

Prvi nalazi repatih vodozemaca (Urodela) u pleistocenskoj pećinskoj fauni Srbije; još jedna kockica u slagalici

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PRVI NALAZI REPATIH VODOZEMACA (URODELA) U PLEISTOCENSKOJ PEĆINSKOJ FAUNI SRBIJE; JOŠ JEDNA KOČKICA U SLAGALICI

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Ključne reči: Urodela, pleistocen, *Salamandra*, *Triturus karelinii*

Sažetak: Fosilna fauna pleistocenskih pećina odslikava sastav faune njihove okoline. Najčešće se u njima naleže ostaci krupnih sisara ledenog doba koji su je koristili kao stanište. Uz njih česti su i ostaci drugih sitnih kičmenjaka kao što su sitni sisari, ribe, vodozemci, gmizavci i ptice. Ostaci sitnih kičmenjaka u većini slučajeva u pećinu dospevaju kao plen grabljivica (ptice i sisari) ali je manji broj njih pećinu koristio i kao sklonište ili stanište. U proučavanje fluktuacija pleistocenske klime sve češće se uključuju podaci o sastavu herpetofaune (vodozemci i gmizavci) koji na indirektan način ukazuju na tipove staništa, prisustvo vodenih tokova i sl. U pećinskim hepeto-asocijacijama najređi su nalazi repatih vodozemaca (Urodela) i u ovom radu prikazujemo zaključke na koje nas navode jedina tri pleistocenska nalaza ostataka Salamandrida u Srbiji.

U tri pećine u Srbiji pronađeni su fosilizovani pršljenovi repatih vodozemaca (Urodela). Smolućka pećina nalazi se na jugozapadu Srbije, oko 15km severoistočno od Tutina u kanjonu Smolućke reke U njoj je pronađeno 18 pršljenova koji su identifikovani kao *Salamandra salamandra*. Nažalost ovi podaci su nam dostupni samo iz literature. U istraživanjima Arheološkog instituta u pećinama Mala Balanica i Mirosava pronađen je samo po jedan pršljen salamandrida. Mala Balanica nalazi se u blizini sela Sićevo u Sićevačkoj klisuri (jugoistočna Srbija), dok se pećina Mirosava nalazi u centralnoj Srbiji istočno od Čuprije. U Maloj Balanici pronađeni pršljen pripada vrsti *Salamandra salamandra* dok je u pećini Mirosava fosilni pršljen identifikovan kao *Triturus cf. karelinii*. Identifikacija fosilnih pršljenova iz Male Balanice i Mirosave urđena je na osnovu poređenja sa komparativnim osteološkim materijalom i pomoću podataka iz literature. Pršljen iz Male Balanice ima tipične karakteristike vrste *Salamandra salamandra*.



Dužina mu je približno 5mm; opistocelan je; izdužen; neuralni luci su dorzoventralno spljošteni, sa duboko konkavnom prednjom ivicom i medijalnim zarezom na zadnjoj ivici; neuralni grebeben nizak i jasno razvijen samo u srednjem delu neuralnih lukova.

Pršljen iz Mirosave je manjih dimenzija, dužina centra ne prelazi 2mm i blago je zakrivljen sa trbušne strane. Neuralni luci su dorzo-ventralno spljošteni i blago se uzdižu ka zadnjem kraju pršljena. Prednja ivica neuralnih lukova je ravna dok na zadnjoj postoji široki zarez. Neuralni greben je oštećen i čini se da se pojavljuje u nivou zadnje ivice prezigapofiza i da nije visok. Ventralna strana pršljena i delimično bočne su prilično erodovane te je ovaj pršljen identifikovan kao *Triturus cf. karelinii*.

