

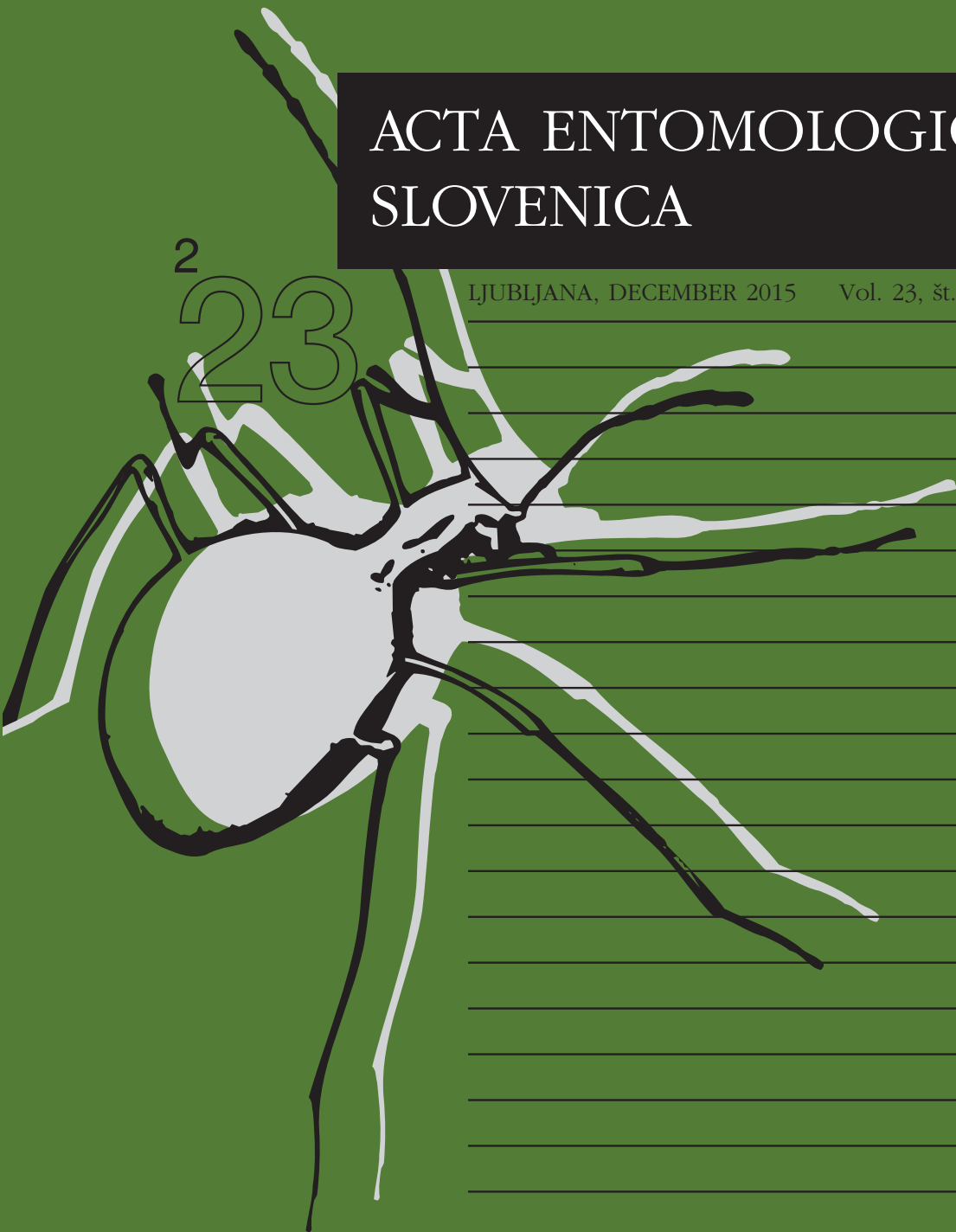
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LJUBLJANA, DECEMBER 2015

