

THE NEOGENE OF THE DUKAGJINI BASIN

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Abstract. The Neogene deposits of the Dukagjini Basin are lacustrine sediments of great thickness (1,500 m). The earliest sediments are Middle – Upper Miocene, (in northern part of Basin), carbonates, interbedded with tuffs. They transgress Mesozoic rocks and are transgressively covered by the Pontian (with important coal stratum, up to 50 m). Pontian consists of lacustrine and marshy-fluviatile sediments. The Dacian and the Romanian (Levantian) stages and their substages are distinguished in the sediments of Pliocene. The fauna of the Pontian and the Pliocene was rich in molluscs, mainly gastropods, belonging to an endemic association.

Keywords: Neogene stratigraphy, Dukagjini Basin, Kosovo.

Rezumat. Neogenul Bazinului Dukagjini. Depozitele neogene din bazinul Dukagjini sunt reprezentate de sedimente lacustre cu grosimi mari (1.500 m). Primele sedimente datează din Miocenul mediu-superior (în partea de nord a bazinului), sunt carbonați intercalați cu tufuri. Acestea sunt dispuse transgresiv peste rocile mezozoice și sunt acoperite transgresiv de cele pontiene (cu strate de cărbune însemnate, de până la 50 m grosime). Pontianul constă în sedimente lacustre și de mlaștină-fluviatile. Dacianul și Romanianul (Levantinul), precum și substadiile acestora se disting prin prezența sedimentelor pliocene. Fauna din Pontian și Pliocen a fost bogată în moluște, mai ales gastropode aparținând unor asociații endemice.

Cuvinte cheie: stratigrafia Neogenului, Bazinul Dukagjini, Kosovo.

INTRODUCTION

The Dukagjini Basin originated like a tectonic intramountainous depression during the uplifting of Dinarides and due to the gradual dropping of the individual blocks of the Palaeozoic-Mesozoic basement, following a complicated network of transversal and longitudinal dislocations. The main role belongs to the big transversal faults Shkoder-Peje, in north, and Prizreni, in south of the Basin.

The earliest Neogene sediments belong to the Middle-Upper Miocene that occur at the northern part of the basin, in north of Peja - Klina area, overlying the basin basement. These are overlain with unconformity by the Pontian deposits that extent southwards, up to Gjakova-Rahovec.

The youngest sediments are the ones of the Pliocene. They occur all over the basin up to Prizreni. The Dacian and Romanian (Levantian) are distinguished.

The Neogene sediments up to 1500 m thick are fresh waters (lacustrine) sediments with abundant fossils: Molluscs, Ostracods, and microflora. Molluscs, especially Gastropoda, compose an endemic association very rich in *Viviparus*, *Kosovia* etc. The origin of the fauna is accepted by north, the Pannonian Basin (*Kosovia*) as well as by south, the Eagean Basin (*Viviparus*).

Many geologists have been engaged, mainly during the last years, in investigations about the Neogene sediments of the Dukagjini Basin, publishing also the results of their studies: ATANACKOVIC (1959), BOKCIC (1983), ELEZAJ et al. (2000), ELEZAJ (2009, 2009a, 2009b, 2009c), KODRA et al. (2009, 2009a), POPOVIC (1969, 1970, 1971, 1973/74), SHABANI (1980), SHABANI & OSTROSI (2002), YMERI (2003).

STRATIGRAPHY

NEOGENE. MIOCENE

1. Middle – Upper Miocene.

The Middle-Upper Miocene sediments appear in the northeastern part of the Basin and they extent beneath the sediments dating from the Pontian, up to Peja and Klina (Fig. 3). They overlay with unconformity the Paleozoic-Mesozoic basement and contain Molluscs and Ostracods.

The following three horizons can be distinguished:

- a. **Basal horizon.** The basal conglomerates and sandstones, clayey sands and clays with coal strata (up to 10 m), clayey and marl sands with molluscs (*Planorbis* sp. etc.), *Ostracoda*, fossilized plants. 80 m thick.
- b. **Carbonate horizon.** It is composed by marls and marly clays, limestones and sandstones with *Limnaeus* sp., *Hydrobia* sp., Unionidae and Ostracoda: *Candona condida*, *Darvinula dadayei*, *D. stvensoni*, *Illioocypris bradayi*, *I. gibba*. on a thickness of 140 m.
- c. **Clay - sandstones horizon.** It consists of sandstone, clay and tuffite, with coal strata interbedded. 100 m thick. The macroflora and microflora are indicative for a warm climate. The marshy vegetation misses. Floras belong to the Middle – Late Miocene (analogous to Sarmatian s.l – Pannonian) (BOKCIC, 1983).