Današnji predstavnici familije Salamandridae imaju široke ali disjunktne arele svoga rasprostranjenja na severnoj hemisferi. Međutim antropogene promene staništa sve više utiču na smanjenje njihove brojnosti. Kao i drugi vodozemci, izuzetno su vezani za vodena staništa i staništa sa povećanom vlažnošću. Vrsta *Salamandra salamandra* je česta u brdsko-planinskim vlažnim šumama veće nadmorske visine ali ne preko 1000m. U ravničarskim predelima je izuzetno retka. Hibernacija se obično odvija u grupama u šumskoj stelji, šupljim deblima ili ispod stena. Dugonogi mrmoljak, *Triturus karelinii* je danas prepoznat kao grupa koja objedinjuje više geografski koherentnih klada rasprostranjenih od jugoistočnog Balkana do Kaspijskog mora. Nastanjuje mešovite šume kao i šumske kserofite proplanke i livade. Sreće se u blizini dubljih jezera i stalnih bara i u odnosu na ostale tritone nastanjuje suvlja staništa.

Šareni daždevnjak (*S. salamandra*) svojim jarko žutim mrljama na crnoj pozadini upozorava predatore da je otrovan. Pojava ostataka salamandra ukazuje da je pećina najverovatnije bila okružena gustom šumom. Blizina reke čiji je nivo najverovatnije bio znatno viši nego danas obezbeđivala je sigurnu sredinu za razvoj larvi. Zbog svoje otrovnosti najveća je verovatnoća da ostaci salamandre u pećinu nisu dospeli kao plen nekog predatora. Obzirom da je u Smolučkoj pećini nađen veći broj pršljenova kao i da se pominje veća količina falangi neidentifikovanog repatog vodozemca, postoji mogućnost da je pećina u nekom momentu poslužila kao mesto hibernacije manje grupe ovih vodozemaca. Druga mogućnost je da su u pećinu uneti blizinom vodenog toka. Nažalost ovo se ne može proveriti na originalnom materijalu. Pećina Mala Balanica nalazi se u Sićevačkoj klisuri okružena listopadnom šumom. Salamandre nisu uobičajeni stanovnici pećina a i nemaju predatora koji bi njihove ostatke mogao da unese u pećinu. Pršljen pronađen u njenim sedimentima verovatno je unet spiranjem iz okoline. Kao tipični stanovnici šumskih staništa salamandre ukazuju da je neposredna okolina ove pećine kao i Smolučke bila pokrivena šumom. Mrmoljak *Triturus karelinii*, za razliku od daždevnjaka podnosi znatno suvlje uslove sredine. Kao i u Maloj Balanici samo jedan pršljen pronađen u Mirosavi verovatno je unet spiranjem iz okoline. Međutim, ovaj mrmoljak ovog puta ukazuje da je okolina pećine bila kserofitnija, verovatno prekrivena suvljim travnatim proplancima i retkom šumom. Osim toga ova vrsta ukazuje i da je u okolini pećine postojala i neka stalna bara ili jezero.

Nalaz ovih retkih vodozemaca u fosilnim asocijacijama pleistocenskih pećina Srbije dodaje još jednu kockicu u slagalici našeg tumačenja paleosredina.

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THE FIRST FINDINGS OF TAILED AMPHIBIANS (URODELA) IN THE PLEISTOCENE CAVE FAUNA OF SERBIA; ANOTHER PIECE IN THE PUZZLE

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Key words: Urodela, Pleistocene, *Salamandra*, *Triturus karelinii*

Abstract: The fossil fauna of the Pleistocene caves reflects the composition of the fauna of their surroundings. Most often, they contain the remains of large Ice Age mammals that used it as a habitat. Along with them, the remains of other small vertebrates such as small mammals, fish, amphibians, reptiles, and birds are common. In most cases, the remains of small vertebrates end up in the cave as prey for predators (birds and mammals), but a smaller number of them also used the cave as a shelter or habitat. Data on the composition of herpetofauna (amphibians and reptiles) are increasingly included in the study of Pleistocene climate fluctuations, which indirectly indicate the types of habitats, the presence of watercourses, etc. In cave herpeto-associations, the rarest finds are tailed amphibians (Urodela), and in this paper, we show the conclusions that lead us to the only three Pleistocene finds of Salamandrid remains in Serbia.