Vol. 23, št./No. 2



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SLOVENSKO ENTOMOLOŠKO DRUŠTVO
ŠTEFANA MICHIELIJA

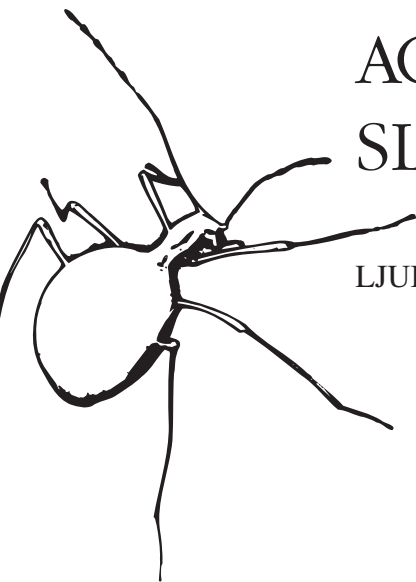
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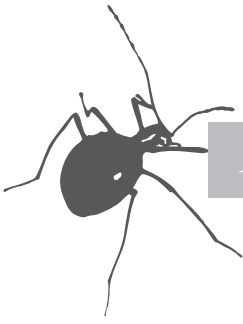
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**RAZŠIRJENOST IN STATUS VRST RODU GLADKIH PLAVAČEV,
GRAPHODERUS (COLEOPTERA: DYTISCIDAE), V SLOVENIJI**Špela AMBROŽIČ¹, Andrej KAPLA¹, Al VREZEC^{1,2}¹Nacionalni inštitut za biologijo, Večna pot 111, SI-1000 Ljubljana, Slovenija,
email: spela.ambrozic@nib.si, andrej.kapla@nib.si, al.vrezec@nib.si²Prirodoslovni muzej Slovenije, Prešernova 20, SI-1000 Ljubljana, Slovenija**Abstract – DISTRIBUTION AND STATUS OF SPECIES IN THE GENUS
GRAPHODERUS (COLEOPTERA: DYTISCIDAE) IN SLOVENIA**

We summarize knowledge over species status and distribution in the genus *Graphoderus* in Slovenia regarding historical and recent data. Systematic surveys with new sampling approaches were conducted to evaluate the current distribution of these species. There are four species of the genus *Graphoderus* recorded so far in Slovenia and all are relatively rare, but most frequent species being *Graphoderus cinereus* and *G. austriacus*. Other two species *G. bilineatus* and *G. zonatus* had been found in Slovenia only on few locations, the latter with no recent records. According to EU Habitat Directive two Natura 2000 sites have been designated for conservation of *G. bilineatus* in Slovenia. A revision of threat status on the national Red List in Slovenia is proposed for all four species.

KEY WORDS: *Graphoderus*, historical overview, altitudinal distribution, nature conservation, red list, *Graphoderus bilineatus*

Izveček – Rod gladkih plavačev (*Graphoderus*) je pri nas dokaj slabo poznan, zato smo v okviru študije zbrali zgodovinske podatke o pojavljanju vrst gladkih plavačev v Sloveniji in s sistematičnim vzorčenjem z novjšimi metodološkimi pristopi ugotoviti današnje stanje razširjenosti in pogostnosti teh vrst v vodnih telesih po vsej državi. Rod gladkih plavačev zajema štiri v Sloveniji relativno redke vrste z najpogostejšima vrstama gladkim (*Graphoderus cinereus*) in malim plavačem (*G. austriacus*). Poleg teh dveh sta bila v Sloveniji potrjena le na nekaj lokacijah še ovratniški (*G. bilineatus*) in barjanski plavač (*G. zonatus*). Glede na Habitatno direktivo EU sta za varstvo ovratniškega plavača predlagani dve Natura 2000 območji.

Glede na nova spoznanja je v članku predlagana tudi revizija kategorij ogroženosti gladkih plavačev na Rdečem seznamu ogroženih vrst v Sloveniji.

KLJUČNE BESEDE: *Graphoderus*, zgodovinski pregled, višinska razširjenost, naravovarstveno ovrednotenje, ovratniški plavač, *Graphoderus bilineatus*

1. Uvod

Kozaki (Dytiscidae) so plenilska družina vodnih hroščev, ki po ocenah zajema 4000 vrst (Nilsson in Fery 2006). Kot plenilci tako nevretenčarskega kot vretenčarskega plena imajo v vodnem ekosistemu pomembno vlogo, kar še posebej velja za manjše stoječe vode, kot so mrtvice, jezera in mlake (Klausnitzer 1996). Spričo pospešenega uničevanja tovrstnih življenjskih prostorov zaradi zasipavanja, izsuševanja in drugih sprememb v vodnih ekosistemih, denimo vnos tujerodnih plenilskih rib ali intenziviranje ribogojstva, gre za dokaj ogroženo skupino (Åbjörnsson s sod. 1997, Dudgeon s sod. 2006). Večina raziskav kozakov v Sloveniji je temeljila le na favnističnih pregledih posameznih območij v sklopu ostalih vrst vodnih hroščev (Drovenik 1999, 2002 in 2004, Kajzer 2001, Drovenik in Vrezec 2002, Ambrožič s sod. 2005), ne pa na celokupnih pregledih stanja pri nas. V Sloveniji ima status ogrožene vrste glede na Rdeči seznam (Uradni list RS, št. 82/02 in 42/10) pet vrst kozakov, ki imajo tudi status zavarovanih vrst, varuje pa se tudi njihov habitat (Uradni list RS, št. 46/2004). Od teh je le ena vrsta iz rodu gladkih plavačev (*Graphoderus*), in sicer ovratniški plavač (*Graphoderus bilineatus*), ki je na Rdečem seznamu opredeljena kot premalo poznana vrsta (K). Problematika izginjanja kozakov je bila prepoznana tudi na evropskem nivoju, saj sta bili na Prilogo II Direktive o habitatih (Direktiva Sveta 92/43/EC) kot vrsti evropskega varstvenega pomena uvrščeni dve vrsti kozakov, orjaški kozak (*Dytiscus latissimus*) in ovratniški plavač. Zanesljivo se od teh dveh v Sloveniji pojavlja le slednji, ki pa je bil do sedaj znan le iz dveh starejših navedb (Vrezec s sod. 2011), kar še dodatno priča o slabši raziskanosti skupine pri nas.

