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Sarajevo, 25.-27. 10. 2024.

4th meeting of bat workers

Sarajevo, 25-27 10. 2024.

Knjiga sažetaka
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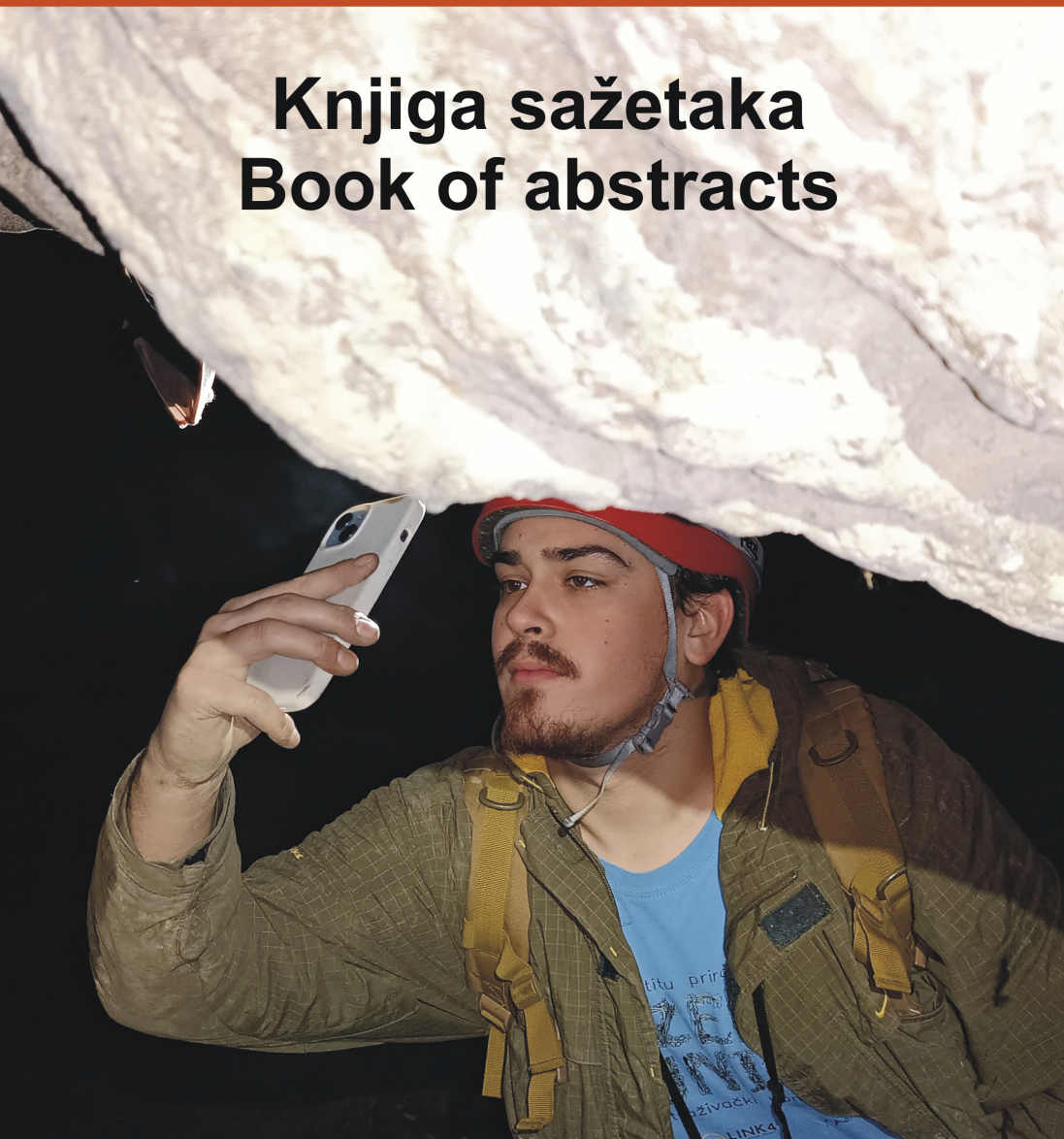

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Četvrti put na okupu

Kad smo se prije nekoliko godina prvi put okupili mislio sam da je to sad i nikad više. A onda smo postajali sve više prijatelji, pridruživali su se mlađi, našlo se i nešto novaca i tako godina za godinom (tako barem pjesma kaže) stigosmo do četvrtog okupljanja. Prema prijavljenim prezentacijama biće tu zanimljivog sadržaja, ali najvažnije je da se družimo i dogovaramo za nova zajednička istraživanja. EBRS u Taragoni bio je svakako poticajan za naše studente pa će, nadam se, peti susret biti još brojniji sa učesnicima i sadržajniji po temama. Neka uživanje koje nas prati na istraživanjima prožme i ovo okupljanje.

J.M.

Rezultati istraživanja šišmiša tokom studentskog istraživačkog kampa "Ekosistemi Balkana – Demir Kapija 2024" (Sjeverna Makedonija) s naglaskom na šišmiše pronađene u cestovnim tunelima

Results of bat survey during biology students research camp "Ecosystems of Balkan – Demir Kapija 2024" (North Macedonia) with emphasis on bats found in road tunnels

Eva Pavlovič[1], Samo Grgurevič[1], Dren Dolničar[1], Lorena Vovk[1], Klara Žos[1]

Društvo studenata biologije (Ljubljana, Slovenija) organizovalo je istraživački kamp "Ekosistemi Balkana – Demir Kapija 2024" (Sjeverna Makedonija) od 24. 4. do 4. 5. 2024. Za vrijeme kampa istražili smo 58 lokaliteta, neke sa više metoda. Za prisutnost šišmiša provjerili smo 13 mostova, 11 potencijalnih podzemnih skloništa, 2 zgrade, mrežarili smo na 5 lokaliteta, a akustičkim popisom također smo istražili različite lokalitete. Pronašli smo 20 vrsta šišmiša: *Rhinolophus hipposideros*, *R. ferrumequinum*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, *M. capaccinii*, *M. mystacinus*, *M. emarginatus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, *Eptesicus serotinus*, *Nyctalus noctula*, *Plecotus austriacus*, *Pl. kolombatovici*, *Barbastella barbastellus*, *Miniopterus schreibersii* i *Tadarida teniotis*.

Nekoliko podzemnih skloništa, koje smo provjerili su cestovni tuneli (među njima, neki su napušteni). Najveći broj šišmiša pronašli smo u tunelu na staroj glavnoj cesti u Demir Kapiji (WGS 84: 41,4042° N, 22,2591° E), kojeg smo provjerili u tri različita dana. U pukotinama pronašli smo *M. blythii*, *M. myotis/blythii*, *Myotis* sp. (mali), *Mi. schreibersii* i *T. teniotis*. Pored toga, iako je prometa na toj cesti veoma malo, u tunelu pronašli smo zgaženog *M. myotis/blythii* i *P. pipistrellus/pygmaeus*. Sa obje strane ulaza tunela, u stijeni su isklesane podzemne prostorije (sada zatvorene i zaključane), koje su bile ulazi u Mackensenov tunel (zapadni ulaz 41,4039° N, 22,2589° E; istočni ulaz 41,4044° N, 22,2598° E). U prostorije nismo mogli ući,

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ali sa detektorom u svakoj prostoriji zabilježili smo sklonište *R. hipposideros*, a ispred zapadne prostorije u mrežu smo uhvatili *Pl. austriacus* i *Pl. kolombatovici*. U drugom tunelu (41,3887° N, 22,3491° E), koji se nalazi na istoj staroj glavnoj cesti, našli smo *M. myotis*, *M. blythii*, *M. mystacinus* i *H. savii*. Prisutnost šišmiša u nekim tunelima u Sjevernoj Makedoniji već su u prošlosti provjerili različiti istraživači i u njima pronašli različite vrste (Đulić & Mikuška 1966, Kryštufek et al. 1992, Stojanovski 1994, 1998). To nam pokazuje, da tuneli sa hrapavim i neobrađenim stijenama i sa pukotinama u Severnoj Makedoniji mogu biti dobra skloništa za više vrsta šišmiša. Zato bi trebalo procjeniti utjecaj na šišmiše u vrijeme kada se priprema renovacija sličnih struktura.

***

The Biology Students' Society (Ljubljana, Slovenia) organized the research camp "Ecosystems of Balkan – Demir Kapija 2024" (North Macedonia) from 27 April to 4 May 2024. During the camp, we surveyed 58 different sites, some with more than one method. We surveyed 13 bridges, 11 potential underground bat roosts, 2 buildings, mist netted at 5 sites and done additional acoustic surveys on other sites. We recorded 20 bat species: *Rhinolophus hipposideros*, *R. ferrumequinum*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, *M. capaccinii*, *M. mystacinus*, *M. emarginatus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, *Eptesicus serotinus*, *Nyctalus noctula*, *Plecotus austriacus*, *Pl. kolombatovici*, *Barbastella barbastellus*, *Miniopterus schreibersii* and *Tadarida teniotis*.

Some of the underground roosts we surveyed were road tunnels near Demir Kapija (although some not in use anymore). The majority of the bats we found were in the tunnel of the old main road in Demir Kapija (WGS 84: 41.4042° N, 22.2591° E), which we visited on three separate days. In its crevices we found *M. blythii*, *M. myotis/blythii*, *Myotis* sp. (small), *Mi. schreibersii* and *T. teniotis*. In addition, although there is little traffic, we found a run over *M. myotis/blythii* and *P. pipistrellus/pygmaeus* inside the tunnel. There are two underground chambers, one on each side of the tunnel, carved into the rock wall, which are the entrances to the original Mackensen tunnel (west entrance 41.4039° N, 22.2589° E; east entrance 41.4044° N, 22.2598° E). Since they were closed and locked, we could not enter, but with ultrasound detector we recorded *R. hipposideros* roosting in both, and we mist netted *Pl. austriacus* and *Pl. kolombatovici* by the west entrance. In the second road tunnel (41.3887° N, 22.3491° E) further down the old main road we found *M.*

myotis, *M. blythii*, *M. mystacinus* and *H. savii*. In the past, some artificial tunnels in North Macedonia have been surveyed by different researchers (Đulić & Mikuška 1966, Kryštufek et al. 1992, Stojanovski 1994, 1998) and different bats species have been found in them. This shows that used and unused artificial tunnels with rough or crude and untreated walls in North Macedonia can be good roosts for multiple bat species. Therefore, the potential impact on bats should be considered when renovating such structures.

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Results of bats and temperatures monitoring in the military tunnel under Vrh Sv. Treh Kraljev (Logatec, central Slovenia) during winter 2023/24

Rezultati praćenja šišmiša i temperatura u vojnom tunelu ispod Vrha Sv. Treh Kraljev (Logatec, središnja Slovenija) tijekom zime 2023/24.

Lorena Vovk[1], Inti Črnigoj[2], Tinkara Rudolf[2], Maja Zagmajster[3]

The tunnel under the hill Vrh Sv. Treh Kraljev is located in central Slovenia in the municipality Logatec. It is about 740 m long tunnel, with two entrances; the main entrance is about 1,8 m high and 3 m wide (WGS84: 46.0109° N, 14.1730° E, 813 m a.s.l.), while the second entrance at the other end is a vertical shaft of about 8 m depth, and app. 5 x 5 width/length. At the distance of about 100 m from the main entrance the tunnel intersects a natural cave Jama pri Sv. Treh Kraljih (Slovenian cave cadastre no. 541, length 769 m, depth 70 m).

In the period from 30th September 2023 to 19th April 2024, we performed weekly bat surveys in the tunnel, dividing it into 21 sections of length between 10 and 58 metres. Air temperature was measured by six data loggers, five of which were placed in five sections inside the tunnel (at distances from 40 to 630 m from the main entrance), while one data logger was placed outside the tunnel, near the main entrance.

During our survey, we observed five species of bats: *Rhinolophus hipposideros*, *Myotis myotis* / *M. blythii*, *Myotis* sp. (two different small species, referred to as sp. 1 and sp. 2) and *Plecotus* sp. *R. hipposideros* was present during all winter, with the lowest number of animals (27) on 13th April, and the highest number (242) on 10th February. *M. myotis* / *M. blythii* was found in the tunnel from October to the end of March, and then again on 19th April. Most of the times only one or two

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animals were found in the tunnel, while the highest number of individuals of this taxon (8) was recorded at the end of March. One *Plecotus* sp. and one *Myotis* sp. 1 were observed during all four surveys in March, but not at the same positions. Bats of both species disappeared in the beginning of April, but were observed again on 19th April – two *Plecotus* sp. and four *Myotis* sp. (three individuals of sp. 1 and one individual of sp. 2).

During the winter, the bats were not evenly distributed between the sections. The number of *R. hipposideros* was the highest in two consecutive sections at the end of the first third of the tunnel (at the approximate distance from 130 to 210 m from the main entrance). The number of bats was the lowest in section right behind the main entrance, and in sections at the most distant parts of the tunnel from the main entrance. The air temperature outside the tunnel during our survey extended between -8.5°C and 25.7°C, with the average being 6.7°C. The variability of the temperature within the tunnel was lower, but still extended between 2.1°C and 13.9°C, with the average between 7°C and 9°C at different sections. The influence of air temperature was greatest in the sections close to both tunnel entrances. There was no clear relationship between the temperatures inside the tunnel and the number of bats present in those sections, indicating that also other factors than temperature may be important for selection of resting places. However, the results of the Spearman correlation test show a negative relationship between the number of *R. hipposideros* in the tunnel and average daily outside temperature with Spearman's correlation coefficient $R = -0.6$ ($p \leq 0.001$).

***

Tunel ispod brda Vrh Sv. Treh Kraljev nalazi se u središnjoj Sloveniji u općini Logatec. Tunel je dug oko 790 m te ima dva ulaza; glavni ulaz visok je oko 1,8 m i širok 3 m (WGS84: 46,0109° N, 14,1730 ° E, 813 m n.v.), dok je drugi ulaz na krajnom delu tunela, okno na visini oko 8 m, s približnim dimenzijama 5 × 5 m (širina/dužina). Na udaljenosti od oko 100 m od glavnog ulaza, tunel presijeca prirodnu špilju "Jama pri Sv. Treh Kraljih" (slovenski katastar špilja br. 541, duljina 769 m, dubina 70 m).

U razdoblju od 30. rujna 2023. do 19. travnja 2024. provodili smo tjedno popisivanje šišmiša u tunelu, kojeg smo podijelili na 21 dionicu duljine između 10 i 58 metara. Temperatura zraka mjerena je pomoću šest zapisivača podataka, od kojih

je pet postavljeno u pet dionica tunela (na udaljenosti od 40 do 630 m od glavnog ulaza), a jedan je postavljen izvan tunela, blizu glavnog ulaza.

Tijekom našeg istraživanja, zabilježili smo pet vrsta šišmiša: *Rhinolophus hipposideros, Myotis myotis / M. blythii, Myotis* sp. (dvije različite male vrste, vrsta 1 i vrsta 2) *i Plecotus* sp. *R. hipposideros* bio je prisutan tijekom cijele zime, s najmanjim brojem jedinki (27) 13. travnja, a najvećim brojem (242) 10. veljače. *M. myotis / M. blythii* zabilježen je u tunelu od listopada do kraja ožujka, a zatim ponovno 19. travnja. Većinu vremena u tunelu su pronađene samo jedna ili dvije jedinke te vrste, dok je najveći broj (8) jedinki zabilježen krajem ožujka. Jedan *Plecotus* sp. i jedan *Myotis* sp. 1 opaženi su tijekom sva četiri popisa u ožujku, ali ne na istim pozicijama. Obje vrste su nestale početkom travnja, ali su ponovno opažene 19. travnja – dva *Plecotus* sp. i četiri *Myotis* sp. (tri jedinki vrste 1 i jedna jedinka vrste 2).

Tijekom zime, šišmiši nisu bili ravnomjerno raspoređeni po dionicama. Broj *R. hipposideros* bio je najveći u dvije uzastopne dionice na kraju prve trećine tunela (na udaljenosti od približno 130 do 210 m od glavnog ulaza). Broj šišmiša bio je najmanji u dionici odmah iza glavnog ulaza, kao i u dionicama na najudaljenijim dijelovima tunela od glavnog ulaza.

Temperatura zraka izvan tunela tijekom našeg istraživanja kretala se između -8,5 i +25,7 °C, s prosječnom temperaturom od 6,7 °C. Varijabilnost temperature unutar tunela bila je manja, ali se ipak kretala između 2,1 i 13,9 °C, s prosječnim vrijednostima između 7 i 9 °C u različitim dionicama. Utjecaj vanjske temperature bio je najveći u dionicama blizu oba ulaza u tunel. Nije utvrđena jasna veza između temperatura unutar tunela i broja šišmiša u dionicama, što ukazuje na to da su i drugi čimbenici osim temperature važni za izbor mjesta odmora. Međutim, rezultati Spearmanovog testa korelacije pokazuju negativnu vezu između broja *R. hipposideros* u tunelu i prosječne dnevne temperature izvan tunela, s koeficijentom korelacije $R = -0.6$ ($p \leq 0.001$).