Fossilized vertebrae of tailed amphibians (Urodela) were found in three caves in Serbia. The Smolučka Cave is located the southwest of Serbia, about 15 km northeast of Tutin in the canyon of the Smolučka River. In it, 18 vertebrae were found, which were identified as *Salamandra salamandra*. Unfortunately, these data are available to us only from the literature. In the research of the Archaeological Institute in the Mala Balanica and Mirosava caves, only one salamander vertebra was found. Mala Balanica is located near the village of Sićevo in the Sićevo Gorge (southeastern Serbia), while the Mirosava cave is located in central Serbia east of Čuprije. The vertebra found in Mala Balanica belongs to the species *Salamandra salamandra*, while in the Mirosava cave, the fossil vertebra was identified as *Triturus* cf. *karelinii*.

The identification of the fossil vertebrae from Mala Balanica and Mirosava was carried out based on comparative osteological material and data from the literature.



The vertebra from Mala Balanica has typical characteristics of the *Salamandra salamandra* species. Its length is approximately 5mm; it is opisthocoelous; elongated; neural arches are dorsoventrally flattened, with a very concave anterior margin and medial notch on the posterior margin; the neural crest is low and developed only in the middle part of the neural arches. The vertebra from Mirosava was smaller. The length of the centrum does not exceed 2mm and it is slightly curved on the ventral side. The neural arches are dorsoventrally flattened and increase towards the posterior end of the vertebra. The front edge of the neural arches is straight, while the back edge has a wide notch. The neural crest is damaged, low, and starts at the level of the posterior margin of the prezygapophysis. The ventral side of the vertebra and partially the lateral ones are quite eroded, and this vertebra is identified as *Triturus cf. karelinii*.

Today's representatives of the family Salamandridae have wide but disjunct distribution in the northern hemisphere. However, anthropogenic influences are increasingly affecting the reduction of their numbers. Like other amphibians, they are attached to water habitats and habitats with increased humidity. The species *Salamandra salamandra* is common in hilly and mountainous moist forests at higher altitudes, but not over 1000m. It is very rare in the plains. Hibernation is usually in groups on the forest floor, hollow trunks, or under rocks. Today, newt *Triturus karelinii* is recognized as a group that unites several geographically coherent clades distributed from the south-eastern Balkans to the Caspian Sea. It inhabits mixed forests as well as forest xerophytic glades and meadows. It is found near deeper lakes and permanent ponds and inhabits drier habitats, than the other newts. The colorful salamander (*S. salamandra*) warns predators that it is poisonous with its bright yellow spots on a black background. The appearance of salamander remains indicates that the cave was most likely surrounded by dense forest. The proximity of the river provided a safe environment for the development of tadpoles. Due to its toxicity, it is most likely that the remains of the salamander did not enter the cave as prey of some predator. Given that a larger number of vertebrae were found in the Smolučka Cave, as well as a larger number of phalanges of an unidentified tailed amphibian, there is a possibility that the cave at some point served as a hibernation place for a smaller group of these amphibians. Another possibility is that they were brought into the cave near a watercourse. Unfortunately, this cannot be verified on the original material. The Mala Balanica cave is located in the Sićevo Gorge, surrounded by a deciduous forest. Salamanders are not common cave dwellers and have no predators that could bring their remains into the cave. The vertebra found in its sediments was probably washed in from the environment. As typical inhabitants of forest habitats, salamanders indicate that the immediate surroundings of this cave, as well as Smolučka, were covered by forest. The newt *Triturus karelinii*, unlike the salamander, tolerates significantly drier environmental conditions. As in Mala Balanica, only one vertebra was found in Mirosava and was probably washed from the surrounding area.

However, this newt this time indicates that the cave environment was more xerophytic, probably covered with drier grassy glades and sparse forest. In addition, this species also indicates that there was a permanent pond or lake in the vicinity of the cave. The finding of these rare amphibians in the fossil associations of the Pleistocene caves of Serbia is another piece of the puzzle of our interpretation of paleoenvironments.

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