Rod gladkih plavačev zajema štiri v Sloveniji relativno redke vrste z najpogostejšima vrstama gladkim (*Graphoderus cinereus*) in malim plavačem (*G. austriacus*) (Kajzer 2001, Drovenik 2003). Poleg teh dveh sta bila v Sloveniji potrjena še ovratniški (*G. bilineatus*) in barjanski plavač (*G. zonatus*) (Šerić Jelaska s sod. 2008, Vrezec s sod. 2011). Ovratniški plavač je kot vrsta evropskega varstvenega pomena opredeljen tudi kot kvalifikacijska vrsta dveh posebnih ohranitvenih območij v okviru omrežja Natura 2000 v Sloveniji: SI3000257 Rački ribniki – Požeg (Uradni list RS, št. 49/2004) in SI3000215 Mura (Uradni list RS, št. 33/2013).

V prispevku podajamo zgodovinski pregled pojavljanja vrst rodu *Graphoderus*, pregled recentne razširjenosti vrst glede na intenzivna vzorčenja v zadnjih 10 letih po vsej Sloveniji, posodobljene referenčne tabele (dopolnjeno po Vrezec in Kapla 2007) za obravnavane vrste, opis višinskega razporejanja pogostejših vrst v Sloveniji in opredelitev naravovarstvenega statusa obravnavanih vrst v Sloveniji.

2. Material in metode

Zgodovinski pregled

Za pregled zgodovinske razširjenosti vrst gladkih plavačev v Sloveniji smo uporabili podatke iz zbir in literature, ki pa so zgolj ključne najdbe ali manjše študije in pregledna dela o favni hroščev (Franciscolo 1979, Drovenik 1999, 2002, 2004, Kajzer 2001; Drovenik in Vrezec 2002, Ambrožič s sod. 2005, Šerić Jelaska s sod. 2008). Dodatno smo podatke zbrali tudi iz entomoloških zbir Prirodoslovnega muzeja Slovenije in sicer iz naslednjih zbir: Schmidtova entomološka zbirka, Stussinerjeva entomološka zbirka, Staudacherjeva entomološka zbirka, Gspanova zbirka hroščev ter Osrednja slovenska zbirka hroščev (Savo Brelih). Pregledali smo tudi Entomološko zbirko Gradskog muzeja Varaždin na Hrvaškem. Poleg teh smo pregledali še Koleoptersko zbirko Biološkega inštituta Jovana Hadžija ZRC SAZU (Božidar Drovenik) in dve privatni zbirki hroščev (Alojz Kajzer, Vrezec). Zbrane podatke smo geolocirali z namenom grafičnega prikaza prostorske razširjenosti vrst. Lokacijam, ki niso bile natančno določene s koordinatami smo pripisali nove koordinate, ki smo jih določili ali glede na podan opis lokacije ali pa smo točko umestili v prostor kot centroid najbližjega kraja, kjer je bila vrsta najdena. Nahajališča vrst smo uredili po štirih makroregijah (Alpska, Sredozemska, Dinarska in Panonska makroregija) naravnogeografske regionalizacije Slovenije po Gabrovcu in sod. (Perko in Orožen Adamič 1998) za nadaljnje analize.

Terensko vzorčenje

Sistematične terenske raziskave smo opravili med letoma 2007 in 2014 na območju celotne Slovenije. Potencialne lokacije smo najprej zbrali s pomočjo hidrografskega sloja (DTK25P) na spletni aplikaciji Atlas okolja (gis.arso.gov.si/atlasokolja). Naknadno smo jih na terenu preverili in izbrali najbolj primerne glede na odsotnost ribiške dejavnosti, bližino kmetijskih površin in prisotnost obrežne in vodne vegetacije v vodnem telesu. Izbrane lokacije smo razdelili po naravnogeografskih enotah (Perko in Orožen Adamič 1998). Izjema so območja ob reki Muri, Dravi in Voglajni, kjer je bilo vzorčenje izvedeno bolj na gosto. Izbirali smo predvsem manjša vodna telesa, ki so bila zaraščena z vodno in obrežno vegetacijo. Večji del podatkov je bil zbran v okviru nacionalnega monitoringa hroščev, ko so bile opravljene prve sistematične raziskave vodnih hroščev na območju celotne Slovenije in v sklopu populacijskih raziskav ovratniškega plavača (Vrezec s sod. 2008, 2011, 2012). Dodatne raziskave vodnih hroščev so bile opravljene v okviru raziskav favne hroščev na širšem območju rek Voglajne, Mure in Drave (Vrezec s sod. 2013, 2014, Ambrožič s sod. 2014, 2015).