Netopirofon, dobrovoljna vruća telefonska linija za šišmiše u Sloveniji

Netopirofon, the voluntary bat hotline of Slovenia

Klara Žos[1], Lorena Vovk[1]

Slovensko društvo za proučavanje i zaštitu šišmiša (SDPVN) ima dobrovoljnu telefonsku liniju pod nazivom Netopirofon. Posvećena je pružanju pomoći ozlijeđenim i bolesnim šišmišima te siročadi, kao i davanju informacija ljudima o šišmišima. Pored toga, volonteri odgovaraju na pitanja o biologiji i ekologiji šišmiša te savjetuju mještane o tome kako koegzistirati sa šišmišima koji žive u njihovim kućama, na tavanima, ispod krovova itd. Ipak, službene odluke o upravljanju šišmišima koji nastanjuju zgrade su u nadležnosti Zavoda Republike Slovenije za zaštitu prirode.

Netopirofon, kakav postoji danas, prvi je put uspostavljen 2009. godine kao dio projekta sufinanciranog od strane grada Ljubljane, ali i prije toga su na internetu bili objavljeni brojevi mnogih volontera koji su davali savjete ili pružali pomoć kada bi ih se kontaktiralo. Zbog pozitivnih reakcija javnosti, odlučili smo nastaviti s Netopirofonom i nakon završetka projekta. U posljednje tri godine (2020-2023) primili smo između 219 i 271 poziva godišnje.

Važan dio Netopirofona uključuje pružanje pomoći šišmišima koji se nađu na tlu ili u drugim neobičnim situacijama. Takvi šišmiši su obično ozlijeđeni ili bolesni te im je potrebna liječnička pomoć i skrb koju pružaju volonteri. Tokom 2024. godine, članovi SDPVN-a stekli su nova praktična znanja o njezi šišmiša i liječenju raznih ozljeda, posebno rastrganih krila i površinskih rana. Također smo stekli nova iskustva u brizi za mladunce šišmiša, s posebnim naglaskom na nove tehnike hranjenja i dodatke prehrani koji pomažu u razvoju kostiju. Ovdje iznosimo neka od novostečenih znanja koja smo stekli uz podršku drugih evropskih društava.

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The Slovenian Association for Bat Research and Conservation (SDPVN) has a volunteer hotline called Netopirofon. It is dedicated to helping injured, sick, and orphaned bats, as well as providing information about bats to the public. Furthermore,

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volunteers answer questions about the bat biology and ecology, as well as advise people on how to co-exist with bats living in their houses, attics, roofs, etc. However, the official decisions for management of bats living in buildings are under the jurisdiction of the Institute of the Republic of Slovenia for Nature Conservation.

Netopirofon, as it is today, was first set up in 2009 a s part of the project supported by Ljubljana city, but even before that, the phone numbers of various volunteers were posted online, who were available to give advice and help when called. Due to positive feedback from the public, we decided to continue Netopirofon even outside of the project. In the last three years (2020- 2023), we have received between 219 and 271 calls per year.

An important part of Netopirofon includes helping bats that are found on the ground or in other unusual circumstances. These bats are usually injured or sick and need treatment and care, which is provided by the volunteers. In 2024, SD-PVN members gained new practical knowledge about bat care and the treatment of various injuries, particularly wing tears and surface wounds. We gained new experience in caring for juvenile bats, paying particular attention to new feeding techniques and nutritional supplements for skeletal development. Here we present some of the newly acquired knowledge we have gained with the help of other European societies.

Napušteni železniči tunel kod sela Zrza (Đakovica, Kosovo)

Abandoned railway tunnel near the village of Zrza (Đakovica, Kosovo)

Primož Presetnik[1]

Tokom BOOM 2018 (Balkanski odonatološki sastanak) 9. avgusta 2018. slučajno sam iz automobila primjetio čudnu crnu rupu ispod obližnjeg brda u blizini sela Zrza, oko 8,5 km istočno od Đakovice (Kosovo). Zastao sam i shvatio da je to nekadašnji željeznički tunel dug oko 700 m. U njemu sam primjetio samo jednu ženku *Myotis myotis*/*blythii* sa mladunčetom i jednu samu jedinku iste vrste, ali veća gomila guana većeg šišmiša ukazuje da se više životinja, bar povremeno, zadržava u ovom tunelu. Tunel bi trebalo provjeriti nekoliko puta između aprila i septembra, da bi se utvrdio njegov značaj za šišmiše. Verovatno će to skloništе biti uništeno, sa planiranom reaktivacijom te pruge. Međutim, koliko znam, ovo je prva objavljena informacija o šišmišima u kosovskim tunelima.

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During BOOM 2018 (Balkans OdonatOlogical Meeting) on 9 August 2018, while driving my car, I happened to notice a strange black hole under a nearby hill near the village of Zrza, about 8.5 km east of Đakovica (Kosovo). I interrupted my journey and discerned that it was a former railway tunnel, about 700 metres in length. In it, I noticed only a single female *Myotis myotis*/*blythii* with a pup and another single bat of the same takson, although the larger pile of large-sized bat guano indicated that a larger number of animals may reside in the tunnel at least occasionally. To determine the importance of the tunnel for bats, it would be necessary to conduct repeated surveys between April and September. Most probably this roost will be destroyed with planned activation or this railway line. However, to the best of my knowledge, this is the first published information on bats in the tunnels of Kosovo.

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Rezultati istraživanja faune šišmiša tokom "Istraživačkog kampa studenata biologije – Podbrdo 2024" (Slovenija)

Results of bat surveys from the "Biology student research camp – Podbrdo 2024" (Slovenia)

Samo Grgurevič[1, 2], Eva Pavlovič[1, 2], Dren Dolničar[1, 2], Lorena Vovk[1, 2], Klara Žos, [1, 2] Primož Presetnik[1, 2, 3]

Društvo studenata biologije organiziralo je "Istraživački kamp studenata biologije – Podbrdo 2024" (SZ Slovenija), između 12. 7. i 21. 7. 2024. Za vrijeme kampa smo prisutnost šišmiša provjerili u 28 zgrada, 25 mostova i 2 pećine. Mrežarili smo na 8 lokaliteta, a uz pomoć ručnog i automatskog ultrazvučnog detektora uradili smo akustične popise. Na širom području smo zabilježili minimalno 21 različitu vrstu: *Rhinolophus hipposideros, Myotis myotis, M. blythii*, *M. bechsteinii, M. nattereri* s. lat., *M. emarginatus*, *M. mystacinus*, *M. alcathoe*, *M. davidii*, *M. daubentonii*, *Pipistrellus. pipistrellus, P. pygmaeus**, *P. kuhlii/nathusii**, *Hypsugo savii**, *Eptesicus serotinus*, *Vespertilio murinus*, *Nyctalus leisleri, N. noctula*, *Plecotus macrobullaris*, *Pl. auritus*, *Barbastella barbastellus* (* – vrste/taksoni zabilježeni samo uz akustične popise). Iako su svi novi distribucijski podaci za sve vrste veoma bitni, posebno smo bili zadovoljni sa podacima novih ili već potvrđenih poznatih porodiljskih kolonija: 9 *R. hipposideros*, 3 *P. pipistrellus*, jedna *M. myotis* i jedna *Pl. macrobullaris*. Osim kolonija *P. pipistrellus*, koje su pronađene iza vanjskih drvenih obloga fasada ili otvorenih kapaka na prozorima, sve su porodiljske kolonije bile u crkvama. Pored toga, smatramo za izvanredno bitne još i nove podatke o distribuciji *M. alcathoe* i *M. davidii* na sjeverozapadu Slovenije.

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The Biology Students' Society (Ljubljana, Slovenia) organized the "Biology students research camp – Podbrdo 2024" (NW Slovenia) from 12 to 21 July 2024.

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[2] Biology Students' Society, Ljubljana, Slovenia
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During the camp, we surveyed 28 buildings, 25 bridges and 2 caves. We mist netted at 8 different locations and conducted acoustic surveys using hand-held and automatic ultrasound detectors. We found the presence of at least 21 different species in the wider area: *Rhinolophus hipposideros, Myotis myotis, M. blythii*, *M. bechsteinii, M. nattereri* s. lat., *M. emarginatus*, *M. mystacinus*, *M. alcathoe*, *M. davidii*, *M. daubentonii*, *Pipistrellus pipistrellus, P. pygmaeus**, *P. kuhlii/nathusii**, *Hypsugo savii**, *Eptesicus serotinus*, *Vespertilio murinus*, *Nyctalus leisleri, N. noctula*, *Plecotus macrobullaris*, *Pl. auritus*, and *Barbastella barbastellus* (* – species/taxa detected only with acoustic surveys). Although all new distribution data of all species are important, we were especially pleased with the data on discovered or confirmed maternity roosts: 9 of *R. hipposideros*, 3 of *P. pipistrellus*, one of *M. myotis* and one of *Pl. macrobullaris*. With the exception of maternity roosts of *P. pipistrellus*, which were all located behind the outside wooden cladding or open window shutters of houses, all other maternity roosts were in churches. We also found new data regarding the distribution of *M. alcathoe* and *M. davidii* for north-western Slovenia especially valuable.

Železnički i cestovni tuneli u Sloveniji – slabo istražena skloništa šišmiša

Railway and road tunnels in Slovenia – poorly researched bat roosts

Primož Presetnik[1], Gregor Domanjko[2], Eva Pavlovič[3], Samo Grgurevič[4]

Slovenija je ispresijecana cestama i željeznicama, s mnogo tunela. Međutim, kako su mnoge transportne linije još uvijek u upotrebi i stoga opasne za istraživače, postoji malo podataka o šišmišima u takvim strukturama. Znamo za samo 4 željeznička tunela i 9 cestovnih tunela koji su pregledani zbog šišmiša, i to uglavnom samo vizualno tokom dana. Većina tunela je pregledana samo jednom ili dva puta, a samo su tri strukture pregledane više od 10 puta. Ipak, u željezničkim (*) i cestovnim (#) tunelima zabilježeno je 9 vrsta šišmiša: *Rhinolophus hipposideros* (*), *R. ferrumequinum* (#), *Myotis myotis* (*), *M. blythii* (#), *M. emarginatus* (#), *Nyctalus noctula* (#), *Pipistrellus* sp. (#), *Plecotus auritus* (*) i *Barbastella barbastellus* (*). Prema našim saznanjima, samo tri tunela imaju značajnu koncentraciju šišmiša. Oba dijela željezničkog tunela Mačkovci-Stanjevci (Goričko, Slovenija), koji se urušio u sredini i odavno je napušten, služe kao mjesta parenja za *M. myotis* i cjelogodišnja skloništa za nekoliko jedinki *R. hipposideros*, ali su zabilježeni i šišmiši drugih vrsta. Tunel ispod autoputa zapadno od sela Sela pri Rudniku (središnja Slovenija) važan je hibernakul za značajan broj *N. noctula* i nekoliko jedinki drugih vrsta. Vjerovatno bi inspekcija drugih, manje korištenih tunela, posebno u kombinaciji s upotrebom mreža i ultrazvučnih detektora, brzo otkrila dodatne lokacije važne za šišmiše.

Slovenia is criss-crossed by roads and railways, with many tunnels. However, there is little data on bats in such structures, because most transport routes are still in use and therefore dangerous for surveyors. We know of only 4 railway tunnels and

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9 road tunnels that have been surveyed for bats, and most only visually during the day. Most tunnels were surveyed just once or twice, and only three structures were surveyed more than 10 times. Nevertheless, 9 bat species were recorded in railway (*) and road (#) tunnels: *Rhinolophus hipposideros* (*), *R. ferrumequinum* (#), *Myotis myotis* (*), *M. blythii* (#), *M. emarginatus* (#), *Nyctalus noctula* (#), *Pipistrellus* sp. (#), *Plecotus auritus* (*), and *Barbastella barbastellus* (*). To our knowledge, there are only three tunnels with a significant concentration of bats. Both sides of the railway tunnel Mačkovci-Stanjevci (Goričko, NE Slovenia), which has collapsed in the middle and has been abandoned for a long time, are mating roosts for *M. myotis* and year-round roosts for a few *R. hipposideros*, but bats of some other species have also been recorded there. A tunnel under the motorway W of the village of Sela pri Rudniku (central Slovenia) is an important hibernaculum for significant numbers of *N. noctula* and a few individuals of other species. It is likely that inspection of other, less used tunnels, especially in combination with the use of mist nets and ultrasound detectors, would quickly reveal additional sites important for bats.

Zaštita nadzemnih skloništa u Hrvatskoj – izazov za budućnost

Protection of aboveground bat roosts in Croatia – a challenge for the future

Magdalena Janeš[1], Dina Rnjak[1], Goran Rnjak[1], Stipe Maleš[1], Hrvoje Hodak[1], Paula Prpić[1]

U Hrvatskoj je prepoznat niz utjecaja ljudskog djelovanja koji dovode do gubitka ili smanjenja kvalitete povoljnih skloništa šišmiša. Za mnoge vrste koje koriste nadzemne objekte poznat je vrlo mali broj skloništa, a njihove su kolonije često znatno manje od onih koje formiraju špiljske vrste u podzemnim objektima. Obnove i izmjene nadzemnih objekata trenutno se često provode u svrhu energetskih obnova, sanacija nakon potresa, restauracija i sl. Između ostalog uključuju zamjene krovišta, fasada, zatvaranje pukotina, prozora i ostalih prolaza za šišmiše. Osvjetljavanje skloništa također predstavlja jedan od problema. S druge strane, urušavanje zapuštenih objekata jednako otežava ili u potpunosti onemogućuje ostanak šišmiša u njima. Prema analizi stanja očuvanosti izrađenoj u okviru nacionalnog programa praćenja stanja šišmiša, znatan je udio poznatih nadzemnih skloništa upitne (36%) ili loše kvalitete (6%), odnosno dio njih više ne funkcionira kao sklonište šišmiša (12%). Problematiku zaštite nadzemnih skloništa prikazat ćemo na primjeru nekoliko lokaliteta u Hrvatskoj čiju su ugrozu zabilježili djelatnici Geonature u sklopu svoga rada tijekom posljednjih godina.

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In Croatia, a range of human activities contribute to the loss and degradation of suitable bat roosts. For many species that use above-ground structures, only a small number of roosts are known, and their colonies are often significantly smaller than those formed by cave-dwelling species in underground habitats. Renovations and modifications of above-ground structures are frequently carried out for purposes such as energy efficiency improvements, post-earthquake repairs, restorations, and similar activities. These works often involve replacing roofs, facades,

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sealing cracks, and blocking windows and other access points for bats. Additional problems arise due to artificial lighting of roost entrances. On the other hand, the collapse of neglected structures similarly hinders or completely prevents bats from using them. According to the conservation status analysis conducted as part of the national bat monitoring program, a significant portion of known above-ground roosts are of questionable (36%) or poor quality (6%), while some no longer function as bat roosts (12%). The issue of protecting above-ground roosts will be illustrated on an example of several sites in Croatia where threats have been documented by Geonatura staff during their work in recent years.

Rezultati studentskog istraživačkog kampa na području Spomenika prirode "Slapovi Sopotnice" u 2024. godini (Srbija)

Results from the 2024 students annual research camp at Natural monument "Slapovi Sopotnice" (Serbia)

Jovan Kokotović[1], Vojo Milanović[2], Lena Đurić[1],
Ines Ćutuk[2], Kosta Janičić[1]

Na letnjem istraživačkom kampu na području Spomenika prirode "Slapovi Sopotnice" 2024. godine, studenti članovi Naučno istraživačkog društva studenata biologije i ekologije "Josif Pančić" nastavili su višegodišnje istraživanje slepih miševa započeto 2015. godine. Podaci o prisustvu vrsta slepih miševa prikupljani su metodama koje uključuju pregled potencijalnih dnevnih skloništa, snimanje eholokacionih signala slepih miševa putem stacionarnih i ručnih detektora i hvatanje slepih miševa standardnim mrežama. Tokom 5 terenskih dana obišli smo ukupno 6 potencijalnih dnevnih skloništa slepih miševa (2 pećine i 4 građevine). Mrežarenje vršeno je na 3 lokaliteta tokom 4 noći. Zabeleženo je prisustvo ukupno 9 vrsta: *Rhinolophus hipposideros, Plecotus auritus, Pipistrellus pipistrellus, Hypsugo savii, Myotis blythii, Myotis bechsteinii, Myotis nattereri, Myotis mystacinus* i *Myotis alcathoe.* Ovogodišnjim nalazima spisak vrsta čije je prisustvo utvrđeno na području porastao je za 3 (*Myotis nattereri, Myotis alcathoe, Plecotus auritus*), a kao posebno značajne izdvojili bismo vrste *Myotis alcathoe* koja je ove godine prvi put registrovana, kao i vrste *Myotis blythii* čije je prisustvo ranije utvrđeno putem eholokacionih signala, a ove godine je definitvno potvrđeno. Organizaciju kampa podržao je Planinarski klub "Kamena Gora"

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During this year's annual summer research camp at Natural monument "Slapovi Sopotnice", student members of the Scientific Research Society of Biology and Ecology Students "Josif Pančić" continued the bat research started in 2015. Bat presence data was collected using standard methods such as potential roost site examination, ultrasound recording and analysis using stationary and hand-held bat detectors and mist-netting. Over 5 field work days we checked 6 potential roost sites (2 caves nad 4 man-made structures). Mist netting was done at 3 locations over 4 nights. Presence data was collected for 9 species: *Rhinolophus hipposideros, Plecotus auritus, Pipistrellus pipistrellus, Hypsugo savii, Myotis blythii, Myotis bechsteinii, Myotis nattereri, Myotis mystacinus* i *Myotis alcathoe*. With these records we expand the list of known present species in the area by 3 (*Myotis nattereri, Myotis alcathoe, Plecotus auritus*), notable species from this year's research are *Myotis alcathoe* which was registered for the first time this year, as well as *Myotis blythii* whose presence was previously recorded via echolocation and was definitely confirmed this year. The camp was organised with the help od the Mountaineers club "Kamena Gora"

