "Kobilini Steni" ("Mare's Walls") geosite (emended after Angelov et al., 2009)
Lower Jurassic: *1*, Ozirovo and Kostina Fms (Hettangian-Aalenian); Triassic (*2-9*): *2*, Komshtitsa Fm (Carnian-Norian); *3*, Rusinov Del Fm (Ladinian-Carnian); *4*, Milanovo Fm (Ladinian); *5*, Babino Fm (Anisian); *6,7*, Mogila Fm (*6*, Lakakatnik Member, Anisian, *7*, Opletnya member, Olenekian-Anisian); *8*, Svidol Fm (Olenekian); *9*, Petrohan terrigenous group (Lower Triassic); Upper Paleozoic: *10*, Vranska, Buk, and Zverino Fms (Lower Permian); *11*, Permian vocanics (Lower Permian); *12*, Ochindol Fm (Stephanian); *13*, Upper Carboniferous vovlasnics; *14*, lithostratigraphic boundary; *15*, normal fault; *16*, reverse fault; *17*, thrust; *18*, faults: *1*, South Beglich normal fault; *2*, Ostra Mogila reverse fault; *3*, Pop Sokolets reverse fault; *4*, Arzhishta reverse fault;*19*,bedding; *20*, planar parallelism

Tectonics

The area of "Kobilini Steni" ("Mare's Walls") geosite belongs to the Berkovitsa Tectonic Unit of the Western Balkan Zone (according to Ivanov, 1998) or the Western Balkan Unit (according to Dabovski, Zagorchev, 2009). It is tectonically

complicated by four steep and south deepening faults that have been previously established and described in details by Tronkov (1963, 1965). From north to south they are: South Beglich normal fault, Ostra Mogila, Pop-Sokolets, and Arzhishta reverse faults.

Characteristics of the geosite

"Kobilini Steni" ("Mare's Walls") geosite comprises three main parts (Fig. 1): (i) the rock cliffs and rock walls at Kobilini Steni locality, (ii) rock crest and rock pinnacles beneath the cliffs, and (iii) proluvial deposit along the valley north of the village of Opletnya.

Rock cliffs and rock walls at Kobilini Steni locality

This geological phenomenon represents series of stepped rock cliffs and steep rock walls (Plate I, *1-4*, Plate II, *1-3*) located between 900 and 1400 m altitude at the south-western slope of Beglichki Part of Vratsa Mountain beneath Parshevitsa and Beglichka Mogila Peaks (Plate I, *5*). The cliffs and walls are exposed in west-northwest to east-southeast direction and their total length is 2.6 km (measured at the uppermost edge). They are formed mainly in the limestones of the Opletnya and Lakatnik Members of the Mogila Formation (Plate I, *6-8*), and the uppermost levels of the uppermost cliff are formed in the rocks of Babino Formation (Plate I, *9*). The height of the cliffs in the central part of the locality is over 100 m (Plate I, *10,11*). The exposure of these forms was predetermined by the presence of a vertical primary fractures in the rocks. The combined activity of the paleorivers, modern streams and karst processes has led to the formation of a cirque-like view of the slope (Fig. 3; Plate I, *12*). This locality is named by local people Zlite Ratove (The Evil Hills) (Topografska karta na zemlishteto na selo Milanovo (Osikovo).

Fig. 3. Satellite image of Kobilini Steni locality, view to the north (Google Earth)

Rock crest and rock pinnacles

On the right riverside of the valley below Kobilini Steni locality, amongst the rocks of the Babino Formation, a rock crest is formed (Fig.1; Plate II, *4*). It is exposed across the slope in west-southwest to east-northeast direction, and comprises several rock pinnacles (Plate II, *5, 6*) with height over 10 m. On the left riverside of the same valley there are three single pinnacles (Fig.1; Plate II, *7-9*) formed in the rocks of the Opletnya member. All the pinnacles are due to the effect of karst processes, as well as the vertical primary fractures in the rocks.

Proluvial deposit

In the valley north of the village of Opletnya a fan of impressive recent proluvial sediments is deposited (Figs. 1, 4; Plate II, *10-12*). It could be seen between 1,3 to 2,9 km north of the village. It consists of poorly sorted and angular boulders to cobbles predominantly of limestones from the Iskar carbonate group. Single boulders from red sandstones of the Petrohan terrigenous group could be seen. The widest south part of this deposit is 65 m wide and the narrowest north one is about 10 m wide.

Fig. 4. Satellite image of the proluvial deposit north of the village of Opletnya, view to the north (Google Earth)

Expert estimation

The geological phenomena, described in the present article, are referred to the geosites of aesthetic value (geomorphological class). After the conducted expert estimation, according to the original Bulgarian methodology for estimation of geological phenomena (Sinyovski et al., 2002), we concluded that they are of local importance, and they could be estimated as geosites of high degree of preservation, exposure, resistance and accessibility.

Conclusion

The high degree of exposure of the Triassic carbonate rocks in the Iskar Gorge give a good opportunity for observation of geomorphological geosites of high aesthetic value. "Kobilini Steni" ("Mare's Walls" or The Evil Hills) geosite reveals impressive views of rock cliffs, rock walls and pinnacles and thus it could be included in the Lakatnik Rocks massive as its northeastern segment. For this purpose a further popularization by placing of signboards with geological information (data concerning the lithology, genesis, age of the rocks, and the mechanism of forming of the geosite) is required.This activity will increase the total expert value of the geosite by adding investigational and educational value to its present characteristics.