Vodne hrošče smo vzorčili z uporabo dveh metodoloških pristopov (Vrezec s sod. 2011). Pri metodi vzorčenja z vodnimi pastmi (Brucker s sod., 1995, Lundkvist s sod. 2002, Kalninš 2006, Koese in Cuppen 2006), smo uporabili vrši podobno mrhovinsko past, ki smo jih naredili iz 1,5 l plastenk (Slika 1). Kot atraktant smo uporabili različne vabe (konzervirana in suha mačja hrana, kosi postrvi). Mrhovinsko past smo potopili na dno vodnega telesa. Na vsako lokacijo smo postavili od 10 do 20 pasti. Vzorčenje je trajalo od ene do dveh noči. Ulov smo zabeležili na obrazce in natančneje



Slika 1: Izvedba vodne pasti za vzorčenje vodnih hroščev, zlasti kozakov (Dytiscidae) (foto: Andrej Kapla).

Figure 1: Bottle trap made from a plastic bottle used for sampling water beetles, especially predaceous diving beetles (Coleoptera: Dytiscidae) (photo: Andrej Kapla).

identifikacijo vrst izvedli v laboratoriju. Vzorčenje z vodno mrežo je bila druga uporabljena metoda, kjer smo z mrežo zajemali med vodnim rastlinjem ali po dnu, tako da smo šteli dva do pet zamahov na desetih do trinajstih mikrolokacijah v vodnem telesu in ulov zabeležili za vsako mikrolokacijo (Koesse in Cuppen 2006, Kalman s sod. 2008). Natančnejšo identifikacijo vrst smo izvedli v laboratoriju. Vsa vzorčenja zavarovanih vrst so bila opravljena z dovoljenjem Agencije Republike Slovenije za okolje št. 35601-150/2006-6, ki ga je Nacionalni inštitut za biologijo pridobil za obdobje 2007 – 2011 in št. 35601-75/2012-8 za obdobje 2012 – 2017.

Izračun relativnih gostot in priprava referenčnih tabel

Uporabljeni metodološki pristopi za vzorčenje vodnih hroščev nam omogočajo tudi izračunavanje relativnih abundanc (RA) hroščev, torej indeks abundance (Krebs 1999). Uporabili smo podatke vzorčenja z vodnimi pastmi, kjer je enoto vzorčenja predstavljala lovna noč, ki pomeni ulov ene pasti v eni noči. Izračun relativne abundanc (RA) zato izražamo kot število osebkov / 10 lovnih noči (Vrezec in Kapla 2007):

$$RA = (\text{št. osebkov} \times 10) / (\text{št. pasti} \times \text{št. noči})$$

S podatki te študije smo dopolnili referenčne tabele za vrste rodu *Graphoderus* podane v Vrezec in Kapla (2007). Rezultate smo testirali z Mann-Whitney U testom.

Prostorsko in višinsko razporejanje

Za ponazoritev prostorskega in višinskega razporejanja vrst rodu gladkih plavačev smo vključili sistematično zbrane podatke, ki smo jih pridobili z metodo lova z vodnimi pastmi in mreženjem. Rezultate smo testirali z χ^2 -testom.

3. Rezultati

Zgodovinski pregled razširjenosti vrst

Pred letom 1950 so bili v Sloveniji znani podatki za štiri vrste gladkih plavačev, po letu 1950 pa le tri, saj kljub intenzivnejšemu vzorčenju in večjemu številu podatkov barjanskega plavača (*Graphoderus zonatus*) nismo več potrdili (Tabela 1). Sicer pa sta bili največkrat potrjeni vrsti tako v preteklosti kot danes mali (*G. austriacus*) in gladki plavač (*G. cinereus*) (Tabela 1).

Tabela 1: Število podatkov za štiri vrste gladkih plavačev (*Graphoderus*) v Sloveniji pred in po letu 1950.

Table 1: Number of records for four species of the genus *Graphoderus* in Slovenia collected before and after the year 1950.

Vrsta	Število podatkov do 1950	Število podatkov po 1950
<i>Graphoderus austriacus</i>	7	51
<i>Graphoderus bilineatus</i>	1	2
<i>Graphoderus cinereus</i>	5	87
<i>Graphoderus zonatus</i>	2	0

V nadaljevanju smo podali pregled nahajališč za vse štiri vrste gladkih plavačev in kratke opise posamezne vrste s kartami razširjenosti pred in po letu 1950 kot prispevek k gradivu favne hroščev Slovenije (Breljih s sod. 2003, 2006, 2010; Vienna s sod., 2008). Seznam lokacij, ki zajema vsa najdišča navedena pri posameznih taksonih, je podan v Prilogi 1. Pri navajanju lastnih osebnih in krajevnih imen smo uporabili kratice, ki so obrazložene v Prilogi 2.