Rezultati istraživanja napuštenih željezničkih tunela u Hercegovini

Results of the Survey of Abandoned Railway Tunnels in Herzegovina

Amina Agić[1], Ines Ćutuk[1], Vojo Milanović[1], Jasminko Mulaomerović[1], Rejna Kolašinac[2], Mirza Kalabić[3]

Obilazak napuštenih željezničkih tunela u Hercegovini proveden je 9. augusta 2024. i obuhtvao je nekoliko lokacija s ciljem praćenja vrsta i brojnosti šišmiša. Ukupno je istraženo šest tunela, dva iznad sela Dračevica (Svitava) i četiri na potezu Bradina-Konjic. Istraživanje šišmiša u tunelima iznad sela Dračevica sprovedeno je u dva tunela: tunel Bulatovac i tunel Bubreg. U tunelu Bulatovac, zabilježeno je 1140 jedinki vrsta *Myotis myotis/Myotis blythii, od kojih je oko 70% jedinki nosilo mlade,* što ukazuje na značajno mjesto za reprodukciju. Također, zabilježena je jedna ženka vrste *Myotis capaccinii*, koja nije bila reproduktivno zrela. U tunelu Bubreg zabilježeno je 427 adultnih jedinki *M. myotis/M. blythii i jedan mladi*, uz dodatne vrste: *Rhinolophus euryale* (2 jedinke), *Rhinolophus ferrumequinum* (4 jedinke), *M. capaccinii* (8 jedinki), te mumificirana jedinka *M. myotis*. Istraživanje tunela na području Bradine uključivalo je provjeru četiri tunela. U tunelu Šunji je zabilježena jedna jedinka *Rhinolophus hipposideros.* U tunelu Lukač je registrovano ukupno 10 jedinki vrste *R. hipposideros*, od čega su dvije jedinke bile u letu, koje su identificirane na osnovu video snimaka. Zatim, u tunelu Brđani I pronađeno je pet jedinki *M. myotis/M. blythii*, te tri jedinke *M. blythii od kojih je jedna ženka nosila mlado*. Također su registrovane dvije jedinke *R. hipposideros.* U tunelu Brđani II zabilježeno je prisustvo kolonije od 21 jedinke *R. hipposideros*, koja se nalazila na kraju tunela, čiji je drugi izlaz zasut i samim tim neprohodan, a pored kolonije je zabilježen i jedan mladi *R. hipposideros* na stijeni tunela.

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The survey of abandoned railway tunnels in Herzegovina was conducted on August 9, 2024, covering several locations with the aim of monitoring bat species and population numbers. A total of six tunnels were investigated, two above the village of Dračevica (Svitava) and four along the Bradina-Konjic stretch. The bat survey in the tunnels above the village of Dračevica included two tunnels: Bulatovac tunnel and Bubreg tunnel. In the Bulatovac tunnel, 1,140 individuals of the species *Myotis myotis/Myotis blythii* were recorded, with around 70% of the individuals carrying young, indicating a significant breeding site. Additionally, one female of the species *Myotis capaccinii*, which was not reproductively mature, was observed. In the Bubreg tunnel, 427 adult individuals of *M. myotis/M. blythii* and one juvenile were recorded, along with other species: *Rhinolophus euryale* (2 individuals), *Rhinolophus ferrumequinum* (4 individuals), *M. capaccinii* (8 individuals), and one mummified *M. myotis* individual. The survey of tunnels in the Bradina area involved the inspection of four tunnels. In the Šunji tunnel, one individual of *Rhinolophus hipposideros* was recorded. In the Lukač tunnel, a total of 10 individuals of *R. hipposideros* were registered, two of which were observed in flight and identified based on video footage. In the Brđani I tunnel, five individuals of *M. myotis/M. blythii* were found, along with three individuals of *M. blythii*, one of which was a female carrying a young. Two individuals of *R. hipposideros* were also recorded. In the Brđani II tunnel, a colony of 21 individuals of *R. hipposideros* was observed at the end of the tunnel, whose second exit is blocked and therefore impassable, and alongside the colony, one juvenile *R. hipposideros* was seen on the tunnel wall.

Novi podaci o lokacijama dvobojnog šišmiša (*Vespertilio murinus*) u BiH

New data on the locations of the parti-coloured bat (*Vespertilio murinus*) in B&H

Amina Agić[1], Jasminko Mulaomerović[1], Besim Gurda[2,3]

Prisustvo dvobojnog šišmiša (*Vespertilio murinus*) u BiH do sada je sa sigurnošću zabilježeno na nekoliko lokaliteta: Igman, Bjelašnica, Sarajevo, Ulog, Ponikva, Crno Polje, Rujište, Stolac. Ovim istraživanjima pronalazak vrsta proširen je na još dva lokaliteta i to na planinu Vranicu i Tomislavgrad, te je ponovo potvđeno prisustvo u Sarajevu.

Istraživanje planine Vranice, tačnije habitata oko Prokoškog jezera izvršeno je 14. jula, 2023. godine. Postavljena su dva detektora od kojih je jedan bio postavljen na prozor kuće udaljene od samog jezera oko 200 metara (43.957598 N, 17.751064 E). Snimci sa detektora, postavljenog na prozor kuće, zabilježili su veliku brojnost dvobojnog šišmiša, kao i novi izgled signala pomoću kojeg se ova vrsta i prepoznaje. Pored toga ovi rezultati predstavljaju prve podatke za hiropterofaunu Prokoškog jezera.

Dana 26. oktobra, 2023. godine, prilikom mijenjanja prozora u prizemlju kuće u mjestu Kongora u Tomislavgradu (43.6526254 N, 17.3219180 E), uočeno je prisustvo deset jedinki nepoznatog spola, vrste *Vespertilio murinus*. Sve jedinke su pronađene ispod klupice prozora na strani kuće u pravcu sjeveroistoka.

Prisustvo dvobojnog šišmiša u Sarajevu potvrđeno je i 15. septembra, 2024. godine. Nakon poziva djevojke u pronalasku šišmiša na prometnoj cesti na Čengić Vili (43.850433, 18.370796), ekipa Centra za krš i speleologiju, pobrinula se za zbrinjavanje šišmiša, prilikom čega je i idetifikovano o kojoj je vrsti riječ. Pored identifikacije, zaključeno je da je riječ o odraslom mužjaku dvobojnog šišmiša (*Vespertilio murinus*), koji nije bio reproduktivno zreo. Jedinka je po oporavku ponovo

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puštena, a nakon pronalaska 2017. godine (Mulaomerović, 2017) ovaj nalaz predstavlja drugi nalaz dvobojnog šišmiša za područje grada Sarajeva.

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The presence of the parti-colored bat (*Vespertilio murinus*) in Bosnia and Herzegovina has so far been confirmed at several locations: Igman, Bjelašnica), Sarajevo, Ulog, Ponikva, Crno Polje, Rujište, and Stolac. This research extends the known distribution of the species to two more locations: Mount Vranica and Tomislavgrad, while also reconfirming its presence in Sarajevo.

The study of Mount Vranica, specifically the habitats around Prokoško Lake, was conducted on July 14, 2023. Two detectors were placed, one of which was mounted on a window of a house located approximately 200 meters from the lake (43.957598 N, 17.751064 E N). Recordings from the detector positioned on the house window revealed a high abundance of the parti-colored bat, as well as a new signal profile by which the species can be identified. Additionally, these results represent the first data on the chiropteran fauna of Prokoško Lake.

On October 26, 2023, while replacing windows in the ground floor of a house in Kongora, Tomislavgrad (43.6526254 N, 17.3219180 E), the presence of ten individuals of unknown sex from the species *Vespertilio murinus* was observed. All individuals were found under the window sill on the northeast side of the house.

The presence of the parti-colored bat in Sarajevo was also confirmed on September 15, 2024. After a call from a young woman reporting a bat found on a busy road in Čengić Vila (43.850433, 18.370796), the team from the Center for Karst and Speleology took care of the bat, identifying the species. It was concluded that the individual was an adult male parti-colored bat (*Vespertilio murinus*), though it was not reproductively mature. After recovery, the bat was released. Following the first record in 2017 (Mulaomerović, 2017), this finding represents the second record of the parti-colored bat for the city of Sarajevo.

Reference

Mulaomerović, J., (2017). Sredina jeseni u Sarajevu: Noćni šišmiš i dvobojni šišmiš. Naš krš, XXXVII (50), 1:82-84

Nove male porodiljske kolonije malih potkovastih šišmiša (*Rhinolophus hipposideros*) 2023./2024.

New small maternity colonies of lesser horseshoe bats (*Rhinolophus hipposideros*) 2023/2024

Vojo Milanović[1], Amina Agić[1], Ines Ćutuk[1], Tatjana Vojinović[1], Senad Mulaomerović[1], Jasminko Mulaomerović[1], Besim Gurda[2,3]

Istraživanja šišmiša provedenih na nekoliko lokacija u periodu između jula 2023. godine i jula 2024. godine ukazala su na značajna okupljanja i reproduktivnu aktivnost malih potkovastih šišmiša (*Rhinolophus hipposideros*). Prvo istraživanje nedovršene vikendice porodice Markanović na lokalitetu Maglaja sprovedeno je 9. jula 2023. godine, prilikom čega je zabilježeno osam jedinki malih potkovastih šišmiša, od čega su šest bile ženke s mladima. Na istoj lokaciji, 28. juna 2024. godine, ta brojka je bila za jednu jedinku viša, pa smo tako zabilježili ukupno devet odraslih šišmiša, među kojima je ponovo šest ženki imalo mlade, što nam ukazuje na kontinuiranu prisutnost i reprodukciju ove vrste na ovom lokalitetu. Kuću u selu Dištica nadomak Maoče također smo posjetili dva puta. Prvi put dana 27. augusta, 2023. godine u pomoćnoj prostoriji kuće, smo pored guana, zatekli samo mumificiranu jedinku malog potkovastog šišmiša. Godinu dana kasnije, dana 29. juna, 2024. godine, prilikom ponovnog istraživanja smo zapazili koloniju od ukupno 11 jedinki od čega su najmanje četiri jedinke bile ženke sa mladima. U Pećini pod Mušenicom, selo Turovi, Trnovo, šest jedinki *Rhinolophus hipposideros* pronađeno je 2023. godine, pri tom je jedna ženka imala mladog, a 31. jula 2024. godine, broj šišmiša je porastao na osam jedinki. U staroj centrali u Stocu, 15. jula 2024. godine, zabilježeno je 16 šišmiša, od kojih su šest bile ženke s mladima. Na lokaciji devastiranog objekta na Stojčevcu, 31. jula 2024. godine, pronađena je kolonija od 26 šišmiša, s brojnim mladima, ali zbog uvjeta u objektu nije bilo moguće tačno odrediti broj mladih jedinki. Sprovedena istraživanja dala su uvid ne samo u reproduktivnu aktivnost malog potkovastog šišmiša, već i u nesitraženost i potencijal napuštenih objekata kao skloništa šišmiša u toku reproduktivne faze.

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The bat surveys conducted at several locations between July 2023 and July 2024 highlighted significance of gatherings and reproductive activity of lesser horseshoe bats (*Rhinolophus hipposideros*). The first survey of the unfinished Markanović family weekend house in Maglaj took place on July 9, 2023, during which eight individuals of lesser horseshoe bats were recorded, six of which were females with young. At the same location on June 28, 2024, this number increased by one individual, resulting in a total of nine adult bats, with six females again carrying young, indicating the continuous presence and reproduction of this species at the site. We also visited a house in the village of Dištica, near Maoča, twice. The first visit was on August 27, 2023, where we found only a mummified individual of *Rhinolophus hipposideros* in the auxiliary room of the house, along with guano. A year later, on June 29, 2024, during a follow-up survey, we observed a colony of 11 individuals, at least four of which were females with young. In the Pećina pod Mušenicom cave, in the village of Turovi, Trnovo, six individuals of *Rhinolophus hipposideros* were found in 2023, with one female carrying young. On July 31, 2024, the number of bats increased to eight individuals. At the old power plant in Stolac, on July 15, 2024, 16 bats were recorded, six of which were females with young. At the site of a ruined building in Stojčevac, on July 31, 2024, a colony of 26 bats with numerous young was found, but due to the conditions in the building, it was not possible to accurately determine the number of young individuals. The conducted surveys provided insights not only into the reproductive activity of the lesser horseshoe bat but also into the under-explored potential of abandoned structures as bat roosts during the reproductive phase.

Bunkeri i šišmiši u Bosni i Hercegovini
Bunkers and Bats in Bosnia and Herzegovina

Ines Ćutuk[1], Jasminko Mulaomerović[1], Rejna Kolašinac[2], Mirza Kalabić[3]

Napušteni bunkeri, pored napuštenih željezničkih pruga uskog kolosijeka, su nas počeli zanimati zbog mogućnosti da jednog od njih prilagodimo za sigurno stanište šišmiša. Radi se o velikom bunkeru koji ima prizemlje i sprat, a nalazi se na ušću rijeke Lašve u Bosnu. Tu se Bosna široko razljeva, a okolne stijene koje pripadaju tzv. „lašvanskoj seriji" ne sadrže ni najmanju pukotinu. Doduše nedaleko od bunkera je zgrada željezničke stanice koja je u jadnom stanju, ali odlična za sklanjanje šišmiša. Ideja je bila da bunkerima koji asociraju na 2. svjetski rat damo sada potpuno drugu funkciju. Obraćanje Željeznicama Federacije BiH sa molbom da nam ustupe ovaj bunker nije uspjelo, jer su tražili na plaćamo najam 1,5 KM po m^2 na mjesec i da usput očistimo bunker koji služi kao WC ribarima i prolaznicima, a također i kao skladište smeća i uginulih životinja. Kako se sve vraća i plaća, tako će sad umjesto sitnog harača koji su ekonomisti iz ŽFBiH mislili namaknuti od CKS, svaki dan gubiti oko 250.000 KM budućih pola godine koliko će im trebati da poprave prugu prema Pločama.

Drugi susret sa bunkerima desio nam se tokom obilaska tunela na napuštenoj pruzi od Sarajeva prema Ustiprači (Višegradu). Kako je improvizirani prelaz preko rijeke Prače nedaleko od Hrenovice razvalila voda, a lokalna zajednica čeka da neko sa neba popravi prelaz, tu smo se malo zabavili pregledom malog bunkera koji je nekada u 2. svjetskom ratu štitio most. Tu smo pronašli jednog malog potkovastog šišmiša (*Rhinolophus hipposideros*), a u drugom bunkeru bliže naselju Hrenovica istu tu vrstu i jednog velikog potkovastog šišmiša (*R. ferrumequinum*). Ovi nalazi ukazuju da bi bilo korisno pregledati i ostale bunkere (onaj veliki kod ušća Drežnice i brojne na trasi stare pruge uz rijeku Bosnu.

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Abandoned bunkers, along with the abandoned narrow-gauge railway tracks, began to interest us due to the possibility of adapting one of them as a safe habitat for bats. The bunker in question is large, with a ground floor and an upper floor, located at the confluence of the Lašva River with the Bosna River. Here, the Bosna River spreads widely, and the surrounding rocks, which belong to the so-called "Lašva series," do not contain even the smallest crack. However, not far from the bunker, there is a railway station building in poor condition but excellent for sheltering bats. The idea was to give bunkers, which evoke memories of World War II, a completely different function now. Our attempt to approach the Railways of the Federation of Bosnia and Herzegovina (ŽFBiH) with a request to lease this bunker was unsuccessful, as they asked us to pay a rent of 1.5 KM per square meter per month and, at the same time, clean the bunker, which is being used as a toilet by fishermen and passersby, as well as a storage space for trash and dead animals. As karma would have it, instead of the small profit the economists from ŽFBiH hoped to extract from CKS, they will now lose around 250,000 KM daily over the next six months while they work on repairing the railway to Ploče.

Our second encounter with bunkers occurred while inspecting tunnels along the abandoned railway from Sarajevo towards Ustiprača (Višegrad). Since the improvised crossing over the Prača River near Hrenovica was destroyed by water, and the local community is waiting for someone to miraculously repair it, we took the opportunity to inspect a small bunker that once protected the bridge during World War II. There, we found one lesser horseshoe bat (*Rhinolophus hipposideros*), and in another bunker closer to the settlement of Hrenovica, we found the same species and one greater horseshoe bat (*R. ferrumequinum*). These findings suggest that it would be worthwhile to inspect other bunkers, such as the large one at the mouth of the Drežnica River and the numerous others along the route of the old railway by the Bosna River.

Jesenja seoba *Nyctalus noctula* iz Sarajeva
Autumn Migration of *Nyctalus noctula* from Sarajevo

Jasminko Mulaomerović[1]

Na poticaj projekta „Countig Noctula“ koji se providi u okviru BatLife Europe, posmatrao sam dvije večeri seobu *Nyctalus noctula* iz zgrade u ulici Trg solidarnosti 3-7 u naselju Alipašino polje A faza. To je stanište od ranije poznato i kao hibernakulum, a i kao sklonište tokom ljetnih mjesci. Ova vrsta zaposjeda pukotine između spratova u svima fazama ovog naselja (A, B i C: oko 20.000 stanova). Dana 30. 8. 2024. godine je bila prva večer posmatranja od 19:30 do 20.00 sati i tad sam izbrojao 59 jedinki koje su direktno krenule ka sjeveru. Nakon toga, 5. 9. sam na istom mjestu u približno isto vrijeme izbrojao 11 jedinki. Još sam dva puta na istom mjestu vršio posmatranje, ali nisam primijetio da večernji šišmiši napuštaju stanište.