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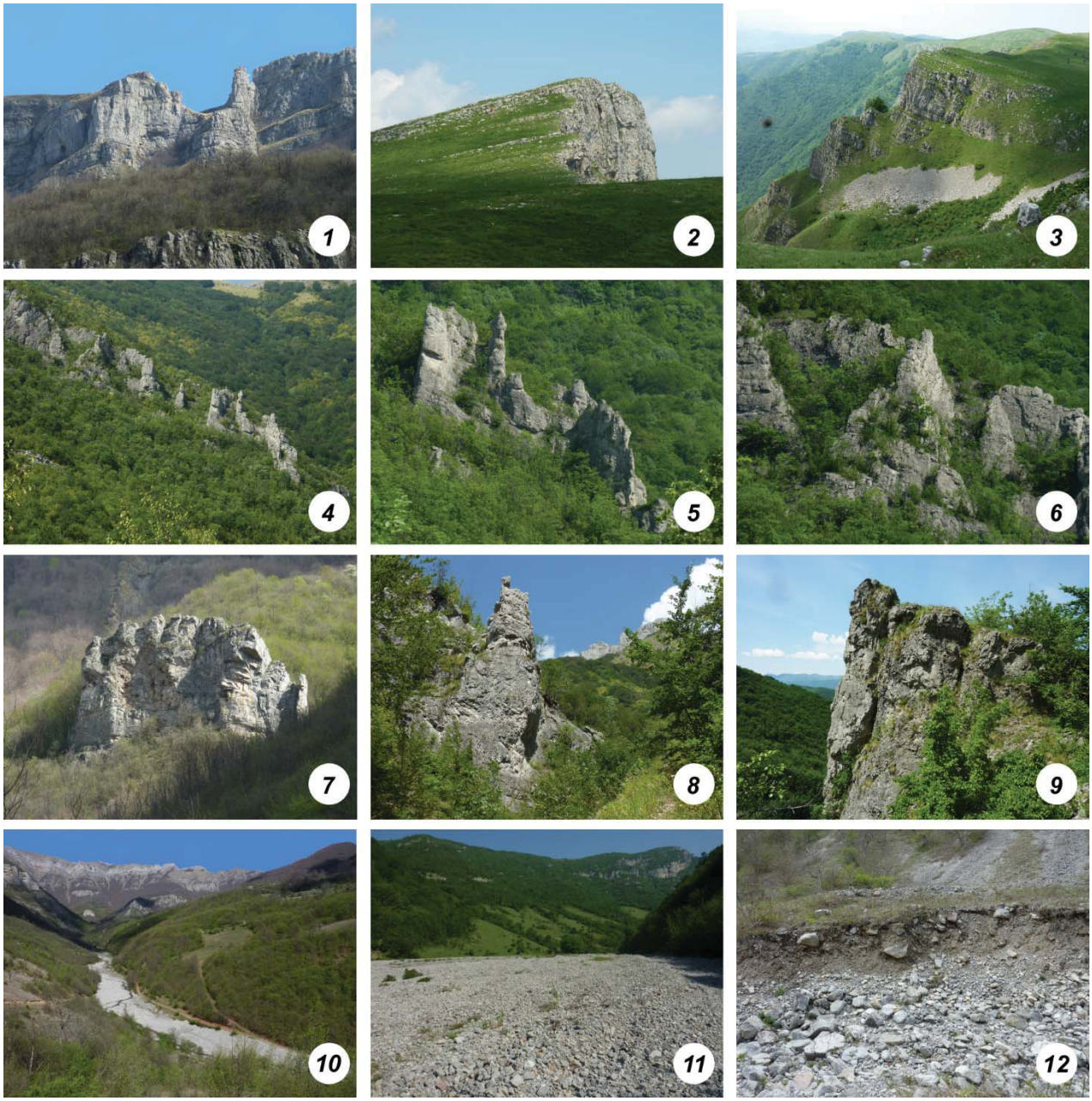
PLATE I

1, general view of the uppermost rock cliff with Beglichka Mogila Peak at the background (view to southeast);*2*, a detail from the eastern part of the uppermost rock cliff beneath Beglichka Mogila Peak (view to southeast); 3, steep rock wall, formed in the Opletnya Member south of Beglichka Mogila Peak (view to north);*4*, rock cliff (Lakatnik Member) and rock wall (Opletnya Member) east of Beglichka Mogila Peak (view to north);*5*, general view of Kobilini Steni locality (view from the village of Milanovo); *6-8*, the Opletnya and Lakatnik Members of the Mogila Formation south of Beglichka Mogila Peak; *9*, the edge of the uppermost rock cliff at the central part of Kobilini Steni locality formed in the Babino Formation (view to northwest); *10, 11*, the highest rock cliffs at the central part of Kobilini Steni locality formed in the Opletnya and Lakatnik Members; *12*, cirque-like view of the slope southwest of Beglichka Mogila and Parshevitsa Peaks (view to northwest) due to the combined activity of the paleorivers, modern streams and karst processes

PLATE II



1, initial stage of rock pinnacles forming in the uppermost rock cliff south of Beglichka Mogila Peak (view to north); *2*, the sharp edge of the uppermost rock cliff south of Beglichka Mogila Peak (view to east);*3*, steeped rock cliffs and a small colluvium deposit south of Parshevitsa Peak (view to west); *4-6*, rock crest across the right riverside south of Parshevitsa Peak (*4*, general view to northwest, *5, 6*, details showing rock pinnacles);*7-9*, single rock pinnacles on the left riverside south of Kobilini Steni locality; *10-12*, recent proluvial deposit along the valley north of the village of Opletnya (*10*, general view to northeast with Kobilini Steni locality at the background, *11*, the 60-meter wide south part of deposit, *12*, the 10-meter wide north part of deposit)