***Graphoderus austriacus* (Sturm, 1834) - mali plavač**

Najdišča v Sloveniji:

Slovenija: Slovenija (Gueorguiev V. B. 1971); Carn., 1900, cdJSs, vŠAm.

Alpska regija: Ljubljana, Ljubljana, 15.10.1899, ldcJSd, vŠAm; Ljubljana, Ljubljana, 4.10.1925, ldcJSd, vŠAm; Smrečno, Pohorje, 1986, lAVr, cZVr, dFHe; Mlaka, Kranj, 1988, lcdAKz; Ribnik pri Žepini, Ljubečna, 20.4.2011, ldŠAm.

Dinarska regija: Ljubljansko barje, Ljubljana, 1900, lcAGs, vŠAm; Koseze, Ljubljana, 1930, ldcAGs, rŠAm, Ljubljansko barje, Ljubljana, 22.7.1986, ldcAGs, rŠAm.

Panonska regija: Sevnica, Spodnja Sava, 1900, dcJSs, vŠAm; Sevnica, Spodnja Sava, 1900, ldcAGs, rŠAm; Ledavsko jezero, Ropoča, 18.7.1995, lBDr, cBIS, dFHe; Bobri, Dolnja Bistrica, 15.5.1996, lBDr, cBIS, dFHe; Gaberje pri Lendavi, Lendava,

26.6.2003, IBDr, cBIS, dŠAm; Stari ribnik pri Račah, Maribor, 19.6.2003, IBDr, cBIS, dŠAm; Petišovci, Lendava, 12.8.2010, IAPi, dSBr; Spodnje Krapje, Ljutomer, 15.4.2011, ldŠAm; Veliki ribnik pri Račah, Maribor, 21.4.2011, ldŠAm; Petišovci, Lendava, 3.5.2011, IBSk, dŠAm; Petišovci, Lendava, 4.5.2011, IBSk, dŠAm; Nagy Parlag, Lendava 13.5.2011, IBSk, dŠAm; Muriša, Lendava, 19.5.2011, IBSk, dŠAm; Stara struga Ledave, Lendava, 25.5.2011, IBSk, dŠAm; Muriša, Lendava, 25.5.2011, IBSk, dŠAm; Stara struga Ledave, Lendava, 26.5.2011, IBSk, dŠAm; Spodnje Krapje, Ljutomer, 25.5.2011, ldAVr; Župjek, Kozjansko, 1.6.2011, IMVr, dŠAm; Župjek - peskokop, Kozjansko, 2011, IMVr, dŠAm; Spodnje Krapje, Ljutomer, 29.8.2012, ldŠAm; Ledavsko jezero, Ropoča 30.8.2012, ldŠAm; Gramoznica pri Gederovcih, Radenci 30.8.2012, ldŠAm; Gramoznica Radmožanci, Lendava 31.8.2012, ldŠAm; Spodnje Krapje, Ljutomer, 31.8.2012, ldŠAm; Gramoznica v Velikih Bakovcih, Bakovci, 31.8.2012, ldŠAm; Gramoznica v Malih Bakovcih, Bakovci 31.8.2012, ldŠAm; Ribnik Taškal, Dokležovje 31.8.2012, ldŠAm; Spodnje Krapje, Ljutomer, 22.10.2012, ldŠAm; Spodnje Krapje, Ljutomer, 24.10.2012, ldŠAm; Spodnje Krapje, Ljutomer, 22.8.2013, ldŠAm; Spodnje Krapje, Ljutomer, 17.4.2014, ldŠAm; Spodnje Krapje, Ljutomer, 8.4.2014, ldŠAm; Ormoške lagune, Ormož, 25.4.2014, ldŠAm;



Slika 2: Pregledna karta zgodovinske in današnje razširjenosti malega plavača (*Graphoderus austriacus*) v Sloveniji. S praznimi krogi so označene najdbe pred letom 1950, s polnimi pa podatki o najdbah vrste po letu 1950.

Figure 2: Historical and present distribution of *Graphoderus austriacus* in Slovenia. The empty circles represent records of species before the year 1950, full circles represent records of species after the year 1950.

Ormoške lagune, Ormož, 16.5.2014, ldŠAm; Ormoške lagune, Ormož, 18.6.2014, ldŠAm; Ormoške lagune, Ormož, 10.7.2014, ldŠAm.

Mali plavač je bil po podatkih do leta 1950 razširjen v alpski, dinarski in panonski makroregiji (Slika 2). Po letu 1950 smo vrsto potrdili samo v alpski in panonski makroregiji (Slika 2).

***Graphoderus bilineatus* (De Geer 1774) – ovratniški plavač**

Najdišča v Sloveniji:

Slovenija: Slovenija (Gueorguiev V. B. 1971).