Sa balkona stana u ul. B. Zenuni 6 koji sa zgradom na Trgu solidarnosti pravi ugao i koji sa trećom zgradom uokviruje park, snimao sam 5. oktobra ultrazvučnim detektoprom i zabilježio vrste *N. noctula* i *Pipistrellus kuhlii* (na osnovu socijalnih signala). Očito da su mužjaci ostali, kao i svake godine.

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Prompted by the “Counting Noctula” project, carried out within BatLife Europe, I observed the migration of *Nyctalus noctula* over two evenings from a building at Trg Solidarnosti 3-7 in the Alipašino Polje A-phase neighborhood. This site has been known as both a hibernaculum and a shelter during the summer months. The species occupies cracks between floors in all phases of this neighborhood (A, B, and C: around 20,000 apartments). On the first evening of observation, August 30, 2024, from 7:30 PM to 8:00 PM, I counted 59 individuals heading directly north. On the next observation, on September 5, at approximately the same time and

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place, I counted 11 individuals. I observed two more times at the same location but did not notice any evening bats leaving the site.

From the balcony of an apartment at B. Zenuni 6, which forms a corner with the building at Trg Solidarnosti and, together with a third building, encloses a park, I recorded on October 5 using an ultrasonic detector and noted the presence of *N. noctula* and *Pipistrellus kuhlii* (based on social calls). Clearly, the males remained, as they do every year.

Istraživanje šišmiša na području Kuči (Crna Gora)
Research on bats in the area of Kuči (Montenegro)

Vojo Milanović[1], Besim Gurda[2], Jasminko Mulaomerović[1]

Od 7. do 10. oktobra ove godine istraživali smo šišmiše na području Kuči za potrebe buduće mreže Natura 2000 u Crnoj Gori. Područje se proteže od Podgorice do granice sa Albanijom, na sjeveru do Komova, a na jugu do rijeke Cijevna. Napravili smo četiri auto transekta kojim smo pokrili dobar dio područja. Na Bezjovskoj lokvi i lokvi u Koritima smo snimali na stacionarne detektore, a posjetili smo i veći broj pećina. Zabilježili smo vrste *Rhinolophus hiposideros, R. ferrumequinum, Nyctalus noctula, Pipistrellus popistrellus, P. pygmaeus, P. kuhlii, Hypsugo savii, Vespertilio murinus, Miniopterus schreibersii, Barbastella barbastellus, Tadarida teniotis* i rod *Myotis*. Izuzev istraživanja koje smo prije nekoliko godina napravili oko Bukumirskog jezera, do sada nije bilo istraživanja na ovom području Crne Gore.

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From October 7 to 10 this year, we conducted bat research in the Kuči region as part of preparations for the future Natura 2000 network in Montenegro. The area extends from Podgorica to the Albanian border, reaching the Komova area in the north and the Cijevna River in the south. We carried out four car transects, covering a large portion of the region. Stationary detectors were set up at the Bezjovska waterhole and the waterhole in Korita, and we also visited several caves. We recorded the following species: *Rhinolophus hipposideros*, *R. ferrumequinum*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, *Vespertilio murinus*, *Miniopterus schreibersii*, *Barbastella barbastellus*, *Tadarida teniotis*, and the *Myotis* genus. Except for a study we conducted around Bukumir Lake a few years ago, there has been no prior bat research in this area of Montenegro.

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Istraživanje šišmiša na području Bijelog Polja (Crna Gora)

Research on bats in the area of Bijelo Polje (Montenegro)

Vojo Milanović[1], Besim Gurda[2], Jasminko Mulaomerović[1]

U septembru 2023. godine istraživali smo šišmiše na području oko Bijelog Polja za potrebe buduće mreže Natura 2000 u Crnoj Gori. Ovo područje smo izabrali zato što prema dosadašnjim istraživanjima postoji samo podatak o šišmišima iz Đalovića pećine. Mi smo istraživali južno od rijeke Bistrice u području Osmanbegovog Sela (istočno od Bijelog polja do granice sa Srbijom) i zapadno od Biljeg Polja prema selima na području Dobrinje. Napravili smo nekoliko auto transekata, istraživali napuštene zgrade i pećine te snimali stacionarnim detektorima na ušću Bistrice u Lim i u kanjonu rijeke Bistrice. Zabilježili smo vrste *Rhinolophus hiposideros*, *R. ferrumequinum, Nyctalus nosctula, Miniopterus schreibersii, Barbastella barbastellus*, rod *Myotis* je zvučnu grupu *P.kuhlii/nathusi*.

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In September 2023, we conducted bat research in the area around Bijelo Polje as part of preparations for the future Natura 2000 network in Montenegro. We chose this area because, according to previous research, the only known data about bats comes from the Đalovića Cave. Our research focused on the area south of the Bistrica River, around Osmanbegovo Selo (east of Bijelo Polje to the border with Serbia), and west of Bijelo Polje towards the villages in the Dobrinja area. We carried out several car transects, explored abandoned buildings and caves, and used stationary detectors to record at the confluence of the Bistrica and Lim rivers, as well as in the Bistrica River canyon. We documented the following species: *Rhinolophus hipposideros*, *R. ferrumequinum*, *Miniopterus schreibersii*, *Barbastella barbastellus*, the *Myotis* genus, and acoustic group *P. kuhlii/nathusii*.

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Istraživanje šišmiša na području Banjana i Oputnih rudina (Crna Gora)

Research on bats in the area of Banjani and Oputne rudine (Montenegro)

Vojo Milanović[1], Besim Gurda[2], Jasminko Mulaomerović[1]

U julu 2023. godine istraživali smo šišmiše na području Banjana i Oputnih rudina (tereni uz granicu sa Bosnom i Hercegovinom (Bileća-Gacko) za potrebe buduće mreže Natura 2000 u Crnoj Gori. Ovo područje smo izabrali zato što prema dosadašnjim istraživanjima ne postoje podaci o šišmišima za ovo područje. Bili smo obavezni istraživati prema UTM kvadratima, tako da je najbliži podatak o šišmišima bio iz pećine Muškovije. Mi smo istraživali na širem području oko sela Vraćenovići, Somina, Velimlje, Crkvice i Dubočka. Napravili smo nekoliko auto transekata, istraživali napuštene zgrade, pećine i napušteni podzemni rudnik boksita. Zabilježili smo vrste *Rhinolophus hiposideros, R. ferrumequinum, Pipistrellus pipistrellus, P. pygmaeus, Hypsugo savii, Miniopterus schreibersii, Barbastella barbastellus*, *Tadarida teniotis*, rod *Myotis* te zvučne grupe *P.kuhlii/nathusi* i *Eptesicus/Vespertilio/Nyctalus*. U nekoliko napuštenih zgrada našli smo male porodiljske kolonije *R. hipposideros*.

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In July 2023, we conducted bat research in the areas of Banjani and Oputne Rudine (near the border with Bosnia and Herzegovina, between Bileća and Gacko) as part of the preparations for the future Natura 2000 network in Montenegro. We chose this area because, according to previous studies, no data on bats existed for this region. We were required to conduct research based on UTM grid squares, and the closest available bat data was from the Muškovije Cave. Our research focused on a broader area around the villages of Vraćenovići, Somina, Velimlje, Crkvice, and Dubočka. We carried out several car transects, explored abandoned buildings, caves, and an abandoned underground bauxite mine. The species we recorded

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included *Rhinolophus hipposideros*, *R. ferrumequinum*, *Pipistrellus pipistrellus, P. pygmaeus, Hypsugo savii, Miniopterus schreibersii*, *Barbastella barbastellus*, *Tadarida teniotis*, the *Myotis* genus, and acoustic groups *P. kuhlii/nathusii* and *Eptesicus/Vespertilio/Nyctalus*. In several abandoned buildings, we found small maternity colonies of *R. hipposideros*.

Šišmiši Bjelašnice
Bats of Bjelašnica Mountain

Jasminko Mulaomerović[1], Amina Agić[1], Mirza Kalabić[2], Rejna Kolašinac[3]

U Bosni i Hercegovini postoji vrlo malo podataka o šišmišima sa visokih planina, a to se odnosi na planine Prenj (Jezerce, 1.600 m n. v.), Klekovača (1.500 m n. v.), Bjelašnica (1.587 m n. v.) i Vlašić (1.770-1.933 m n. v.). Kako bi se dopunili postojeći podaci, započeli smo sistematske posjete visokim planinama, a za prvo istraživanje odabrana je Bjelašnica. Istraživanje sprovedeno 2. augusta 2024. godine obuhvatilo je pretragu devastiranih objekata na Opservatoriji (2.067 m n. v.) i Vlahinji (2.025 m n. v.), te auto transekt od vojnog objekta na Vlahinji do Babinog Dola, uz pomoć ultrazvučnog detektora. Pregledom devastirane zgrade i prizemlja TV centra na Opservatoriji nisu zabilježeni šišmiši, osim rijetkog guana manje vrste u devastiranoj zgradi. U razrušenom vojnom objektu na Vlahinji također nije bilo tragova šišmiša. Pregledom snimaka auto transekta zabilježeno je prisustvo vrsta poput *Pipistrellus pipistrellus, Hypsugo savii, Tadarida teniotis*, te roda *Myotis*, kao i zvučnih grupa *Pipistrellus kuhlii/nathusii* i *Eptesicus/Vespertilio/Nyctalus*. Od ranije je sa ovih terena Igmana i Bjelašnice poznata vrsta *Vespertilio murinus*.

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There is very little data on bats from high mountains in Bosnia and Herzegovina, specifically from the mountains Prenj (Jezerce, 1,600 m a. s. l.), Klekovača (1,500 m a. s. l.), Bjelašnica (1,587 m a. s. l.), and Vlašić (1,770-1,933 m a. s. l.). To supplement the existing data, we started systematic visits to high mountains, and Bjelašnica was chosen for the first survey. The research, conducted on August 2, 2024, involved examining derelict buildings at the Observatory (2,067 m a. s. l.) and Vlahinja (2.025 m n. v.), and the auto transect from the military facility at Vlahinja to Babin Dol using an ultrasonic detector. During the inspection of the

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derelict building and the ground floor of the TV center at the Observatory, no bats were recorded, except for rare guano from a small species in the derelict building. The ruined military facility at Vlahinja also showed no signs of bats. However, analysis of the car transect recordings revealed the presence of species such as *Pipistrellus pipistrellus*, *Hypsugo savii*, *Tadarida teniotis*, and the genus *Myotis*, along with acoustic groups *Pipistrellus kuhlii/nathusii* and *Eptesicus/Vespertilio/Nyctalus*. The species *Vespertilio murinus* has been known from these terrains of Igman and Bjelašnica mountains since earlier.

Prilog poznavanju šišmiša Srbije i Sjeverne Makedonije

A contribution to the knowledge of bats in Serbia and North Macedonia

Jasminko Mulaomerović[1]

Ekskurziju u Srbiju i Sjevernu Makedoniju koju je organizovao SNIK „Atom" iz Zavidovića iskoristio sam da snimam ultrazvučnim detektorom gdje god to bude moguće. Putovanje je počelo 15. 8. 2024. i prvu noć smo prema planu konačili u Dobrunu. Iskoristili smo priliku da obiđemo dva željeznička tunela u kojima je bilo šišmiša, u onom broj 58 dva šišmiša vrste *Myotis myotis/blythii*, a u tunelu broj 54 velika porodiljska kolonija, vjerovatno mješovita *M.myotis/blythii*, koja je procijenjena na oko 600 životinja, od čega je oko 200 bilo mladih. Jedan šišmiš je određen kao *M. blythii* na osnovu bijele tačke. U Arilju (16. 8.) sam napravio mali transekt po gradu i zabilježio tri vrste: *Nyctalus noctula, Pipistrellus pygmaeus* i zvučnu grupu *P. kuhlii/nathusi*. Sljedeću noć (16. 8.) snimao sam u Vranju na jugu Srbije. Zabilježio sam vrste *Nyctalus noctula, Pipistrellus pipistrellus, P. pygmaeus, P. kuhlii, Hypsugo savii, Miniopterus schreibersi,* rod Myotis i zvučne grupe *P. kuhlii/nathusi i Eptesicus/Vespertilio/Nyctalus.*

U Sjevernoj Makedoniji putovanje smo počeli u istočnom dijelu zemlje. U Lesnovu, gdje se nalazi veliki broj umjetnih pećina nastalih vađenjem kamena za mlinska kola, u jednoj maloj pećini koja služi kao crkva vidio sam jednog malog potkovastog šišmiša (*Rhinolophus hipposideros*), a u gradu Vinici gdje smo noćili (18. 8.) zabilježio sam vrste *Nyctalus noctula, P. kuhlii,* rod *Myotis* i zvučne grupe *P. kuhlii/nathusi i Eptesicus/Vespertilio/Nyctalus.* U kanjonu rijeke Matka posjetio sam pećinu Vrelo u kojoj sam vidio veliku količinu guana (nekoliko m^3), ali ne i šišmiše. Pećina je inače uređena za posjetu turista. U kampu „Matka" (19. 8.) zabilježio sam vrste *Nyctalus noctula, P. pipistrellus, P. pygmaeus, Hypsugo savii, Miniopterus schreibersi,* rod *Myotis* i zvučne grupe *P. kuhlii/nathusi i Eptesicus/Vespertilio/Nyctalus.* U Mavrovu smo niočili dvije noći (20. i 21. 8.). Duž „glavne" ulice zabilježio sam vrste *Nyctalus noctula, P. pipistrellus, P. pygmaeus,* rod *Myotis* i zvučnu grupu *P.*

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kuhlii/nathusi. Ispred ulaza u pećinu Šarkova dupka (uređena za turizam) snimao sam ispred vrata i zabilježio vrste *Rhinolophus hipposideros, Nyctalus noctula, P. pipistrellus,* rod *Myotis* i zvučnu grupu *P. kuhlii/nathusi.* 22. 8. sam snimao u Strugi i zabilježio vrstu *Nyctalus noctula*, rod *Myotis* i zvučnu grupu *P. kuhlii/nathusi*. U okolici Srtuge nedaleko od pećine Alilica u jednoj maloj pećini našao jednog malog potkovastog šišmiša (*R. hipposideros*). Zadnju noć smo ponovo noćili u južnoj Srbiji u selo Prekodolce (opština Vladičin Han). Tu sam zabilježio vrste *N. noctula, P. pipistrellus, P. pygmaeus, P. kuhlii, Hypsugo savii* i zvučnu grupu *P. kuhlii/nathusi.* Prema dostupnoj literaturi u gradovima gdje smo noćili do sada nije bilo istraživanja šišmiša.

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I took advantage of the excursion to Serbia and North Macedonia organized by SNIK "Atom" from Zavidovići to record with an ultrasonic detector wherever possible. The journey began on August 15, 2024, and the first night, as planned, we stayed in Dobrun. We took the opportunity to visit two railway tunnels where bats were present. In tunnel number 58, we found two bats of the species *Myotis myotis/blythii*, and in tunnel number 54, a large maternity colony, likely a mixed group of *M. myotis/blythii*, was estimated at around 600 individuals, of which about 200 were young. One bat was identified as *M. blythii* based on a white spot. In Arilje (August 16), I conducted a small transect through the town and recorded three species: *Nyctalus noctula*, *Pipistrellus pygmaeus*, and the sound group *P. kuhlii/nathusii*. The next night (August 16), I recorded in Vranje, southern Serbia, identifying *Nyctalus noctula*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, *Miniopterus schreibersi*, the genus *Myotis*, and the sound groups *P. kuhlii/nathusii* and *Eptesicus/Vespertilio/Nyctalus*.

In North Macedonia, we began our trip in the eastern part of the country. In Lesnovo, where there are numerous artificial caves created by extracting stone for millstones, I saw a lesser horseshoe bat (*Rhinolophus hipposideros*) in a small cave that serves as a church. In the town of Vinica, where we spent the night (August 18), I recorded the species *Nyctalus noctula*, *P. kuhlii*, the genus *Myotis*, and the sound groups *P. kuhlii/nathusii* and *Eptesicus/Vespertilio/Nyctalus*. In the Matka River canyon, I visited the Vrelo Cave, where I observed a large amount of guano (several cubic meters) but did not see any bats. The cave is otherwise set up for tourist visits. At the "Matka" camp (August 19), I recorded the species *Nyctalus*

noctula, *P. pipistrellus*, *P. pygmaeus*, *Hypsugo savii*, *Miniopterus schreibersi*, the genus *Myotis*, and the sound groups *P. kuhlii/nathusii* and *Eptesicus/Vespertilio/Nyctalus*. In Mavrovo, we stayed for two nights (August 20 and 21). Along the "main" street, I recorded the species *Nyctalus noctula*, *P. pipistrellus*, *P. pygmaeus*, the genus *Myotis*, and the sound group *P. kuhlii/nathusii*. In front of the entrance to the Šarkova Dupka Cave (also set up for tourism), I recorded in front of the door and noted the species *Rhinolophus hipposideros*, *Nyctalus noctula*, *P. pipistrellus*, the genus *Myotis*, and the sound group *P. kuhlii/nathusii*. On August 22, I recorded in Struga and identified the species *Nyctalus noctula*, the genus *Myotis*, and the sound group *P. kuhlii/nathusii*. Near Struga, not far from the Alilica Cave, I found a lesser horseshoe bat (*R. hipposideros*) in a small cave. The last night, we stayed again in southern Serbia in the village of Prekodolce (Vladičin Han municipality). There, I recorded the species *N. noctula*, *P. pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, and the sound group *P. kuhlii/nathusii*. According to available literature, there has been no prior bat research in the towns where we stayed.