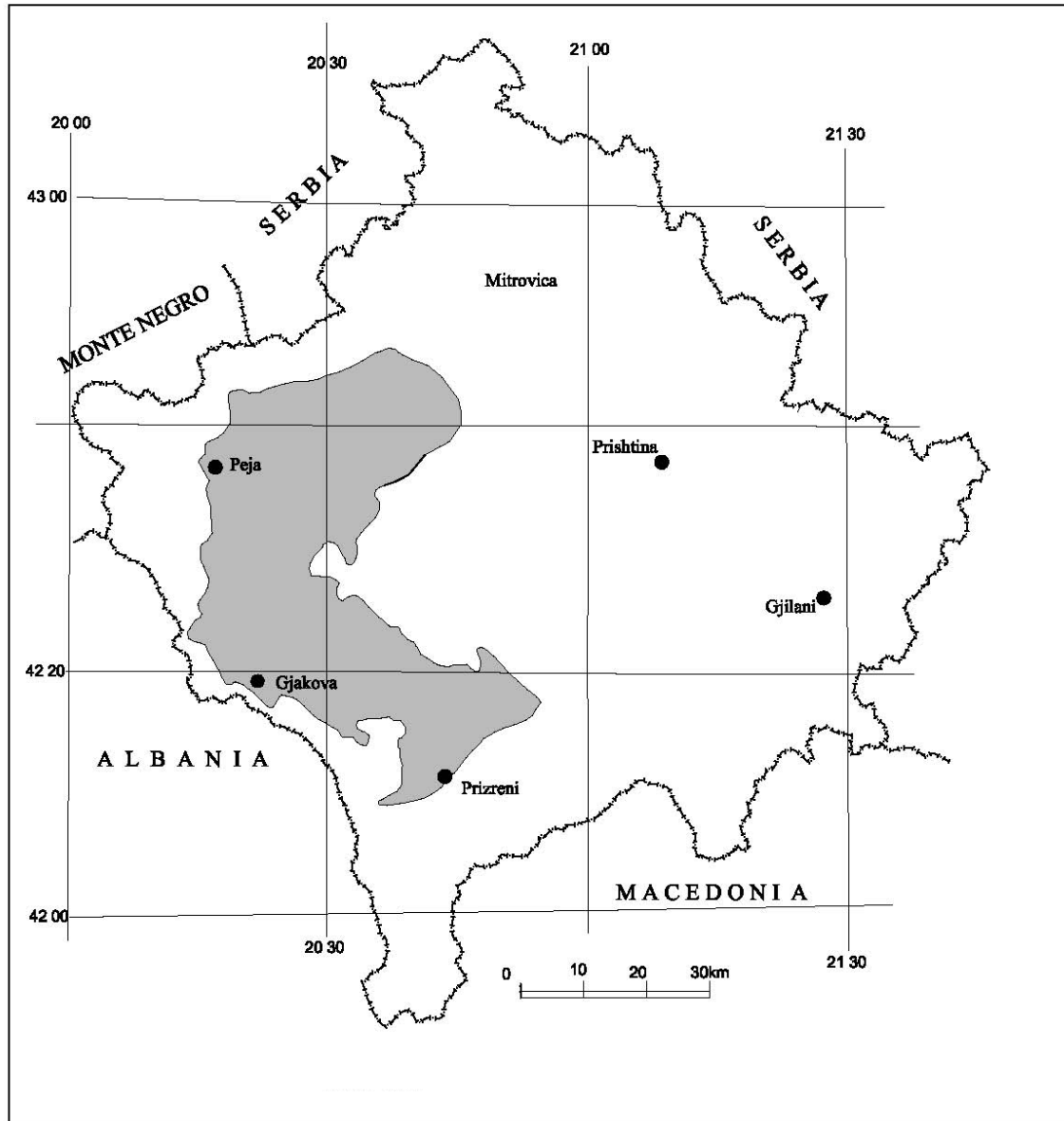


Figure 1. Dukagjini Basin.
 Figura 1. Bazinul Dukagjini.