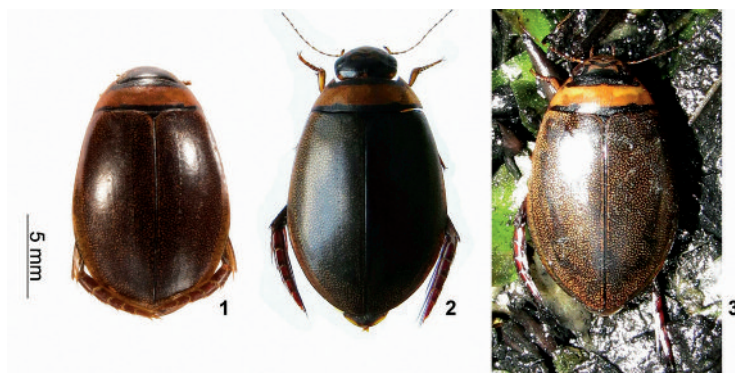
Panonska regija: Rački ribniki, Maribor – Rače, 1936, lcJPe, cCCS, dSBr; Spodnje Krapje, Ljutomer, 15.4.2011, ldŠAm, cZVr; Spodnje Krapje, Ljutomer, 25.5.2011, ldAVr.

Ovratniški plavač je bil po podatkih do leta 1950 potrjen le na območju Rač v okolici Maribora (Drovenik in Pirnat 2003) (Slika 3) po primerku iz leta 1936 (leg. Josef Peyer), ki je shranjen v Osrednji zbirki hroščev Slovenije v Prirodoslovnem



Slika 3: Pregledna karta zgodovinske in današnje razširjenosti ovratniškega plavača (*Graphoderus bilineatus*) v Sloveniji. S praznimi krogci so označene najdbe pred letom 1950, s polnimi pa podatki o najdbah vrste po letu 1950.

Figure 3: Historical and present distribution of *Graphoderus bilineatus* in Slovenia. The empty circles represent records of species before the year 1950, full circles represent records of species after the year 1950.



Slika 4: 1 - Ovratniški plavač (*Graphoderus bilineatus*) iz leta 1936 (leg. Josef Peyer) shranjen v Osrednji zbirki hroščev Slovenije v Prirodoslovnem muzeju Slovenije (foto: Andrej Kapla); 2 - Samica ovratniškega plavača najdena 15. 4. 2011 v gramoznici Spodnje Krapje ob reki Muri in shranjena v zbirki Vrezec (foto: Andrej Kapla); 3 - Samica ovratniškega plavača v gramoznici Spodnje Krapje 25. 5. 2011, ki je bila izpuščena (foto: Damijan Denac).

Figure 4: 1 – Water beetle *Graphoderus bilineatus* collected in year 1936 (leg. Josef Peyer) stored in Central collection of beetles at Slovenian Museum of Natural History (photo: Andrej Kapla); 2 – Female of water beetle *Graphoderus bilineatus* collected on 15.4.2011 in abandoned gravel pit Spodnje Krapje near Mura river and is stored in Vrezec collection (photo: Andrej Kapla); 3 - Female of water beetle *Graphoderus bilineatus* collected on 25.5.2011 in abandoned gravel pit Spodnje Krapje near Mura river, the specimen was released (photo: Damijan Denac).

muzeju Slovenije (Slika 4). V letu 2011 je bila vrsta v Sloveniji ponovno odkrita v zapuščenih gramoznicah pri Spodnjem Krapju ob reki Muri (Slika 5). V letu 2011 smo na lokaciji Spodnje Krapje v aprilu in maju z mrežo ulovili dva osebka ovratniškega plavača (Slika 4). Ujeta samica v aprilu mesecu je shranjena v zbirki Vrezec. Pri nadaljnjih sistematičnih raziskavah med leti 2012 in 2014 pa vrste nismo več potrdili.

***Graphoderus cinereus* (Linnaeus, 1758)**

Najdišča v Sloveniji:

Slovenija: Slovenija (Gueorguiev V. B., 1971).

Alpska regija: Vrbje, Žalec, 26.6.2006, ldAVr, cZVr, rŠAm; Blato na Jelovici, Bohinjska Bistrica, 6.8.2010, ldŠAm, cZVr.

Sredozemska regija: Goče, Vipava, 3.4.1988, ldSBr, cCCS; Dobravlje pri Tomaju, Sežana, 4.6.2002, lBDr, cBIS, dŠAm; Gračišče, Kubeč, 12.8.2008, ldAVr, cZVR; Škocjanski zatok, Koper, 29.5.2012, 20.7.2012 ISPo, cNMPO, dAKz.

Dinarska regija: Ljubljansko barje, Ljubljana, 1910, lMHa, cCCS, dSBr; Mali plac, Bevke, 7.4.2011, ldŠAm; Ribniki pri Vrhniku, Vrhnika, 7.4.2011, ldŠAm.