Istraživanje šišmiša na području Prokoškog i Pijavičkog jezera
Bat research in the area of Prokoško and Pijavičko Lake

Amina Agić[1], Jasminko Mulaomerović[1]

U sklopu istraživanja alpskog vodenjaka i prikupljanja podataka za analizu evulocijskih linija, posjećeno je više jezera u okolini planine Vranice među kojima je Prokoško jezero na planini Vranici (1636 m. n. v.) i Pijavičko jezero (764 m. n. v.) kao jedno od tri Ždrimačka jezera kojeg pored Pijavičkog čine i Pasje i Adžića jezero. Dok se Prokoško jezero nalazi na samoj planini Vranici, Ždrimačka jezera se nalaze u selu Ždrimci u podnožju planine Vranice. Oba istraživana jezera su ledničkog porijekla.

Istraživanje šišmiša na Prokoškom jezeru obavljeno je u noći sa 14. na 15. juli, 2023. godine, pri čemu su postavljena su dva stacionarna detektora, jedan odmah iznad samog jezera (det. 1) a drugi na prozor kuće 200 metara zračne udaljenosti od jezera (det. 2). Pregledom snimaka ustanovljeno je prisustvo različitih vrsta i to: *Rhinolophus hipposideros, Nyctalus noctula, Pipistrellus pipistrellus, Hypsugo savii, Vespertilio murinus, Miniopterus schreibersii, Barbastella barbastellus, Tadarida teniotis*, kao i vrste iz roda *Myotis* i zvučna grupa *Pipistrellus kuhlii/nathusii*. Od posebnog značaja je bilo bilježenje većeg broja preleta vrste *Vespertilio murinus*, što je ustanovljeno na osnovu socijalnih signala. Zastupljene su gotovo sve poznate (4) varijante socijalnih signala prema Middleton et al., 2022, ali i neki koji do sada nisu bili poznati. Brojnost ove vrste signala pokazuje da je Prokoško jezero *hot spot* za istraživanje socijalnih signala ove vrste.

Na Pijavičkom jezeru detektori su postavljeni u noći sa 16. na 17. mart, 2024. godine., a zabilježene su samo dvije vrste: *Tadarida teniotis* i *Pipistrellus pipistrellus*, potvrđujući prisustvo šišmiša i u ovom ekosistemu, iako u manjem broju vrsta nego na Prokoškom jezeru. Ovi rezultati predstavljaju prve nalaze šišmiša na ovim područjima, obzirom da se hiropterofuna prethodno na ovim mjestima nije

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proučavala, te je u budućnosti potrebno obaviti još detaljnija istraživanja i drugim metodama.

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As part of the research on the alpine newt and the collection of data for the analysis of evolutionary lineages, several lakes in the vicinity of Mount Vranica were visited, including Prokoško Lake on Mount Vranica (1636 m a.s.l.) and Pijavičko Lake (764 m a.s.l.), one of the three Ždrimačka Lakes, which, alongside Pijavičko, also includes Pasje and Adžića Lakes. While Prokoško Lake is located on Mount Vranica itself, the Ždrimačka Lakes are situated in the village of Ždrimci at the base of Mount Vranica. Both surveyed lakes are of glacial origin.

The bat survey at Prokoško Lake was conducted during the night of July 14-15, 2023, with two stationary detectors set up: one located directly above the lake (det. 1) and the other on the window of a house 200 meters away from the lake (det. 2). The analysis of the recordings revealed the presence of various species, including *Rhinolophus hipposideros*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *Hypsugo savii*, *Vespertilio murinus*, *Miniopterus schreibersii*, *Barbastella barbastellus*, *Tadarida teniotis*, as well as species from the genus *Myotis* and the sound group *Pipistrellus kuhlii/nathusii*. Of particular significance was the recording of numerous passes of the species *Vespertilio murinus*, identified through social signals. Almost all known (4) variations of social signals according to Middleton et al., 2022, were represented, along with some previously undocumented signals. The abundance of these signal types suggests that Prokoško Lake is a *hot spot* for studying the social signals of this species.

At Pijavičko Lake, the detectors were set up during the night of March 16-17, 2024, where only two species were recorded: *Tadarida teniotis* and *Pipistrellus pipistrellus*, confirming the presence of bats in this ecosystem, although with fewer species than at Prokoško Lake. These findings represent the first records of bats in these areas, as the chiropteran fauna had not been previously studied here. Future research with more detailed methods is needed to further explore these locations.

Refrerence

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Rezultati istraživanja hiropterološke sekcije tokom naučno - istraživačkog kampa "Blagaj 2024" (Bosna I Hercegovina)

Research results of the chiropterological section during the scientific research camp "Blagaj 2024" (Bosnia and Herzegovina)

Lena Đurić[1], Jovan Kokotović[1], Vojo Milanović[2]

U periodu od 25.4.2024 do 29.4.2024. godine organizovan je naučno – istrazivački kamp "Blagaj 2024". U toku kampa istraženo je 13 lokaliteta, oblast uz reku Bunicu, uključujući i 3 pećine. Istraživanje je obavljeno postavljanjem vertikalnih nevidljivih mreža (mist-netting) na 3 lokaliteta, kao i metodom snimanja ultrazvučnih signala pomoću stacionarnih detektora (na 8 lokaliteta) i snimanjem pomoću mobilnog detektora. Zabeleženo je minimum 12 različitih vrsta šišmiša: *Rhinolophus euryale*, *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Miniopterus schreibersii*, *Nyctalus noctule*, *Pipistrellus kuhlii*, *Pipistrellus pygmeus*, *Hypsugo savii*, *Myotis nattereri*, *Myotis emarginatus*, *Myotis mystacinus* i fonetske grupe: *Pipistrellus kuhlii* / *Pipistrellus nathusii* i *Pipistrellus pygmeus* / *Miniopterus schreibersii*. Od izuzetne važnosti su pronalasci potencijalnih porodiljskih kolonija *Rhiolophus euryale* i *Myotis emarginatus* (radi potvrde neophodno je istražiti područje u drugom periodu). Takođe bitan pronalazak su 4 gravidne ženke *Miniopterus schreibersii*, što ukazuje na potencijalnu prisutnost porodiljske kolonije u bližem okrugu. Zaključeno je da je potrebno ponovno istražiti područje u drugim periodima godine, radi dobijanja detaljnijeg stanja faune šišmiša.

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The scientific research camp "Blagaj 2024" was held between April 25 and April 29, 2024. During the camp, 13 different locations were explored, the area along the Bunica river, including three caves. The research was conducted by placing

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vertical invisible nets (mist-netting) in three locations, as well as recording ultrasonic signals using stationary detectors (at eight locations) and a mobile detector. A minimum of 12 different bat species were recorded: *Rhinolophus euryale, Rhinolophus ferrumequinum, Rhinolophus hipposideros, Miniopterus schreibersii, Nyctalus noctule, Pipistrellus kuhlii, Pipistrellus pygmeus, Hypsugo savii, Myotis nattereri, Myotis emarginatus, Myotis mystacinus* and phonetic groups: *Pipistrellus kuhlii / Pipistrellus nathusii* and *Pipistrellus pygmeus / Miniopterus schreibersii*. Of exceptional importance are the discoveries of potential maternity colonies of *Rhiolophus euryale* and *Myotis emarginatus* (for confirmation, it is necessary to investigate the area in another period). In addition, four gravid *Miniopterus schreibersii* females were discovered, indicating the possibility of a maternity colony in the surrounding area. It was determined that re-investigation of the area at different times of year is required to gain a more complete state of the bat fauna.

Rezultati hiropterološke sekcije tokom naučno-istraživačkog kampa „Komarnica 2024“ (Crna Gora)

Results of the Chiropterology Group during the Scientific Research Camp “Komarnica 2024” (Montenegro)

Ines Ćutuk[1], Vojo Milanović[1], Mia Dejanović[1,2], Jelena Lukić[1], Amina Agić[1], Jasminko Mulaomerović[1]

The research conducted by the chiropterology group during the scientific research camp “Komarnica 2024,” from June 5 to June 9, 2024, was focused on identifying potential bat roosts and examining the species inhabiting the Komarnica canyon and surrounding areas. Three methods were used: mist-netting, inspection of potential roosts, and recording auto transects with ultrasonic detectors. Vertical nets were set up for three nights, resulting in the capture of 10 bats from 5 different bat species: *Rhinolophus ferrumequinum, R. hipposideros, Plecotus auritus, Pipistrellus pipistrellus,* and *Myotis mystacinus*. While investigating potential roosts, *Rhinolophus hipposideros* has been found in the Šlepica Cave, and traces of bat presence (guano, bones) were found at 5 additional locations. Recording auto transects with ultrasonic detectors, during four nights, documented the following species: *Pipistrellus pipistrellus, P. pygmaeus, Pipistrellus kuhlii / P. nathusii, Hypsugo savii, Nyctalus noctule, Barbastella barbastellus, Plecotus auritus, Myotis daubentonii, Myotis sp., Tadarida teniotis, Eptesicus serotinus / Vespertilio murinus / Nyctalus leisleri*. In total, at least 13 bat species have been found during the study, indicating a good level of ecosystem conservation. To fully understand the chiropterofauna of this area, research needs to be conducted during different seasons and continued over a longer period.

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Istraživanje hiropterološke sekcije tokom naučno-istraživačkog kampa „Komarnica 2024“, u periodu od 5. 6. do 9. 6. 2024. godine, zasnivalo se na pronalasku potencijalnih skloništa šišmiša, te pregled vrsta koje obitavaju u kanjonu Komarnice i okolnom području. Korištene su tri metode: mist-netting (hvatanje vertikalnim mrežama), inspekcija potencijalnih skloništa i snimanje auto transekata ultrazvučnim detektorom. Vertikalne mreže su postavljane tri noći te je uhvaćeno 10 jedinki od 5 različitih vrsta šišmiša: *Rhinolophus ferrumequimun, R. hipposideros, Plecotus auritus, Pipistrellus pipistrellus i Myotis mystacinus*. Inspekcijom potencijalnih skloništa zabilježen je *Rhinolophus hipposideros* u Kaverni Šlepica, te su tragovi prisutnosti šišmiša (guano, kosti) pronađeni na još 5 lokaliteta. Snimanjem auto transekata ultrazvučnim detektorom, tokom četiri noći, zabilježene su sljedeće vrste: *Pipistrellus pipistrellus, P. pygmaeus, Pipistrellus kuhlii / P. nathusii, Hypsugo savii, Nyctalus noctule, Basbastella barbastellus, Plecotus auritus, Myotis daubentonii, Myotis sp., Tadarida teniotis, Eptesicus serotinus / Vespertilio murinus / Nyctalus leisleri*. Ukupno tokom istraživanja zabilježeno je prisustvo od minimum 13 vrsta šišmiša, što ukazuje na dobar nivo očuvanosti ekosistema. Za potpuno razumijevanje hiropterofaune ovog područja, istraživanje je neophodno sprovesti u različitim periodima godine i nastaviti ga tokom dužeg vremenskog perioda.

Šišmiši u napuštenim tunelima šumske pruge u olovskom kraju

Bats in abandoned tunnels of the forest railway in the Olovo region

Jasminko Mulaomerović[1], Mirnes Hasanspahić[1]

Provodeći aktivnosti na projektu ''Šišmiš u napuštenim željeznièkim tunelima" u Bosni i Hercegovini" za koji smo finansijsku potporu dobili od Vlade Luksemburga obišli smo dva tunela u okolici Olova.

Od ranije smo imali saznanja o jednom tunelu na lokaciji Dobrun, tunel je na kraku šumske pruge koja se je odvajala od pruge Zavidovići - Han-Pijesak - Kusače, i trasirana je uz rječicu Jablanicu (lijeva pritoka Stupčanice), i dolazila do pod brdo Palež. Služila je za eksploataciju šumske građe. Nakon što je pruga prestala da služi, ostao je šumski put koji se ne koristi intezivno. Danas je to lijepa ruta za brdske bicikliste. Dužina tunela je oko 50 metara, sa blagom krivinom, pa svjetlost slabije prodire. Zabilježili smo jednog malog potkovastog šišmiša (*Rhinolophus hipposideros*).

Na lokaciji Dobrun nalaze se dva kemenoloma kamena krečnjaka pogodnog za zidanje i popločavanje. Kamenolomi se i danas eksploatišu. U jednom od kamenoloma primjetili smo još jedan tunel za koji nismo znali. Ulaz i izlaz tunela su u samom kemenolomu, sa jedne strane je ulazak moguć, ali sa druge je otvor većim dijelom zatrpan. U tunelu smo našli 5 malih potkovastih šišmiša (*R. hipposideros*). Nije nam poznata namjena ovog tunela. Ucrtan je u topografskoj karti, ali nejasno. Znamo da je jedan krak pruge vodio prema naselju Kolakovići, tu je bilo odvajanje ta dva kraka šumske pruge. Moguće je da je drugi krak pruge ostao nezavršen, a da je tunel eskploatacijom kamena narušen.

Treća lokacija koju smo pregledali nije tunel, već mala pećina, poznata kao Pećina u Bijelom kršu. Otvorena je prilikom izgradnje pruge Olovo – Zavidovići i nalazi se uz samu cestu. Pored nje smo do sada prolazili na desetine puta i nikad je nismo pregledali. Tako bi bilo i ovog puta da iz automobila nismo vidjeli jednog malog

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potkovastog šišmiša. Detaljniji pregled pokazao je da je ova mala pećina skloništе za 4 mala potkovasta šišmiša (*R. hipposideros*).

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While conducting activities for the project "Bats in Abandoned Railway Tunnels" in Bosnia and Herzegovina, which we received financial support for from the Government of Luxembourg, we visited two tunnels in the vicinity of Olovo.

We had prior knowledge of one tunnel located in Dobrun, situated along a branch of the forest railway that split off from the Zavidovići-Han Pijesak-Kusače railway. The railway followed the Jablanica stream (a left tributary of the Stupčanica River) and led to the foot of Palež Hill. It was used for the exploitation of forest timber. After the railway was decommissioned, a forest road remained, which is not intensively used today. It is now a beautiful route for mountain bikers. The tunnel is about 50 meters long, with a slight curve, so light penetrates poorly. We recorded one lesser horseshoe bat (*Rhinolophus hipposideros*).

At the Dobrun location, there are two limestone quarries, which provide stone suitable for building and paving. These quarries are still being exploited today. In one of the quarries, we discovered another tunnel we were not aware of. The entrance and exit of the tunnel are located within the quarry itself. The entrance is accessible from one side, but the exit is mostly buried. Inside the tunnel, we found five lesser horseshoe bats (*R. hipposideros*). The purpose of this tunnel is unknown to us. It is marked on the topographic map, but unclearly. We know that one branch of the railway led towards the Kolakovići settlement, where the two branches of the forest railway split. It is possible that the second branch of the railway was left unfinished and that the tunnel was damaged by stone quarrying.

The third location we inspected was not a tunnel but a small cave known as the "Cave in White Karst". It was opened during the construction of the Olovo-Zavidovići railway and is located right next to the road. We have passed by it dozens of times but never inspected it. That would have been the case this time as well, had we not spotted a lesser horseshoe bat from the car. A more detailed inspection showed that this small cave serves as a shelter for four lesser horseshoe bats (*R. hipposideros*).

Praćenje stanja porodiljskih kolonija malog potkovastog šišmiša (*Rhinolophus hipposideros*) u NP Sutjeska (Bosna i Hercegovina): Rezultati istraživanja iz 2024. godine

Monitoring of the maternity colonies of the lesser horseshoe bat (*Rhinolophus hipposideros*) in Sutjeska National Park (Bosnia and Herzegovina): Results of research from 2024

Vojo Milanović[1], Amina Agić[1]

Nastavak istraživanja i prćenja stanja šišmiša u Nacionalnom parku Sutjeska nastavio se i 2024. godine. Kao i prethodne godine i ove su pregledana 3 značajna objeka u kojem se nalaze porodiljske kolonije malog potkovastog šišmiša (*Rhinolophus* hipposideros): muzej, hotel Mladost“ i napušteni hotel „Sutjeska“, Prema najnovijim istraživanjima provedenim 20. jula u muzeju zabilježeno je prisustvo 87 adultnih jedinki malog potkovastog i 37 juvenilnih jedinki. U kotlovnici hotela “Mladost” zabilježeno je 6 adultnih jedinki i 1 juvenilna. Iako ove godine nije bio omogućen pristup potkrovlju napuštenog hotela, šišmiši su bili prisutni na svim spratovima, sa zabilježenih 69 adultnih i 37 juvenilnih jedinki. Ukupno je tako zabilježeno 162 adultne jedinke šišmiša, uz napomenu da bi brojka vjerovatno bila veća da je bilo moguće pregledati potkrovlje napuštenog hotela.