2. Upper Miocene. Pontian.

This is the most important and investigated biostratigraphic unit of the Neogene basin. It consists of lacustrine and marshy - fluviatile sediments, widespread, very thick (700 – 750 m), with faunal and lithological diversity, bearing coal stratum. The greatest development is in northeastern side of the basin, from Istog (Burimi) to Kline and more in the south, in the Rahovec - Cermjan ophiolitic belt. In Gjakove, they are encountered by the drillings under the Pliocene sediments. They are in unconformity with the Middle – Upper Miocene and/or the Mesozoic basement.

a. **Lower Pontian.** It is composed by basal sequence sediments, including coal stratum.

- Basal conglomerates, with ophiolites, limestones, sands and clays clasts, 10 – 30 m.
- Unstratified clays with carbonate lenses, 5 - 20m.
- Disseminated grayish and greenish clays, unstratified, with coal, up to 230 m.

The endemic Ostracoda associations are composed of *Candona pontometohica* KRSTIC, *C. marginata crucevonese* KRSTIC, *C. candida pliocenica* KRSTIC etc. (SHABANI, 1980).

All are sediments originating from lacustrine - fluviatile environments.

- **Coal stratum.** They are situated on the bottom of the sedimentary pile. The coal is of xylite type. It crops out north of the Kline on 50–60 m thickness, dipping to southwest, reaching a thickness of 14 m at a depth of 428 m. The coal bearing stratum involves also coaly clays and light grayish marls inner beddings, occurred due to the climatic changes. The microflora association is indicative to the subtropical climate.