Panonska regija: Kostanjevica na Krki, Brežice, 1907, lMHa, cCCS, dSBr; Kostanjevica na Krki, Brežice, 1908, lMHa, cCCS, dSBr; Okolica Maribora, 1924, ldHerić, cEzGV; Rački ribniki, Maribor – Rače, 1936, lJPe, cCCS, dSBr; Maribor -



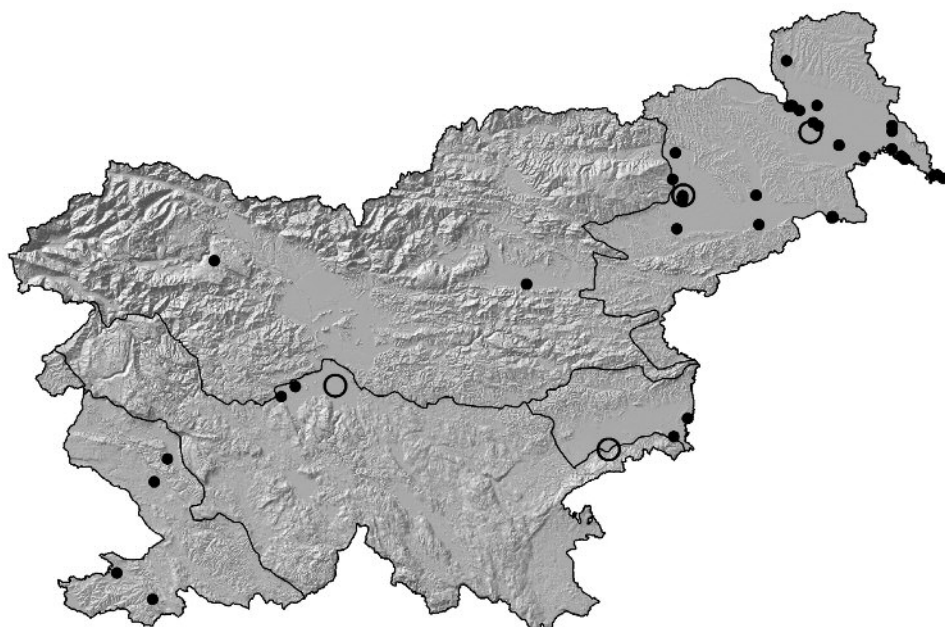
Slika 5: Opuščena gramoznica v sistemu gramoznic Siget, Spodnje Krapje ob Muri, v kateri je bil 15. 4. 2011 najden ovratniški plavač (*Graphoderus bilineatus*) (foto: Špela Ambrožič).

Figure 5: Abandoned gravel pit Spodnje Krapje near Mura river is within system of gravel pits Siget, in which the water beetle *Graphoderus bilineatus* was confirmed on 15 April 2011 (photo: Špela Ambrožič).

okolica (ob Muri), 1936 IJPe, cCCS, dSBr; Pušča, Murska Sobota, 24.5.1992, lcdAKz; Petanjci, Radenci, 24.5.1996, ISto, cCCS, dSBr; Zaton, Petanjci, 15.4.1996, IBDr, cBIS, dFHe; Gaberje pri Lendavi, Lendava, 26.6.2003, IBDr, cBIS, dŠAm; Stari ribniki pri Račah, Maribor, 19.6.2003, IBDr, cBIS, dŠAm; Bobri, Dolnja Bistrica, 4.7.2008 ldAVr, cZVr, vŠAm; Medvedce, Slovenska Bistrica, 8.6.2008, ldAVr, cZVr, vŠAm; Petišovci, Lendava, 4.7.2008, ldAVr, cZVr, vŠAm; Petišovci, Lendava, 2.4.7.2008, ldAVr, cZVr, vŠAm; Spodnje Krapje, Ljutomer, 15.4.2011, ldŠAm, cZVr; Veliki ribnik pri Račah, Maribor, 21.4.2011 ldŠAm; Ribniki pri Slivnici, Maribor, 21.4.2011, ldŠAm; Petišovci, Lendava, 3.5.2011, IBSk, dŠAm; Muriša, Lendava, 5.5.2011, IBSk, dŠAm; Muriša, Lendava, 6.5.2011, IBSk, dŠAm; Nagy Parlag, Lendava, 10.5.2011, IBSk, dŠAm; Nagy Parlag, Lendava, 13.5.2011, IBSk, dŠAm; Nagy Parlag, Lendava, 14.5.2011, IBSk, dŠAm; Zaton, Petanjci, 15.4.2011, ldŠAm; Muriša, Lendava, 19.5.2011, IBSk, dŠAm; Muriša, Lendava, 20.5.2011, IBSk, dŠAm; Stara struga Ledave, Lendava, 25.5.2011, IBSk, dŠAm; Murska šuma, Lendava, 25.5.2011, IBSk, dŠAm; Stara struga Ledave, Lendava, 26.5.2011, IBSk, dŠAm; Murska šuma, Lendava, 26.5.2011, IBSk, dŠAm; Spodnje Krapje, Ljutomer, 18.6.2011, ldAVr, cZVr; Jovsi, Brežice, 23.6.2011, IBSk, dŠAm; Medvedce, Slovenska Bistrica, 3.10.2011, ldŠAm; Spodnje Krapje, Ljutomer,

