

Sitni, ali bitni: uloga sitnih sisara, herpetofaune i mekušaca u rekonstrukciji pleistocenskih paleosredina

Katarina Bogićević, Draženko Nenadić, Dragana Đurić, Mihajlo Jovanović, Aleksandra Savković



Дигитални репозиторијум Рударско-геолошког факултета Универзитета у Београду

[ДР РГФ]

Sitni, ali bitni: uloga sitnih sisara, herpetofaune i mekušaca u rekonstrukciji pleistocenskih paleosredina | Katarina Bogićević, Draženko Nenadić, Dragana Đurić, Mihajlo Jovanović, Aleksandra Savković | Zbornik sažetaka III Kongresa geologa Bosne i Hercegovine, Neum, 21.-23.09.2023. | 2023 | |

<http://dr.rgf.bg.ac.rs/s/repo/item/0008303>

Udruženje/udruga geologa u Bosni i Hercegovini

ZBORNİK SAŽETAKA

III Kongres geologa Bosne i Hercegovine

sa međunarodnim učešćem



BOOK OF ABSTRACTS

III Congress of Geologists of Bosnia and Herzegovina

with international participation

Neum, 21. – 23.09.2023. godine



Izdavač / Publisher

Udruženje/udruga geologa u Bosni i Hercegovini
Association of geologists in Bosnia and Herzegovina

Glavni urednici / Editors-in-chief

Ferid Skopljak, Elvir Babajić, Ćazim Šarić

Tehnička priprema / Technical Preparation

Dr.sc. Ćazim Šarić. dipl.ing.geol.

Štampa:

„Štamparija Fojnica” d.o.o. Fojnica, BiH

Tiraž:

150 primjeraka

Napomena: *Autori su odgovorni za sadržaj i kvalitet svojih radova*

Note: *The authors are responsible for the content and quality of their papers*

ZBORNİK RADOVA

III KONGRES GEOLOGA BOSNE I HERCEGOVINE

ISSN 1840-4073



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SITNI, ALI BITNI: ULOGA SITNIH SISARA, HERPETOFAUNE I MEKUŠACA U REKONSTRUKCIJI PLEISTOCENSKIH PALEOSREDINA

Prof. dr Katarina Bogićević, Univerzitet u Beogradu-Rudarsko-geološki fakultet, Kamenička 6, 11000 Beograd; katarina.bogicevic@rgf.bg.ac.rs

Prof. dr Draženko Nenadić, Univerzitet u Beogradu-Rudarsko-geološki fakultet, Kamenička 6, 11000 Beograd

Dr. Dragana Đurić, Prirodnjački muzej, Njegoševa 51, 11000 Beograd

Dr. Mihailo Jovanović, IPHES, Institut Català de Paleoecologia Humana i Evolució Social in Tarragona, Edificio W3, Campus Sescelades URV, Zona Educacional 4, 43007, Tarragona, Spain

Mast.geol. Aleksandra Savković, Universitat Rovira i Virgili, Departament d'Història i Història de l'Art, Avinguda de Catalunya 35, 43002 Tarragona, Spain

Ključne reči: paleosredine, pleistocen, sitni sisari, herpetofauna, mekušci

Uvod: Fosilni ostaci životinja i biljaka imaju važnu ulogu u rekonstrukciji pleistocenskih paleosredina. U ovom radu opisan je značaj tri grupe životinja: sitnih sisara, herpetofaune i mekušaca. Mada je za rekonstrukciju važan sastav čitave asocijacije, nalasci pojedinih vrsta mogu biti dovoljno indikativni da otkriju tip staništa ili klimatske uslove. Posebnu teškoću pri rekonstrukciji paleosredina u Srbiji predstavlja činjenica da klimatske promene na Balkanskom poluostrvu nisu bile tako oštre kao u srednjoj i zapadnoj Evropi, pa ne postoji drastična razlika u sastavu, na osnovu koje bismo lako razlikovali faunu glacijalnih i interglacijalnih perioda. Zato se mora voditi računa o finim razlikama između asocijacija nastalih u različitim periodima. U Srbiji se, na primer, hladniji periodi karakterišu većim rasprostranjenjem stepskih vrsta, dok su u toplijim periodima češći stanovnici šuma.

Metode rekonstrukcije: Najjednostavnija a ujedno i najčešće korišćena metoda za rekonstrukciju tipa staništa je metoda ekoloških grupa. Za svaku vrstu se odredi u kojoj grupi staništa danas najčešće živi, pa se zatim izračuna procentualna zastupljenost svake grupe u celokupnoj fauni. Jedna od varijanti je metoda TH-indeksa, gde se za svaku vrstu odredi afinitet prema 9 vrsta staništa. Još jedna česta metoda za rekonstrukciju tipa staništa je izrada cenograma. Sitni sisari se takođe koriste i za rekonstruisanje klimatskih uslova, odnosno količine padavina (vlažnosti) i temperature. Postoji čitav niz metoda kojima se izračunava relativna i apsolutna temperatura i količina padavina na osnovu procentnog učešća raznih vrsta glodara koji su indikatori vlažne, suve, hladne ili tople klime.