Ovi podaci ukazuju na određene promjene u raspodjeli i brojnosti kolonija šišmiša u odnosu na prethodnu godinu, kada je istraživanje provedeno 15. i 16. jula 2023. godine. Tada su pronađene značajne porodiljske kolonije šišmiša u muzeju (63 adultne jedinke), kotlovnici hotela “Mladost” (35 adultnih jedinki), i potkrovlju napuštenog hotela (minimalno 85 adultnih jedinki), što je ukupno činilo 183 adultne jedinke šišmiša na području Tjentišta (Milanović i sar., 2023).

Područje istraživanja, smješteno unutar Nacionalnog parka Sutjeska, predstavlja jedno od najvećih pronalazaka porodiljskih kolonija malog potkovastog šišmiša, što

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naglašava važnost ovog lokaliteta za očuvanje populacija ove zaštićene vrste. Kontinuirani monitoring šišmiša na ovom području od ključne je važnosti kako bi se pratilo stanje njihovih staništa i populacija te osigurala njihova dugoročna zaštita.

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The continuation of research and monitoring of the condition of bats in Sutjeska National Park continued in 2024. As in the previous year, 3 significant objects where maternity colonies of the lesser horseshoe bat (*Rhinolophus hipposideros*) are located were inspected: the museum, the Mladost hotel and the abandoned Sutjeska hotel. According to the latest research conducted on July 20, the museum recorded the presence of 87 adult individuals of the lesser horseshoe bat and 37 juvenile individuals. In the boiler room of the "Mladost" hotel, 6 adults and 1 juvenile were recorded. Although access to the attic of the abandoned hotel was not possible this year, bats were present on all floors, with 69 adult and 37 juvenile individuals recorded. A total of 162 adult bats were thus recorded, with a note that the figure would probably be higher if it was possible to inspect the attic of the abandoned hotel.

These data indicate certain changes in the distribution and abundance of bat colonies compared to the previous year, when the research was conducted on July 15 and 16, 2023. Significant maternity colonies of bats were then found in the museum (63 adult individuals), the boiler room of the "Mladost" hotel (35 adult individuals), and the attic of the abandoned hotel (minimum 85 adult individuals), which made a total of 183 adult bat individuals in the area of Tjentište (Milanović et al., 2023).

The research area, located within the Sutjeska National Park, represents one of the largest finds of maternity colonies of the lesser horseshoe bat, which emphasizes the importance of this locality for the preservation of populations of this protected species. Continuous monitoring of bats in this area is of key importance in order to monitor the state of their habitats and populations and ensure their long-term protection.

Reference

Milanović, V., Mulaomerović, J., & Gurda, B. (2023). Šišmiši Tjentišta i okolice, Skup speleologa Bosne i Hercegovine (pp. 19–19). Zavidovići – Maoča; Centar za krš i speologiju.

Rezultati prvih istraživanja šišmiša na planini Volujak (Bosna i Hercegovina)

Results of the first research on bats on Volujak Mountain (Bosnia and Herzegovina)

Vojo Milanović[1], Besim Gurda[2, 3], Jasminko Mulaomerović[1]

Planina Volujak, smještena na jugoistoku Bosne i Hercegovine, sa svojim vrhovima koji prelaze 2000 m nadmorske visine, predstavlja značajno područje za proučavanje faune šišmiša. Istraživanje je sprovedeno u periodu od 17. do 19. jula 2023. godine, a obuhvatilo je područje na nadmorskoj visini između 1300 i 1500 m. U okviru lokaliteta Čemerno, izvršena je detaljna inspekcija napuštenog motela, gdje su pronađene dvije jedinke velikog potkovastog šišmiša (*Rhinolophus ferrumequinum*) i jedna jedinka malog potkovastog šišmiša (*Rhinolophus hipposideros*).

Metoda hvatanja šišmiša pomoću vertikalnih mreža (mist-netting) primjenjivana je tokom dvije noći na dvije lokacije: na izvoru rijeke Sutjeske i u dvorištu planinarskog doma Volujak. Na izvoru rijeke Sutjeske zabilježene su tri vrste šišmiša: Natererov šišmiš (*Myotis nattereri*), Brandtov šišmiš (*M. brandtii*) i Savijev šišmiš (*Hypsugo savii*). U dvorištu planinarskog doma, uz rub šume, ovom metodom su registrovane dvije vrste: smeđi dugouhi šišmiš (*Plecotus auritus*) i Brandtov šišmiš (*M. brandtii*).

Stacionarni detektor (AudioMoth) postavljen je uz rub šume u blizini planinarskog doma, gdje je zabilježio aktivnost šišmiša iz roda *Myotis*. Posebno zanimljivo zapažanje je da su sve uhvaćene jedinke tijekom ovog istraživanja bile mužjaci, što može ukazivati na specifičnosti sezonske distribucije šišmiša na ovom području.

Iako je istraživanje provedeno u relativno kratkom vremenskom periodu, ustanovljeno je da na ovom lokalitetu obitava najmanje šest vrsta šišmiša. Ovi podaci su od izuzetne važnosti za cjelokupan region Bosne i Hercegovine, budući da je dosadašnje znanje o šišmišima iz ovih planinskih područja i na ovim nadmorskim visinama vrlo ograničeno.

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Mount Volujak, located in the southeast of Bosnia and Herzegovina, with its peaks exceeding 2000 m above sea level, represents an important area for the study of bat fauna. The research was conducted in the period from July 17 to 19, 2023, and covered the area at an altitude between 1,300 and 1,500 m above sea level. Within the locality of Čemerno, a detailed inspection of an abandoned motel was carried out, where two individuals of the greater horseshoe bat were found (*Rhinolophus ferrumequinum*) and one individual of the lesser horseshoe bat (*Rhinolophus hipposideros*).

The method of catching bats using vertical nets (mist-netting) was applied during two nights at two locations: at the source of the river Sutjeska and in the yard of the Volujak mountain lodge. At the source of the river Sutjeska, three species of bats have been recorded: Naterer's bat (*Myotis nattereri*), Brandt's bat (*M. brandtii*) and Savi's bat (*Hypsugo savii*). In the yard of the mountain lodge, next to the edge of the forest, two species were registered using this method: the brown long-eared bat (*Plecotus auritus*) and Brandt's bat (*M. brandtii*).

A stationary detector (AudioMoth) was placed at the edge of the forest near the mountain lodge, where it recorded the activity of bats of the genus *Myotis*. A particularly interesting observation is that all individuals caught during this research were males, which may indicate the specifics of the seasonal distribution of bats in this area.

Although the research was conducted in a relatively short period of time, it was established that at least six species of bats live in this locality. These data are extremely important for the entire region of Bosnia and Herzegovina, since the current knowledge about bats from these mountain areas and at these altitudes is very limited.

Rezultati istraživanja šišmiša područja rijeke Rzav (Bosna i Hercegovina)

Results of research on bats in the area of the Rzav River (Bosnia and Herzegovina)

Vojo Milanović[1], Saudin Merdan[2], Besim Gurda[3], Dalila Berbić[1], Lejla Demirović[2], Mia Dejanović[2], Aleksandra Babić[2], Amina Agić[1], Jasminko Mulaomerović[1]

Rijeka Rzav, smještena u istočnom dijelu Bosne i Hercegovine, okružena je raznolikim tipovima staništa i ekosistema, što ovu regiju čini važnim područjem za proučavanje faune šišmiša. Istraživanje je sprovedeno od 31. maja do 5. juna 2024. godine, tokom kojeg su provedene inspekcije različitih objekata – 5 željezničkih tunela, 1 iskopani tunel i 5 pećina.

U iskopnom tunelu je zabilježeno prisustvo porodiljskih kolonija mediteranskog potkovastog šišmiša (*Rhinolophus euryale*) i trobojnog šišmiša (*Myotis emarginatus*). U željezničkim tunelima otkrivene su porodiljske kolonije mediteranskog potkovastog šišmiša (*R. euryale*) i mješovite kolonije dugoprstog šišmiša (*M. capaccinii*), velikog mišouhog šišmiša (*M. myotis*), malog mišouhog šišmiša (*M. blythii*) i Šrajberovog šišmiša (*Miniopterus schreibersii*). Pored toga, u tunelima su zabilježene i pojedinačne jedinke malog potkovastog šišmiša (*R. hipposideros*) i velikog potkovastog šišmiša (*R. ferrumequinum*). U Kraljičinoj pećini (Dobrun), tokom ranijih istraživanja 2023. godine (Milanović i sar., 2023), zabilježene su brojne jedinke Šrajberovog i dugoprstog šišmiša, dok je u ovom istraživanju registrirana samo jedna jedinka mediteranskog potkovastog šišmiša. Također, prisustvo malog potkovastog šišmiša je potvrđeno u pećini „Plaža ljubavi", a ostaci kostiju mediteranskog potkovastog šišmiša pronađeni su u još jednoj pećini. Tokom tri noći provedeno je hvatanje šišmiša metodom mist-netting, postavljanjem mreža iznad same rijeke Rzav i uz njenu obalu. Ovom metodom je zabilježena prisutnost vodnog šišmiša (*M. daubentonii*). Dodatno, ultrazvučno snimanje šišmiša vršeno je

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putem auto – transekta jedne noći, pri čemu su zabilježene vrste: *Nyctalus noctula, Pipistrellus pipistrellus, P. pygmaeus, P. kuhlii, Hypsugo savii, Miniopterus schreibersii*, *Barbastella barbastellus*, vrste iz roda *Myotis*, te fonetske grupe *P. kuhlii / P. nathusii* i *Eptesicus serotinus / Vespertilio murinus / N. leisleri*.

Ovo područje rijeke Rzav predstavlja značajno stanište za raznoliku faunu šišmiša, s minimalno 15 zabilježenih vrsta, što čini gotovo 50% ukupnog diverziteta šišmiša Bosne i Hercegovine. Ovi podaci naglašavaju važnost daljeg monitoringa i zaštite šišmiša u ovoj regiji.

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The Rzav River, located in the eastern part of Bosnia and Herzegovina, is surrounded by diverse types of habitats and ecosystems, which makes this region an important area for the study of bat fauna. The research was conducted from May 31 to June 5, 2024, during which inspections of various facilities were carried out - 5 railway tunnels, 1 excavation tunnel and 5 caves.

The presence of maternity colonies of the Mediterranean horseshoe bat (*Rhinolophus euryale*) and the Geoffroy's bat (*Myotis emarginatus*) was recorded in the excavation tunnel. Maternity colonies of the Mediterranean horseshoe bat (*R. euryale*) and mixed colonies of the long-fingered bat (*M. capaccinii*), the greater mouse-eared bat (*M. myotis*), the lesser mouse-eared bat (*M. blythii*) and Schreiber's bat (*Miniopterus schreibersii*) were discovered in the railway tunnels. In addition, individuals of the lesser horseshoe bat (*R. hipposideros*) and the greater horseshoe bat (*R. ferrumequinum*) were recorded in the tunnels. In Kraljičina pećina (Dobrun cave), during earlier research in 2023 (Milanović et al., 2023), numerous individuals of Schreiber's bat and long-fingered bat were recorded, while in this research only one individual of the Mediterranean horseshoe bat was registered. Also, the presence of the small horseshoe bat was confirmed in the "Beach of Love" cave, and the remains of the bones of the Mediterranean horseshoe bat were found in another cave. During three nights, bats were caught using the mist-netting method, by placing nets above the river Rzav and along its banks. The presence of the Daubenton's bat (*M. daubentonii*) was recorded using this method. In addition, ultrasonic recording of bats was carried out by an auto-transect one night, during which the following species were recorded: *Nyctalus noctula, Pipistrellus pipistrellus, P. pygmaeus, P. kuhlii, Hypsugo savii, Miniopterus schreibersii, Barbastella barbastellus*,

species from the genus *Myotis*, and the phonetic group *P. kuhlii* / *P. nathusii* and *Eptesicus serotinus* / *Vespertilio murinus* / *N. leisleri*.

This area of the Rzav River represents a significant habitat for a diverse bat fauna, with a minimum of 15 recorded species, which accounts for almost 50% of the total bat diversity of Bosnia and Herzegovina (33 species). These data emphasize the importance of further monitoring and protection of bats in this region.

Reference

Milanović, V., Mulaomerović, J., Kalabić, M., & Gurda, B. (2023). Prva istraživanja šišmiša oko Višegrada, Skup speleologa Bosne i Hercegovine(pp. 21–21). Zavidovići – Maoča; Centar za krš i speleologiju.

Kratka posjeta Visokom
Short visit to Visoko

Amina Agić[1], Jasminko Mulaomerović[1], Ines Ćutuk[1]

Posljednje sedmice augusta, tačnije u noći 28. planirana je posjeta planinarskom domu Zbilja u Visokom. Na poziv starog Jasminkovog prijatelja Jasmina i dojave da u potkrovlju planinarskog doma stanuju šišmiši koji svake večeri u velikim grupama izlaze iz potkrovlja, odlučili smo se da tu situaciju izvidimo i zabilježimo o kojim vrstama je riječ. Prvo je Jasminko nekim životno ugrožavajućim merdevinama, pokušao proviriti kroz otvor na potkrovlju, međutim bezuspiješno. Nakon povratka na sigurno pala je odluka da će se oko tog otvora ipak snimati detektorom Batlooger M. Korištenjem detektora i analizom snimljenih podataka, identificirane su vrste *Nyctalus noctula*, *Pipistrellus pygmaeus*, te zvučna grupa *P. kuhlii/nathusii*. Pored snimanja iznad doma, izvršili smo i auto transekt kroz grad Visoko do uključivanja na autoput, a rezultati snimanja su brojali iste vrste kao i iznad doma. Pored pronalaska vrste *Myotis mystacinus u* Pravoslavnoj crkvi u Visokom, koje je prethodno zabilježio Tarik Dervović, ovi rezultati predstavljaju prve bilješke o šišmišima na području grada Visoko.

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The last week of August, specifically on the night on the 28th, a visit to the Zbilja mountain lodge in Visoko was planned. Following an invitation from Jasminko's old friend Jasmin and a tip that bats were residing in the attic of the lodge and leaving in large groups every evening, we decided to investigate the situation and identify the species involved. Jasminko first attempted to peek through the attic opening using a life-threatening ladder, but without success. After returning to safety, we decided to use the Batlogger M detector to record around the opening. By using the detector and analyzing the recorded data, the following species were identified: *Nyctalus noctula*, *Pipistrellus pygmaeus*, and the sound group *Pipistrellus kuhlii/nathusii*. In addition to recording above the lodge, we conducted a car transect through the city of Visoko up to the highway entrance, with the results

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showing the same species as those recorded above the lodge. Alongside the discovery of the *Myotis mystacinus* in the Orthodox church in Visoko, previously noted by Tarik Dervović, these findings represent the first recorded notes on bats in the Visoko area.

Tri nova skloništa šišmiša u kanjonu Bistrice
Three new bat roosts in the Bistrica Canyon

Ognjen Matović[1,2]

Nakon završetka redovnog zimskog monitoringa, u kojem članovi našeg društva aktivno učestvuju u istraživanju pećina kanjona Bistrice, nastavili smo sa istraživanjem ovog područja i otkrili tri nova skloništa za šišmiše. U pećini Kulina, 17. marta 2024. godine, zabilježili smo prisustvo četiri mala potkovasta šišmiša (*Rhinolophus hipposideros*). Istog dana, u neimenovanoj pećini, pronađena je veća kolonija Šrajberovog šišmiša (*Miniopterus schreibersii*). Nekoliko sedmica kasnije, 21. aprila 2024. godine, u Pećini kod Brščjanice zabilježeno je prisustvo sedam malih potkovastih šišmiša (*R. hipposideros*). Ovi nalazi potvrđuju značaj pećina u kanjonu Bistrice kao ključnih staništa za šišmiše, što naglašava potrebu za kontinuiranim monitoringom i zaštitom ovog područja.

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After completing the regular winter monitoring, in which members of our society actively participate in the exploration of caves in the Bistrica Canyon, we continued researching this area and discovered three new bat roosts. In Kulina Cave, on March 17, 2024, we recorded the presence of four lesser horseshoe bats (*Rhinolophus hipposideros*). On the same day, in an unnamed cave, a larger colony of Schreiber's bent-wing bats (*Miniopterus schreibersii*) was found. A few weeks later, on April 21, 2024, in the Cave near Brščjanica, we observed seven lesser horseshoe bats (*R. hipposideros*). These findings confirm the significance of the caves in the Bistrica Canyon as essential habitats for bats, highlighting the need for continuous monitoring and protection of this area.

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Nalaz porodiljske kolonije malog potkovnjaka (*Rhinolophus hipposideros*) u napuštenoj vodenici u Nevesinjskom polju pored rijeke Zalomke

Finding of the Maternity Colony of Lesser Horseshoe Bats (*Rhinolophus hipposideros*) in an Abandoned Watermill in Nevesinjsko polje near the Zalomka River

Saudin Merdan[1], Aleksandra Babić[1], Mia Dejanović[1]

Tokom istraživanja herpetofaune Nevesinjskog polja 8. augusta 2024. godine, istražili smo nekoliko napuštenih vodenica. Umjesto registrovanja zmijskih vrsta, dokumentovali smo porodiljsku koloniju malih potkovnjaka (*Rhinolophus hipposideros*) u jednoj od vodenica nedaleko od sela Budisavlje, uz rijeku Zalomku. Ova vodenica, dimenzija 4 x 5 metara, ima debele kamene zidove i betonski plafon, što stvara stabilnu mikroklimu pogodnu za stanovanje. Registrovano je ukupno 18 jedinki unutar vodenice, čime se potvrđuje njen značaj kao važnog mjesta za razmnožavanje. Također, u drugoj obližnjoj vodenici zabilježene su još dvije jedinke. Ovaj nalaz ističu ekološku vrijednost napuštenih vodenica u kraškom području, koje su pod sve većim antropogenim pritiskom. Posebnu zabrinutost izaziva izgradnja hidroenergetskog sistema Gornji Horizonti, koja bi mogla dovesti do potapanja ovog lokaliteta i njegovih objekata. Stoga je očuvanje ovih objekata ključno za osiguranje uspješnosti razmnožavanja i stabilnosti populacija *Rhinolophus hipposideros*.