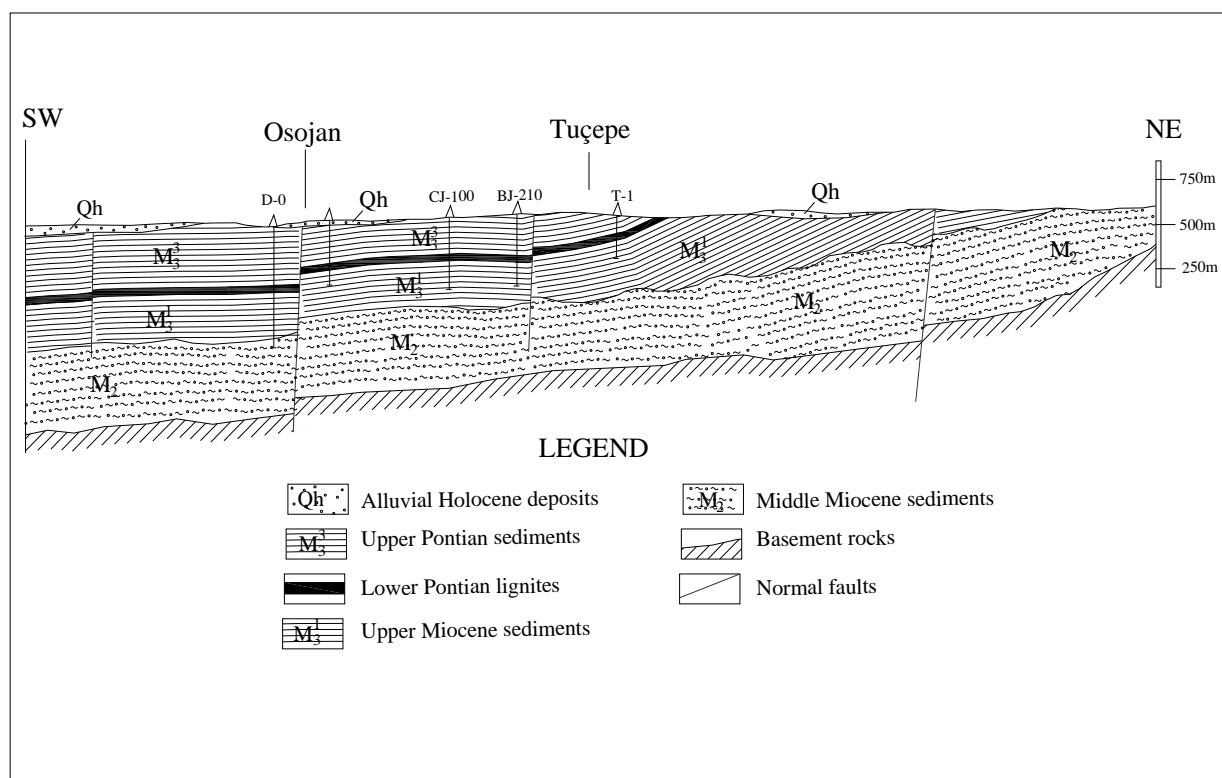


Figure 2. Geological cross - section through Dukagjini Basin (Osojan – Tușepe).

Figura 2. Profil geologic transversal prin Bazinul Dukagjini (Osojan – Tușepe).

b. **Upper Pontian.** It contains the sediments located above the coal strata, formed during the genuine lacustrine phase of the basin and is either normally set on the coal strata, or in unconformity, transgressing the Mesozoic basement. They consist of clays, marly clays and carbonate sands with Diatomaea, fine and medium sands, usually stratified. The grayish clays are transformed into “brend” or “porcelanite”. They are rich in fossils as molluscs, mainly gastropods (*Viviparus*, *Kosovia*), forming 0.2 – 0.4 m thick lumachelle and more, either with dominance of *Congeria*. The endemic molluscs associations are composed of distinct species. *Kosovia* occurs in the Pontian only, while *Viviparus* is in the Pliocene. Ostracods and rich microflora are also present.

The fossil mollusc associations concern *Viviparus d'archiaci* PAVLOVIC, *V. viquesneli* DESHAYES, *V. tetracarinated* ATANASKOVIC, *V. bicingulatus* ZUJEVIC, *V. zujevici* PAVLOVIC, *V. bicarinatus* POPOVIC, *V. lilianus* POPOVIC etc. *Kosovia bouei* PAVLOVIC, *K. ornata* PAVLOVIC, *Brotia viquesneli* PAVLOVIC, *Congeria aff. ornithopsis* BRUSSINA, etc. (KODRA et al., 2009).

PLIOCENE

The Pliocene is widespread throughout the entire basin from Peja and Klina in the north, continuing towards Gjakova, reaching the southernmost area of Prizren. It contains mollusc assemblages, with lacustrine freshwater gastropod dominance, markers for the Dacian and Romanian (Levantian) stages. But, the top of the section can pass also to the lacustrine Pleistocene. These deposits are mainly of clastic and terrigenous rocks: marl or sandy clays, sandstones and conglomerates with thin coal bearing beds, about 400 – 460 m thick.

1. Dacian.

Dacian sediments are composed of grayish to yellow sandy and marly clay, as well as friable sandstone and conglomerates. They represent a continuous series of sediments without interruption up to Romanian (Levantian). They occur at the southern part of the Basin, representing the earliest lacustrine sediments that overlay with unconformity the Mesozoic basement. At the northern part of the Basin, the sediments of the Dacian overlay normally the ones of the Pontian.

Based on the fauna, the Dacian of the Dukagjini Basin is accepted like the analogous of the Dacian of the Romanian Basin (POPOVIC, 1969). In association with the Dacian, the Pontian genera *Kosovia* and *Congeria* miss. The *Dreissensia* and the unsculptured *Viviparus*, occur. The Lower with *M. levantica* POPOVIC and the Upper Dacian with *M. turriculoidea* POPOVIC can be distinguished. *Viviparus kosanini* POPOVIC, *V. plicatus* POPOVIC *V. pavlovici* POPOVIC are the specific Dacian assemblage.