Fosilni ostaci herpetofaune su takođe veoma korisni pri rekonstrukciji sredina u kojima su živeli. Ratnikov je na primeru istočnoevropskih vodozemaca i gmizavaca formirao ekološke tipove u odnosu na njihova najčešća staništa i prisustvo u određenim klimatskim biozonama. Sa druge strane, Böhme je napravio centralnoevropski model redosleda pojedinih vrsta tokom perioda zahlađivanja i otopljanja.



U pećinskim naslagama Srbije gornjopleistocenske starosti u herpetološkim asocijacijama preovlađuju vrste koje se prema Böhmeovom modelu javljaju u toplijim stadijumima kvartarnih klimatskih ciklusa. Ipak, treba imati u vidu da je primenljivost ovih šema na našim terenima ograničena, usled različitih klimatskih uslova i rasprostranjenja herpetofaune tokom pleistocena, pa je potrebna izrada modela koji će uzeti u obzir lokalne uslove na Balkanskom poluostrvu.

Ostaci kvartarnih mekušaca, pored ostataka sitnih sisara i herpetofaune, imaju značajnu ulogu u rekonstrukciji paleosredina, naročito paleoklimatskih prilika. Karakteristične vrste ili indeks-fosili mogu pružiti dragocene podatke o klimatskim karakteristikama neke oblasti, pošto su pojedine vrste posebno prilagođene na hladnu ili toplu klimu.

Tako se, na primer, može zaključiti da su se u toku pleistocena naizmenično smenjivale hladne i tople faze, na osnovu smenjivanja faune vezane za vrlo hladne periode kao što je npr. prisustvo puževa vrste *Columella columella* i relativno "tople faune" za koju je karakteristična vrsta *Arianta arbustorum*.

Veliki klimato-stratigrafski značaj imaju i slatkovodne pleistocenske školjke iz roda *Corbicula*, koje su prisutne u aluvijalnim naslagama severnih delova Srbije. Tokom srednjeg pleistocena korbikule su se povukle iz Panonskog basena naseljavajući oblasti Kaspijskog basena, Indije i nekih delova američkog kontinenta. Na osnovu analogije sa savremenim korbikulama, može se zaključiti da su naslage sa prisustvom pleistocenskih korbikula stvarane tokom toplih klimatskih etapa.

Veoma bitne podatke o paleoklimatskim karakteristikama životne sredine mogu se dobiti i geohemijskim proučavanjima izotopa kiseonika u ljušturama mekušaca. Analizirajući izotopski sastav školjaka iz uzastopnih naraštajnih linija mogu se dobiti ne samo informacije o sezonskim varijacijama klime, već i podaci o globalnim klimatskim promenama.

Na osnovu ostataka mekušaca mogu se dobiti i drugi značajni podaci korisni za rekonstrukciju paleosredina, kao npr. da li je neposredno okruženje bilo šumskog, stepskog ili otvorenog tipa (vlažne livade do stepe), da li su to vrste koje ukazuju na močvarnu, rečnu i jezersku sredinu ili su u pitanju forme koje su isključivo vezane za les i kopnene uslove života i sl.

Zaključak: Upotreba sitnih kičmenjaka i mekušaca u rekonstrukciji uslova paleosredine i paleoklime nalazi se tek u začetku. Paleontolozi pokušavaju da, poredeći distribuciju jedne ili više grupa sitnih kičmenjaka ili mekušaca (fosilnih i savremenih), protumače paleoekološke uslove istraživanog područja. Svaka od opisanih metoda ima svoje prednosti i mane. Zato je korisno, radi veće preciznosti, kombinovati različite vrste metoda.

Zahvalnica: Ovaj rad je finansiran preko Projekta NEEMO Fonda za nauku Republike Srbije broj 7746827.