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During a herpetofauna survey of the Nevesinjsko Polje on August 8, 2024, we explored several abandoned watermills. Instead of registering snake species, we documented a maternity colony of lesser horseshoe bats (*Rhinolophus hipposideros*) in one of the watermills near the village of Budisavlje, along the Zalomka River. The 4 by 5 - meter watermill features thick stone walls and a concrete ceiling, providing

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a stable microclimate favorable for roosting. A total of 18 individuals were recorded in the watermill, confirming its role as an essential breeding site. Additionally, two more individuals were observed in a nearby watermill. This finding highlights the ecological value of abandoned watermills in the karst region, which are under increasing anthropogenic pressure. Of particular concern is the construction of the Gornji Horizonti hydroelectric system, which could lead to the flooding of this locality and its structures. Therefore, the conservation of these buildings is crucial to ensure the successful breeding and stability of *Rhinolophus hipposideros* populations.

Vrste šišmiša registrovane u napuštenom motelu „Runolist“ na planini Šator

Bat Species Recorded in the Abandoned “Runolist” Motel on Šator Mountain

Saudin Merdan[1]

Tokom istraživačke ekspedicije na Šatorskom jezeru 23. avgusta 2024. godine, na nadmorskoj visini od 1500 m, sprovedeno je istraživanje u napuštenom motelu „Runolist“. Ova lokacija, koja se nalazi u blizini jezera i okružena je gustom bukovom šumom, predstavlja značajno stanište za različite vrste šišmiša. Unutar motela registrovano je šest jedinki male potkovaste njemuške (*Rhinolophus hipposideros*) i jedna jedinka dugouhog šišmiša (*Plecotus* sp.). Nalazi ističu važnost napuštenih objekata kao ključnih skloništa za šišmiše u planinskim područjima, koja su karakterizirana jedinstvenim ekološkim uvjetima, uključujući litice, šume i vodena tijela. Ovi rezultati naglašavaju potrebu za daljnjim i detaljnijim istraživanjima planine Šator.

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During a research expedition at Šatorsko Lake on August 23, 2024, situated at an altitude of 1500 m, a study was conducted at the abandoned motel “Runolist.” This site, located in proximity to the lake and surrounded by dense beech forests, presents a significant habitat for various bat species. Within the motel, six individuals of the lesser horseshoe bat (*Rhinolophus hipposideros*) and one individual of the brown long-eared bat (*Plecotus* sp.) were recorded. The findings highlight the importance of abandoned structures as critical roosting sites for bats in mountainous regions, characterized by unique ecological conditions, including cliffs, forests, and water bodies. These results emphasize the need for further and more detailed research in the Šator Mountain area.

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Pionirsko istraživanje struktuiranosti letne membrane odabranih vrsta slepih miševa na centralnom Balkanu: značaj sezonske varijabilnosti pigmentacije letne membrane

Pioneering Research on the Structure of the Wing Membrane of Selected Bat Species in the Central Balkans: The Importance of Seasonal Variability in Wing Membrane Pigmentation

Sara Arsenijević[1], Ana Graovac[1], Milan Plećaš[1], Aleksandra Korać[1], Jelena Burazerović[1]

Slepi miševi (Chiroptera) su jedini sisari koji imaju sposobnost aktivnog leta. Aktivni let omogućavaju prednji ekstremiteti izmenjeni u krila i koža koja formira letnu membranu. Koža letne membrane se zbog svoje uloge u aktivnom kretanju značajno razlikuje od kože u drugim delovima tela slepih miševa. Obojenost kože letne membrane posledica je prisustva melanina u epidermisu. Cilj ovog istraživanja bilo je opisati strukture koje se nalaze u koži letne membrane, odrediti stepen pigmentisanosti i istražiti potencijalne sezonske promene u pigmentaciji letne membrane kod odabranih vrsta slepih miševa. Tkiva kože letne membrane su prikpljena sa 58 jedinki sa područja Centralnog Balkana (Srbija, Bosna i Hercegovina i Crna Gora) u tri različite sezone (proleće, leto i jesen) sa 4 vrste slepih miševa: *Miniopterus schreibersii, Myotis capaccinii, Rhinolophus euryale, Rhinolophus ferrumequinum.* Histološka organizacija kože rađena je sa preparata obojenim toluidin plavom, a procenat epidermalne pigmentacije je izražen nakon analize mikrografija u Image J programu. Koža letne membrane je histološki organizovana u dva sloja epidermisa između kojih se nalazi dermis bogat vezivnim tkivom, ali i strukturama poput krvnih sudova, nerava, lipocita, mišića, folikula dlake i lojnih žlezda. Ukupna obojenost jedinki (*Myotis capaccinii, Rhinolophus euryale, R. ferrumequinum)* se statistički značajno razlikuje među sezonama, tako da su u proleće jedinke najtamnije. *M. capaccinii* je značajno tamniji u prolećnoj sezoni u odnosu na leto i jesen.

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Kod *R. ferrumequinum* se pokazalo da pored efekta sezone, postoji značajan efekat pola na procenat epidermalne pigmentacije, tako da su ženke tamnije od mužjaka.

Jedinke različite obojenosti mogu imati i različite ponašajne i imunske odgovore na parazite i antropogene zagađivače iz okoline. Tamnije obojene jedinke potencijalno su bolje prilagođene sredinama sa intenzivnijim antropogenim uticajem. Veći procenat epidermalne pigmentacije u prolećnoj sezoni bi mogao da bude posledica povećanog antropogenog zagađenja tokom hladnog perioda godine. Buduća istraživanja ovog fenomena bi trebala da uzmu u obzir kako koncentracija melanina u koži može uticati na prevalenciju i intenzitet infekcije parazita i antropogenih zagađivača.

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Bats (Chiroptera) are the only mammals capable of active flight. Active flight is enabled by the modification of the forelimbs into wings and the skin that forms the wing membrane. The skin of the wing membrane differs significantly from the skin on other parts of the bat's body due to its role in active movement. The pigmentation of the wing membrane skin is a result of melanin presence in the epidermis. The aim of this research was to describe the structures found in the wing membrane skin, determine the degree of pigmentation, and explore potential seasonal changes in wing membrane pigmentation in selected bat species. Wing membrane skin tissues were collected from 58 individuals from the Central Balkans (Serbia, Bosnia and Herzegovina, and Montenegro) during three different seasons (spring, summer, and autumn) from four bat species: *Miniopterus schreibersii*, *Myotis capaccinii*, *Rhinolophus euryale*, and *Rhinolophus ferrumequinum*. Histological organization of the skin was analyzed using preparations stained with toluidine blue, and the percentage of epidermal pigmentation was expressed after analyzing micrographs in the ImageJ software.

The wing membrane skin is organized into two layers of epidermis, with the dermis, rich in connective tissue, located between them, along with structures such as blood vessels, nerves, adipocytes, muscles, hair follicles, and sebaceous glands. The overall pigmentation of individuals (*Myotis capaccinii*, *Rhinolophus euryale*, and *R. ferrumequinum*) differed significantly across seasons, with individuals being darkest in the spring. *M. capaccinii* was significantly darker in the spring season compared to summer and autumn. In *R. ferrumequinum*, it was found that, in addition to the effect of season, sex had a significant effect on the

percentage of epidermal pigmentation, with females being darker than males. Individuals with different pigmentation levels may exhibit different behavioral and immune responses to parasites and anthropogenic pollutants in the environment. Darker individuals are potentially better adapted to environments with more intense anthropogenic influence. The greater percentage of epidermal pigmentation in the spring season could be a consequence of increased anthropogenic pollution during the colder period of the year. Future research on this phenomenon should consider how melanin concentration in the skin may affect the prevalence and intensity of parasitic infections and exposure to anthropogenic pollutants.

Speleološka istraživanja u Dabarskom i Fatničkom polju

Speleological research in the Dabarsko and Fatničko poljes

Besim Gurda[1,2], Emir Balić[1], Miran Ahmetagić[1], Joviša Bajić[3]

U periodu od 27. do 29. oktobra 2024. godine radili smo speleološka istraživanja Dabarskog i Fatničkog polja. Iako je primarni povod istraživanja bila izrada speleoloških nacrta te bilježenje hidroloških zapažanja u podzemlju (zbog projekta *Gornji horizonti*), iskoristili smo ovu priliku i da zabilježimo podatke o šišmišima.

Iako su na ovom području provedena brojna druga istraživanja, o šišmišima imamo vrlo malo podataka. Našli smo podatak o prisustvu 1 jedinke *M. schreibersii* u Jami Obod u Fatničkom polju. Potom je u Dabarskom polju u Danojlovoj pećini zabilježeno 5 jedinki *R. hipposideros*, a u Fatničkom polju u Velikoj pećini 10 jedinki *R. hipposideros*. U Dabarskom polju je zabilježena i 1 jedinka *Myotis blythii*, na mostu iznad izvora Opačica.

Tokom naših istraživanja zabilježili smo prisustvo šišmiša na četiri lokaliteta u Dabarskom polju (Ponikva, Ponor kod mlina, Visibaba, Radovića pećina) i na dva lokaliteta u Fatničkom polju (Lepirnica, Velika pećina). Za pet navedenih lokaliteta su ovo prvi podaci o šišmišima, samo za Veliku pećinu imamo podatak od ranije.

Najznačajniji pronalazak je Radovića pećina u kojoj je, po našoj procjeni, bilo preko 1000 jedinki šišmiša. Brzim opažanjem smo zabilježili prisustvo najmanje četiri vrste šišmiša: *R. hipposideros, R. ferrumequinum/euryale, M. schreibersii, M. myotis/blythii*. Detaljan broj i vrste nismo mogli utvrditi obzirom da je većina šišmiša bila u letu, ali ogromna količina guana svjedoči da redovno borave u toj pećini pa bi stoga trebalo u narednom periodu provesti i detaljnija istraživanja.

Od preostalih istraživanih objekata, prisustvo šišmiša smo zabilježili kako slijedi:

[1] Sportski i naučno-istraživački klub Atom, Pinkasa Bandta bb, Zavidovići, Bosna i Hercegovina; besimgurda@gmail.com

[2] Udruženje građana Fojničani, Fojnica bb, Maglaj, Bosna i Hercegovina

[3] Speleološko društvo Ponir, Sime Matavulja bb, Banja Luka, Bosna i Hercegovina

- Pećina Visibaba (Dabarsko polje) – 1 jedinka *R. hipposideros*, povremeno prisustvo *R.ferrumequinum/M.myotis* (guano veličine preko 1,2 cm)
- Ponor kod mlina (Dabarsko polje) – 11 jedinki *R. hipposideros*
- Pećina Ponikva (Dabarsko polje) – povremeno prisustvo *R.ferrumequinum/M. myotis* (guano veličine preko 1,2 cm)
- Pećina Lepirnica (Fatničko polje) – 1 jedinka *R. hipposideros*, 1 jedinka *R.ferrumequinum*
- Velika pećina (Fatničko polje) – 8 jedinki *R. hipposideros*

Obzirom na teren, brojnost speleoloških objekata i veličinu nekih od njih, možemo reći da je ovo samo početak istraživanja i da bismo u budućnosti sigurno trebali posvetiti pažnju i istraživanju faune šišmiša na ovom području.

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From October 27 to 29, 2024, we conducted speleological research in Dabarsko Polje and Fatničko Polje. Although the primary purpose of the research was to create speleological maps and record hydrological observations underground (due to the Upper Horizons project), we also used this opportunity to collect data on bats.

Although numerous other studies have been conducted in this area, there is very little information on bats. We found a record of 1 *M. schreibersii* individual in the Obod Pit in Fatničko Polje. Additionally, 5 *R. hipposideros* individuals were recorded in Danilova Cave in Dabarsko Polje, and 10 *R. hipposideros* individuals were recorded in Velika Cave in Fatničko Polje. In Dabarsko Polje, 1 *Myotis blythii* individual was recorded on the bridge above the Opačica spring.

During our research, we recorded the presence of bats at four locations in Dabarsko Polje (Ponikva, Ponor near the mill, Visibaba, Radovića Cave) and two locations in Fatničko Polje (Lepirnica, Velika Cave). For five of these locations, these are the first records of bats; only for Velika Cave do we have prior data.

The most significant finding is Radovića Cave, where we estimated over 1000 bats. Through fast observation, we recorded the presence of at least four species: *R. hipposideros*, *R. ferrumequinum/euryale*, *M. schreibersii*, *M. myotis/blythii*. We could not determine the exact number or species as most bats were in flight, but the large amount of guano indicates that they regularly inhabit the cave, suggesting that more detailed research should be conducted in the future.

For the remaining investigated sites, we recorded bat presence as follows:

- Visibaba Cave (Dabarsko Polje) – 1 *R. hipposideros* individual, occasional presence of *R. ferrumequinum/M. myotis* (guano over 1.2 cm in size)
- Ponor near the mill (Dabarsko Polje) – 11 *R. hipposideros* individuals
- Ponikva Cave (Dabarsko Polje) – occasional presence of *R. ferrumequinum/M. myotis* (guano over 1.2 cm in size)
- Lepirnica Cave (Fatničko Polje) – 1 *R. hipposideros* individual, 1 *R. ferrumequinum* individual
- Velika Cave (Fatničko Polje) – 8 *R. hipposideros* individuals

Given the terrain, the number of speleological sites, and the size of some of them, we can say that this is only the beginning of research, and in the future, we should certainly dedicate more attention to studying the bat fauna in this area.

Monitoring i zaštita šišmiša u Bosni i Hercegovini
Monitoring and Protection of Bats in Bosnia and Herzegovina

Besim Gurda[1,2]

Udruženje građana Fojničani, Sportski i naučno-istraživački klub Atom i Centar za krš i speleologiju realizirali su jednogodišnji projekat pod nazivom „Monitoring i zaštita šišmiša u BiH". Osnovni cilj projekta bio je doprinijeti zaštiti prirode u Bosni i Hercegovini zagovaranjem zaštite šišmiša i njihovih staništa u skladu s entitetskim strategijama i EU direktivama. Bosna i Hercegovina je usvojila Direktivu o staništima EU i potpisala Međunarodni sporazum o zaštiti šišmiša EUROBATS i na taj način se obavezala zaštititi sve vrste šišmiša i njihova specifična staništa. Ovaj posao nije dovršen jer još uvijek u Bosni i Hercegovini nisu zaštićene sve vrste šišmiša niti njihova staništa.

Obzirom da su i vlasti svjesne manjka institucionalnih kapaciteta u svojim novim strategijama navode da se u narednom desetogodišnjem periodu nevladinim organizacijama, između ostalog, trebaju povjeriti zadaci vezani za monitoring specifičnih grupa organizama i tipova staništa. Stoga je ovaj projekat bio jedinstvena prilika da kao nevladin sektor budemo partner vlastima i uradimo opsežna istraživanja šišmiša u BiH i kroz zagovaračke procese doprinesemo njihovoj zaštiti.

Dosadašnji podaci o šišmišima u BiH, koji su korišteni i za predlaganje Natura 2000 područja su, u najmanju ruku, šturi i zastarjeli. Zbog veličine područja, malog broja istraživača i specifičnih životnih uvjeta šišmiša još uvijek se može reći da imamo samo sporadične podatke o ovim ugroženim sisarima. Zbog toga radimo na uspostavljanju temelja zaštite ovih vrsta i njihovih staništa i redovnom monitoringu populacije šišmiša u BiH.

Terenskim istraživanjima, zagovaračkim aktivnostima, aktivnom medijskom kampanjom i pokretanjem zakonskih procedura nastojali smo doprinijeti zaštiti 33 vrste šišmiša koje naseljavaju Bosnu i Hercegovinu, dati preporuke za konzervaciju i upravljanje njihovim staništima i u konačnici doprinijeti zaštiti prirode u cijelosti.

[1] Sportski i naučno-istraživački klub Atom, Pinkasa Bandta bb, Zavidovići, Bosna i Hercegovina; besimgurda@hotmail.com; eko@ugf.ba

[2] Udruženje građana Fojničani, Fojnica bb, Maglaj, Bosna i Hercegovina

Najvažnija postignuća ovog projekta uključuju brojna terenska istraživanja i nove podatke o šišmišima u Bosni i Hercegovini, Nacionalni izvještaj o stanju šišmiša u BiH (EUROBATS izvještaj), te Smjernice za zaštitu šišmiša kroz ublažavanje i kompenzaciju štetnih uticaja. Također smo organizirali dva okrugla stola o zaštiti šišmiša s vlastima u Federaciji BiH i Republici Srpskoj, kroz koje su pokrenute procedure za zaštitu svih vrsta šišmiša u Bosni i Hercegovini. Pored toga, obilježili smo Međunarodnu noć šišmiša u školama, izradili infografike, promovirali značaj šišmiša putem medija, te realizirali i brojne druge aktivnosti značajne za zaštitu šišmiša.