SERIA	STAGE	COLUMN	Thicke.	LITOLOGY	FOSSILS
	QUATER		80	Sands, Gravels	
NEOGENE	PLIOCEN	Romanian			
		Upper		260	Sands, sandy clays, grayish and blueish marls, gravels, coals.
	Lower				
	Dacian		200	Greyish to yellow sands and marls, clays friabe, sandstones, conglomerates	<i>M. levantica</i> , <i>M. turriculoidea</i> , <i>V. tracanici</i> , <i>V. pavlovici</i> , <i>V. cosanini</i> , <i>V. plicatus</i> , <i>Dreissensia gr. cristellata</i> , etc.
	Upper		400	Clays, marls, carbonate sands with Diatomea (diatomite). Brand	<i>V. viquesneli tricarinatus</i> , <i>V. d'archiaci</i> , <i>V. bicingulatus</i> , <i>V. tetracarinated</i> , <i>V. zujovici</i> , <i>V. kujavcensis</i> , <i>V. miricus</i> , <i>V. lilianus</i> , <i>V. bicarrinatus</i> , <i>Congeria pavlovici pavlovici</i> .
MIOCEN	Pontian				
	Upper		60	Coal stratum	
MIOCEN	Lower		~230	Basal conglomerates, clays with carbonate lenses, greyish and greenish clays, <i>V candida pliocenica</i> .	
	Middle - Upper		320 - 350	Basal conglomerates, sandstones, coals, marls, limestones, tuffite.	<i>Planorbis</i> , <i>Hydrobya</i> , <i>Unionidae</i> , <i>Candona condida</i> , <i>Darvinula dadayei</i> , <i>D. stevensoni</i> , <i>Ilioci pris bradayi</i> , <i>Il. gibba</i> .
MESSOZOI	J-K			J-K flysch K Limestones	

Figure 3. Simplified stratigraphic column of the Dukagjini Basin.
 Figura 3. Coloana stratigrafică simplificată a Bazinului Dukagjini.

2. Romanian (Levantian)

The Romanian (Levantian) sediments occur in the Dukagjini Basin, representing the highest part of the Neogene. Although the sediments of the Romanian (Levantian) are formed uninterruptedly following the ones of the Dacian, at different parts of the Basin they overlap different Dacian levels and the Mesozoic basement. The Lower and Upper Romanian (Levantian) can be distinguished based on molluscs, mainly on *Viviparus*. (POPOVIC, 1970; KODRA et al., 2009a, b).

a. **Lower Romanian (Levantian)**. It is mainly composed of sands and clay sands, as well as pebbles and conglomerates. It is documented by the evolution of the representatives of the genus *Viviparus*, as: *V. conicus* PAVLOVIC, *V. cvijici* ZUJEVIC, but also by the occurrence of new Levantine subspecies, as *V. dinici scalaris* POPOVIC, *V. lomejkoi brevis* POPOVIC.

b. **Upper Romanian (Levantian)**. Its sediments occur mainly in the southern areas of the basin Gjakova and Prizren, setting on the Lower Dacian ones. They consist of sandstone and clay, interbedded with thin conglomerate beds to the top of the section. They contain rich *Viviparus* association, with taxa continuing their evolution from the Lower Romanian: *V. dinici* PAVLOVIC, *V. lomejkoi* PAVLOVIC; we also mention the occurrence of new species, such as *V. bistraginus* POPOVIC and *V. reticulatum* POPOVIC. The Romanian sediments pass gradually to the Pleistocene lacustrine ones.

CONCLUSIONS

1. The Neogene of the Dukagjini Basin consists of sediments of fresh waters, lacustrine ones.
2. The Middle-Upper Miocene overlies with unconformity the Paleozoic-Mesozoic basement of the Basin, consisting of older Neogene lacustrine sediments.

3. The Pontian (analogous Mediterranean Messinian) overlies with unconformity the Middle-Upper Miocene sediments and the basement of the Basin. It can be separated in the Lower Pontian (basal sediments and coal stratum) and the Upper Pontian, typical lacustrine facies with endemic association of molluscs, mainly *Kosovia* and *Viviparus*.
4. The Pliocene sediments occur all over the Basin and contain mollusc endemic associations of the fresh lacustrine waters. The Dacian and Romanian (Levantian) stages can be distinguished.
5. The Dacian stage can be divided in the Lower and Upper one and it is defined by the lack of *Kosovia* and *Congerina*, and the occurrence of *Dreissensia* and *M. levantica* (Lower) and *M. turriculoidea* (Upper) Dacian.
6. The Romanian (Levantian) stage is divided into the Lower and Upper one based on the typical species and subspecies of *Viviparus*.
7. The Levantine sediments pass gradually to the Pleistocene lacustrine sediments.

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