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SMALL BUT IMPORTANT: THE ROLE OF SMALL MAMMALS, HERPETOFAUNA AND MOLLUSCS IN THE RECONSTRUCTION OF PLEISTOCENE PALAEOENVIRONMENTS

Katarina Bogićević, PhD, Full Professor, University of Belgrade-Faculty of Mining and Geology, Kamenička 6, 11000 Belgrade; katarina.bogicevic@rgf.bg.ac.rs

Draženko Nenadić, PhD, Full Professor, University of Belgrade-Faculty of Mining and Geology, Kamenička 6, 11000 Belgrade

Dragana Đurić, PhD, Museum advisor, Natural History Museum, Njegoševa 51, 11000 Belgrade

Mihailo Jovanović, PhD, IPHES, Institut Català de Paleoecologia Humana i Evolució Social in Tarragona, Edificio W3, Campus Sescelades URV, Zona Educacional 4, 43007, Tarragona, Spain

Aleksandra Savković, M.S., Universitat Rovira i Virgili, Departament d'Història i Història de l'Art, Avinguda de Catalunya 35, 43002 Tarragona, Spain

Key words: palaeoenvironment, Pleistocene, small mammals, herpetofauna, molluscs

Introduction: Fossil remains of animals and plants play an important role in the reconstruction of Pleistocene palaeoenvironments. This paper describes the importance of three groups of animals: small mammals, herpetofauna and molluscs. Although the composition of the entire association is important for reconstruction, the findings of individual species are sometimes sufficiently indicative to reveal the type of habitat or climatic conditions. A particular difficulty in reconstructing palaeoenvironments in Serbia is the fact that climate changes on the Balkan Peninsula were not as sharp as in Central and Western Europe, so there is no drastic difference in composition, on the basis of which we would easily distinguish the fauna of the glacial and interglacial periods. Therefore, fine differences between associations formed in different periods must be taken into account. In Serbia, for example, colder periods are characterized by a wider distribution of steppe species, while in warmer periods forest dwellers are more common.

Methods of reconstruction: The simplest and at the same time the most frequently used method for habitat type reconstruction is the method of ecological groups. For each species, it is determined in which group of habitats it most often lives today, and then the percentage representation of each group in the entire fauna is calculated. One of the variants is the TH-index method, where the affinity for 9 habitat types is determined for each species.

Another common method for habitat type reconstruction is the creation of a cenogram. Small mammals are also used to reconstruct climatic conditions, i.e. the amount of precipitation (humidity) and temperature. There are a number of methods that calculate relative and absolute temperature and precipitation based on the percentage of various rodent species that are indicators of wet, dry, cold or warm climates.



Fossil remains of herpetofauna are also very useful in reconstructing the environments in which they lived. Using the example of Eastern European amphibians and reptiles, Ratnikov formed ecological types in relation to their most common habitats and presence in certain climatic biozones. On the other hand, Böhme created a Central European model of the sequence of individual species during periods of cooling and warming.

In the cave deposits of Serbia of Late Pleistocene age, the herpetological associations are dominated by species that, according to Böhme's model, appear in the warmer stages of the Quaternary climatic cycles. However, it should be borne in mind that the applicability of these schemes in our region is limited, due to different climatic conditions and the distribution of herpetofauna during the Pleistocene, so it is necessary to develop a model that will take into account local conditions on the Balkan Peninsula.

The remains of Quaternary molluscs, in addition to the remains of small mammals and herpetofauna, play a significant role in the reconstruction of palaeoenvironments, especially palaeoclimatic conditions. Characteristic species or index-fossils can provide valuable information about the climatic characteristics of an area, since certain species are specially adapted to cold or warm climate.

Thus, for example, it can be concluded that during the Pleistocene, cold and warm phases alternated, based on the change of fauna related to very cold periods such as, for example, the presence of gastropods of the species *Columella columella* and a relatively "warm fauna" characterized by the species *Arianta arbustorum*.

Freshwater Pleistocene bivalves from the genus *Corbicula*, which are present in the alluvial deposits of the northern parts of Serbia, have great climatic and stratigraphic significance. During the Middle Pleistocene, *Corbicula* retreated from the Pannonian Basin, inhabiting the Caspian Basin, India and some parts of the American continent. Based on the analogy with modern *Corbicula*, it can be concluded that deposits with the presence of their Pleistocene counterparts were created during warm climatic stages. Very important data on the palaeoclimatic characteristics of the environment can also be obtained by geochemical studies of oxygen isotopes in mollusc shells. Analyzing the isotopic composition of shells from successive lineages can provide not only information on seasonal climate variations, but also data on global climate changes. Based on the remains of molluscs, other significant data useful for the reconstruction of palaeoenvironments can be obtained, such as whether the immediate environment was forest, steppe or open type (wet meadows to steppe), whether these are species that indicate marshy, river and lake environments or are in question forms that are exclusively related to loess and terrestrial living conditions, etc.

Conclusion: The use of small vertebrates and molluscs in the reconstruction of palaeoenvironmental conditions and palaeoclimate is only in its infancy. By comparing the distribution of one or more groups of small vertebrates or molluscs (fossil and modern), palaeontologists try to interpret the palaeoecological conditions of the researched area using different methods. Each of the described methods has its advantages and disadvantages. Therefore, it is useful to combine different types of methods for greater accuracy.

Acknowledgement: This work was funded through the NEEMO Project of the Science Fund of the Republic of Serbia, number 7746827.



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