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Citizens Association Fojničani, Sports and Scientific-Research Club Atom, and the Center for Karst and Speleology implemented a year-long project titled "Monitoring and Protection of Bats in Bosnia and Herzegovina". The primary goal of the project was to contribute to nature conservation in Bosnia and Herzegovina by advocating for the protection of bats and their habitats, in accordance with entity strategies and EU directives. Bosnia and Herzegovina has adopted the EU Habitats Directive and signed the International Agreement on the Protection of Bats (EUROBATS), thereby committing to the protection of all bat species and their specific habitats. However, this work remains unfinished as not all bat species or their habitats in Bosnia and Herzegovina are currently protected.

Recognizing the lack of institutional capacity, authorities have outlined in their new strategies that in the coming decade, non-governmental organizations should be entrusted with tasks related to the monitoring of specific groups of organisms and habitat types. Therefore, this project represented a unique opportunity for the non-governmental sector to partner with authorities and conduct extensive research on bats in Bosnia and Herzegovina, contributing to their protection through advocacy efforts.

The existing data on bats in Bosnia and Herzegovina, which was used to propose Natura 2000 areas, is at best sparse and outdated. Due to the size of the territory, the small number of researchers, and the specific living conditions of bats, it can still be said that we only have sporadic data on these endangered mammals. For this reason, we are working on establishing a foundation for the protection of these species and their habitats, along with regular monitoring of bat populations in Bosnia and Herzegovina.

Through field research, advocacy activities, an active media campaign, and initiating legal procedures, we aimed to contribute to the protection of the 33 bat species inhabiting Bosnia and Herzegovina, provide recommendations for the conservation and management of their habitats, and ultimately contribute to nature conservation as a whole.

The most important achievements of this project include numerous field studies and new data on bats in Bosnia and Herzegovina, the National Report on the State of Bats in Bosnia and Herzegovina (EUROBATS Report), and Guidelines for the Protection of Bats through the Mitigation and Compensation of Harmful Impacts. We also organized two roundtable discussions on bat protection with authorities in the Federation of Bosnia and Herzegovina and Republika Srpska, which initiated procedures for the protection of all bat species in Bosnia and Herzegovina. Additionally, we marked International Bat Night in schools, created infographics, promoted the importance of bats through the media, and carried out many other activities significant for bat conservation.

Praćenje šišmiša nakon EIA: primjer iz vjetroelektrane na Kosovu

Post-EIA bat monitoring: an example from a wind farm in Kosovo

Philippe Théou[1], Ervis Loçe[2]

Nakon izgradnje vjetroelektrane u istočnom Kosovu i nedostatka fokusa na vrste šišmiša unutar EIA-e, iscrpan plan praćenja pripremljen je i proveden između novembra 2020. i oktobra 2021. Metodologija se temeljila na pasivnom snimanju, aktivnom snimanju i istraživanju lešina. Ukupno je na području vjetroelektrane zabilježeno 12 vrsta i 4 grupe vrsta: *Barbastella barbastellus, Hypsugo savii, Myotis* sp., *Nyctalus lasiopterus, N. leisleri, N. noctula, Pipistrellus pipistrellus, P. pygmaeus, P. nathusii, P. kuhlii/nathusii, Plecotus* sp., *Miniopterus schreibersii, Rhinolophus hipposideros, Tadarida teniotis, Nyctalus* sp./*Eptesicus* sp./*Vespertelio* sp. i *Vespertillo murinus*. Na temelju prikupljenih podataka, investitoru su date jasne preporuke u skladu sa smjernicama EUROBATS-a kako bi se maksimalno ograničio utjecaj infrastrukture na populacije šišmiša koji koriste područje, u nadi da će budući slični projekti u regiji iskoristiti takve najbolje mogućnosti prakse od početka procesa razvoja.

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Following the construction of a wind farm in eastern Kosovo* and the lack of focus on bat species within the EIA, an exhaustive monitoring plan was prepared and implemented between November 2020 and October 2021. The methodology was based on passive recording, active recording and carcass research. In total, 12 species and 4 group of species were recorded within the area of the wind farm: *Barbastella barbastellus, Hypsugo savii, Myotis sp., Nyctalus lasiopterus, N. leisleri, N. noctula, Pipistrellus pipistrellus, P. pygmaeus, P. nathusii, P. kuhlii/nathusii, Plecotus sp., Miniopterus schreibersii, Rhinolophus hipposideros, Tadarida teniotis, Nyctalus sp./Eptesicus sp./Vespertelio sp. and Vespertillo murinus.* On the base of the data

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[2] Natural Sciences Museum "Sabiha Kasimati", Faculty of Natural Sciences, University of Tirana, Tirana.

collected, clear recommendations in line with EUROBATS guidelines were provided to the developer in order to limit at maximum the impact of the infrastructure on bat populations using the area, hoping that future similar project in the region would use such best practices from the start of the development process.

Uvid u podzemna vojna utvrđenja sa posebnom pažnjom na željeznička utvrđenja kao skloništa šišmiša u Sloveniji

Insights into underground military fortifications with special attention of railways fortification as bat roosts in Slovenia

Primož Presetnik[1], Eva Pavlovič[2], Samo Grgurevič[3], Aja Zamolo[1]

Na ovogodišnjem Evropskom simpozijumu o istraživanju šišmiša (Taragona, Katalonija, Španija) predstavili smo poster o prvim uvidima u podzemna vojna utvrđenja (PVU) kao skloništa šišmiša u Sloveniji. Ali na Susretu istraživača šišmiša u BiH imali smo priliku da se detaljnije pozabavimo ovom temom, osobito okolo utvrđenja kod željeznica. Zbog historijskih događaja, u Sloveniji su tokom prošlog vijeka postavljene tri glavne linije vojnog utvrđenja. Prve su kaverne iz Prvog svjetskog rata duž fronta uz reku Soču u zapadnoj Sloveniji, koje su uglavnom improvizovane. Drugi skup utvrđenja (Vallo Alpino) je sličan Magnetovi liniji u Francuskoj. Izgradila ih je fašistička Kraljevina Italija na okupiranom teritoriju zapadne Slovenije. Na suprotnoj strani granice diktatorska Kraljevina Jugoslavija podignula je skromnija utvrđenja Rupnikove linije. Ta su se prostirala i uz sjeverne granice sa Austrijom, koju je anektirala nacistička Njemačka. I na kraju, tu su neki PVU-ovi iz perioda tokom i nakon Drugog svjetskog rata.

Prije nego što smo započeli našu studiju, nije bilo mnogo podataka o šišmišima u PVU-ima. Tokom prošlih 25 godina, ispitali smo više od 160 PVU-a. Ovo uključuje oko 30 iz Prvog svjetskog rata, 100 italijanskih i 20 jugoslovenskih ispred Drugog svjetskog rata, plus 10-ak drugih. PVU-ovi koje smo ispitali po veličini su bili od malih kaverna do ogromnih tunela, dugih nekoliko stotina metara sa više ulaza i borbenih blokova. Nalazili su se između 100 i 1.600 m n.v.. Kod skoro 100 njih pronašli smo žive šišmiše (80%) ili dokaze o njihovom prisustvu (20%), uglavnom tokom hibernacije. Vidjeli smo 10 vrsta šišmiša (* – samo jedno u utvrđenjima

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[2] Ulica bratov Učakar 22, Ljubljana, Slovenija

[3] Ulica Goce Delčeva 6, Ljubljana, Slovenija

kod željeznice), od kojih su najčešći *Rhinolophus hipposideros** (na preko 50 lokacija), *Barbastella barbastellus* (približno 15 lokacija), *R. ferrumequinum* (približno 10 lokacija) i nekoliko drugih na samo jednom ili dva mjesta (*Myotis myotis*, *M. emarginatus*, *M. nattereri* s.lat., *M. mystacinus* s.lat., *Eptesicus nilssonii*, *E. serotinus* i *Plecotus auritus*). Samo *R. hipposideros* je imao nekoliko većih hibernacijskih kolonija (do 66 jedinki), a na jednom lokalitetu smo izbrojali 11 *B. barbastellus*.

Čini se da turizam trenutno ne šteti šišmišima. Međutim, kada se razvijaju nove turističke ponude koji uključuju PVU, također treba razmišljati o tome šta je najbolje za očuvanje šišmiša.

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At this year's European Bat Research Symposium (Tarragona, Catalonia, Spain), we presented a poster on the first insights into underground military fortifications (UMF) as bat roosts in Slovenia. However, at the Meeting of Bat Researchers in BiH, we had the opportunity to deal with this topic in more detail, especially in relation to railway fortifications. Due to historical events, three major military fortification lines were set up in Slovenia during the last century. The first are the WWI caverns along the Isonzo (River Soča) front in western Slovenia, which were mostly improvised. The second set of fortifications are similar to the Maginot Line in France. They were built by the Fascist Kingdom of Italy (Vallo Alpino) on territories in western Slovenia that were occupied at the time. There were also more modest counterpart fortifications built by the dictatorship of the Kingdom of Yugoslavia (Rupnik Line). These extended along the northern border with Austria, which was annexed by Nazi Germany. And finally, there are some UMFs from the period during and after WWII.

Before we started our study, there wasn't much data on bats in UMFs. Over the past 25 years, we've surveyed more than 160 UMFs. This includes around 30 from WWI, 100 from the Italian era and 20 from the Yugoslavian era before WW2, plus about 10 others. The UMFs we surveyed ranged from tiny caverns to huge tunnels, some several hundred metres long, with multiple entrances and fighting blocks. They were located between 100 and 1,600 metres above sea level. In almost 100 of them, we found live bats (80%) or evidence of their presence (20%), mostly during hibernation. We saw bats of 10 species (* – only one in railway fortifications), with the most common being *Rhinolophus hipposideros** (at over 50 sites), *Barbastella barbastellus* (approximately 15 sites), *R. ferrumequinum* (approximately 10 sites),

and a few others at only one or two sites (*Myotis myotis*, *M. emarginatus*, *M. nattereri* s.lat., *M. mystacinus* s.lat., *Eptesicus nilssonii*, *E. serotinus* and *Plecotus auritus*). Only *R. hipposideros* had some numerous hibernation colonies (up to 66 individuals) and in one site we counted 11 *B. barbastellus*.

It seems that tourism isn't harming the bats at the moment. However, when developing new tourism products involving UMF, we should also think about what's best for bat conservation.

Nova saznanja o fauni slijepih miševa NP Biogradska Gora

New Insights into the Bat Fauna of Biogradska Gora National Park

Marina Radonjić[1,4], Bernd Ohlendorf[2], Andrej Čonti[3], Teodora Tanjević[4]

Nacionalni park Biogradska gora jedno je od najvažnijih zaštićenih područja u Crnoj Gori i predstavlja jednu od posljednje tri preostale prašume u Evropi. Na ovom području, u maju 2024. godine, sprovedeno je istraživanje faune slijepih miševa kroz nacionalnu i međunarodnu saradnju Javnog preduzeća za nacionalne parkove Crne Gore i organizacija koje se bave očuvanjem slijepih miševa.

Fokus istraživanja bio je na postavljanju tzv. nevidljivih mreža, visine osam metara, koje su po prvi put primijenjene u Crnoj Gori na tri lokacije, različitih nadmorskih visina i u različitim tipovima staništa. Ukupno je uhvaćeno 96 jedinki slijepih miševa, koje su izmjerene, identifikovane i odmah puštene u prirodu.

Utvrđeno je prisustvo 11 vrsta slijepih miševa. Po prvi put na ovom području zabilježene su vrste *Myotis blythii*, *M. nattereri*, *M. bechsteinii*, *M. brandtii* i *M. alcathoe*. Pored njih, evidentirane su i već pozate vrste ovog područja: *Rhinolophus hipposideros*, *Myotis mystacinus*, *M. daubentonii*, *Barbastella barbastellus*, *Pipistrellus pipistrellus* i *P. pygmaeus*. Dodatno, utvrđena je reprodukcija kod vrsta *R. hipposideros*, *M. brandtii*, *M. alcathoe*, *M. bechsteinii* i *B. barbastellus*. Od do sada poznatih vrsta sa ovog područja, jedino vrsta *Nyctalus noctula* nije uhvaćena mrežama.

Prema sveukupnim dosadašnjim podacima, NP Biogradska gora predstavlja stanište za najmanje 12 vrsta slijepih miševa.

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Ovi rezultati naglašavaju važnost Biogradske gore kao značajnog staništa i skloništa slijepih miševa, posebno šumskih vrsta, te pružaju osnovu za dalji monitoring i zaštitu ove ugrožene grupe sisara.

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Biogradska Gora National Park is one of the most important protected areas in Montenegro and one of the last three remaining primeval forests in Europe. In May 2024, a study on bat fauna was conducted in this area through national and international collaboration between the Public Enterprise for National Parks of Montenegro and bat conservation organizations.

The study focused on setting up so-called "invisible nets," eight meters high, used for the first time in Montenegro at three locations with varying altitudes and habitat types. A total of 96 bats were captured, measured, identified, and then immediately released back into the wild.

The presence of 11 bat species was recorded. For the first time in this area, *Myotis blythii, M. nattereri, M. bechsteinii, M. brandtii*, and *M. alcathoe* were documented. In addition, species already known in the area–*Rhinolophus hipposideros, Myotis mystacinus, M. daubentonii, Barbastella barbastellus, Pipistrellus pipistrellus*, and *P. pygmaeus*–were also recorded. Reproduction was observed in *R. hipposideros, M. brandtii, M. alcathoe, M. bechsteinii*, and *B. barbastellus*. Among previously known species in this area, only *Nyctalus noctula* was not captured by the nets.

Based on all available data, Biogradska Gora National Park is home to at least 12 bat species. These findings highlight the importance of Biogradska Gora as a significant habitat and refuge for bats, especially forest-dwelling species, providing a foundation for continued monitoring and protection of this endangered mammal group.

Napušteni vojni objekat blizu Radoviša, Severna Makedonija – novo nalazište Južnog velikog večernjaka (*Myotis blythii*) i Evropskog dugokrilaša (*Miniopterus schreibersii*)

Abandoned Military Site near Radoviš, North Macedonia – A New Habitat for the Lesser Mouse-eared Bat (*Myotis blythii*) and the Schreiber's Long-fingered Bat *(Miniopterus schreibersii*)

Aleksandar Stojanov[1]

Početkom 2023. godine dobili smo informaciju od lokalnog šumarskog inspektora o mogućem prisustvu velike kolonije slepih miševa u napuštenom vojnom podzemnom objektu. Objekat se nalazi u blizini grada Radoviš, u jugoistočnom delu Severne Makedonije, na brdovitom terenu sa degradiranom hrastovom vegetacijom, a ulaz je u neposrednoj blizini magistralnog puta Radoviš – Štip.

U pratnji inspektora, 3. februara 2023. godine, izvršili smo prvi terenski obilazak objekta. Ovaj bunker se sastoji od nekoliko soba koje su povezane hodnikom sa ulazom. Tom prilikom, registrovali smo dve jedinke evropskog dugokrilaša (*Miniopterus schreibersii*) i jednu jedinku južnog velikog večernjaka (*Myotis blythii*). Takođe, primećena je velika količina gvana u hodniku, što je rezultiralo ponovnim obilaskom objekta 18. avgusta 2023. godine.

Tom prilikom, u objektu je zabeležena velika mešovita kolonija od oko 1000–1100 jedinki južnog velikog večernjaka (*Myotis blythii*) i oko 50–100 jedinki evropskog dugokrilaša (*Miniopterus schreibersii*). Uočeno je i nekoliko ženki sa mladuncima južnog velikog večernjaka.

Ova porodiljska kolonija jedna je od veoma retkih zabeleženih u Severnoj Makedoniji i prva takva kolonija primećena u istočnim delovima zemlje. Kao takvu, trebalo bi je redovno pratiti u budućnosti. Takođe, trebalo bi pokrenuti istraživanje

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i drugih sličnih napuštenih vojnih objekata u Makedoniji, zbog njihove potencijalne važnosti kao skloništa slepih miševa.

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In early 2023, we received information from a local forestry inspector regarding a possible large bat colony in an abandoned underground military site. This site is located near Radoviš, in the southeastern part of North Macedonia, on hilly terrain with degraded oak vegetation, with its entrance close to the Radoviš–Štip main road.

Accompanied by the inspector, we conducted the first field visit to the site on February 3, 2023. The bunker consists of several rooms connected by a hallway leading to the entrance. During this visit, we recorded two individuals of the Schreiber's Long-fingered Bat (*Miniopterus schreibersii*) and one individual of the Lesser Mouse-eared Bat (*Myotis blythii*). We also noted a large quantity of guano in the hallway, which led to a follow-up visit on August 18, 2023.

During the second visit, a large mixed colony of approximately 1,000–1,100 Lesser mouse-eared Bats (*Myotis blythii*) and around 50–100 Schreiber's Long-fingered Bats (*Miniopterus schreibersii*) was recorded. Several female Lesser mouse-eared Bats with young were also observed.

This maternity colony is one of the very few recorded in North Macedonia and the first such colony observed in the eastern parts of the country. As such, it should be regularly monitored in the future. Additionally, research should be initiated on other similar abandoned military sites in North Macedonia due to their potential importance as bat shelters.



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