22.8.2013, IdŠAm; Ledavsko jezero, Ropoča 30.8.2012, IdŠAm; Gramoznica Radmožanci, Lendava, 31.8.2012, IdŠAm; Spodnje Krapje, Ljutomer, 31.8.2012, IdŠAm; Gramoznica v Velikih Bakovcih, Bakovci, 31.8.2012, IdŠAm; Gramoznica v Malih Bakovcih, Bakovci, 31.8.2012, IdŠAm; Mrtvica Prilipe, Brežice, 12.9.2012, IdŠAm; Mali ribnik pri Račah, Maribor, 21.9.2012, IdŠAm; Spodnje Krapje, Ljutomer, 24.10.2012, IdŠAm; Tišina, Murski Petrovci, 25.4.2013, IdŠAm; Dolnji Petanjci, Petanjci, 9.5.2013, IdŠAm; Spodnje Krapje, Ljutomer, 22.8.2013, IdŠAm; Spodnje Krapje, Ljutomer, 17.4.2014, IdŠAm; Veliki ribnik pri Podvincih, Ptuj, 30.4.2014, IŠAm, dAKa; Ormoške lagune, Ormož, 25.4.2014, IdŠAm; Šturmovci, Ptuj, 30.4.2014, IŠAm, dAKa Ormoške lagune, Ormož, 15.5.2014, IdŠAm; Spodnje Krapje, Ljutomer, 21.5.2014, IdŠAm; Spodnje Krapje, Ljutomer, 13.6.2014, IdŠAm; Ormoške lagune, Ormož, 18.6.2014, IdŠAm; Ormoške lagune, Ormož, 10.7.2014, IdŠAm; Spodnje Krapje, Ljutomer, 17.7.2014, IŠAm, dAKa; Ormoške lagune, Ormož, 27.8.2014, IŠAm, dAKa; Spodnje Krapje, Ljutomer, 28.8.2014, IdŠAm.

Gladki plavač je bil po zbranih podatkih do leta 1950 razširjen v alpski in panonski regiji (Slika 6). Po letu 1950 smo vrsto potrdili v vseh makroregijah v Sloveniji (Slika 6).



Slika 6: Pregledna karta zgodovinske in današnje razširjenosti gladkega plavača (*Graphoderus cinereus*) v Sloveniji. S praznimi krogci so označene najdbe pred letom 1950, s polnimi pa podatki o najdbah vrste po letu 1950.

Figure 6: Historical and present distribution of *Graphoderus cinereus* in Slovenia. The empty circles represent records of the species before the year 1950, full circles represent records of species after the year 1950.



Slika 7: Pregledna karta zgodovinske razširjenosti barjanskega plavača (*Graphoderus zonatus*) v Sloveniji. S praznimi krogi so označene najdbe pred letom 1950.

Figure 7: Historical and present distribution of *Graphoderus zonatus* in Slovenia. The empty circles represent records of the species before the year 1950.

***Graphoderus zonatus* (Hoppe 1795) – barjanski plavač**

Najdišča v Sloveniji:

Slovenija: Slovenija (Gueorguiev V. B. 1971).

Alpska regija: Okolica Celja, 1926 (leg. Herić), cEzGV, dR. Košćec.

Panonska regija: Okolica Maribora, 1923, 1925, (leg. Herić), cEzGV, dR. Košćec.

Barjanski plavač je bil pred letom 1950 zabeležen v okolici Maribora leta 1923 in 1925 (leg. Herić) in Celja v letu 1926 (leg. Herić) (Šerić Jelaska s sod. 2008). Primerki so shranjeni v Entomološki zbirki Gradskog muzeja Varaždin (Slika 8). Vrste po letu 1950 v Sloveniji nismo več potrdili (Slika 7).

3.2 Prostorsko in višinsko razporejanje

V letih 2007 do 2014 smo opravili sistematična vzorčenja po celotni Sloveniji. Za ugotavljanje prostorskega razporejanja populacij glede na relativne gostote smo uporabili podatke vzorčenja z vodnimi pastmi od leta 2008 do 2014. Vzorčili smo na 191 lokacijah. Za namene ugotavljanja prostorskega in višinskega razporejanja populacij smo uporabili podatke vzorčenja z vodnimi pastmi in z mrežo od leta 2007 do 2014, skupno 208 lokacij.



Slika 8: Barjanski plavač (*Graphoderus zonatus*) iz okolice Maribora (inventarna št. 8536) najden med leti 1923-1925 (leg. Herić). Primerek je shranjen v Entomološki zbirki Gradskog muzeja Varaždin (foto: L. Šerić-Jelaska).

Figure 8: Specimen of water beetle *Graphoderus zonatus* collected around Maribor between 1923 and 1925 by Herić (inventory number 8.536). Specimen is stored in Entomological collection of the Varaždin City Museum (photo: L. Šerić-Jelaska).

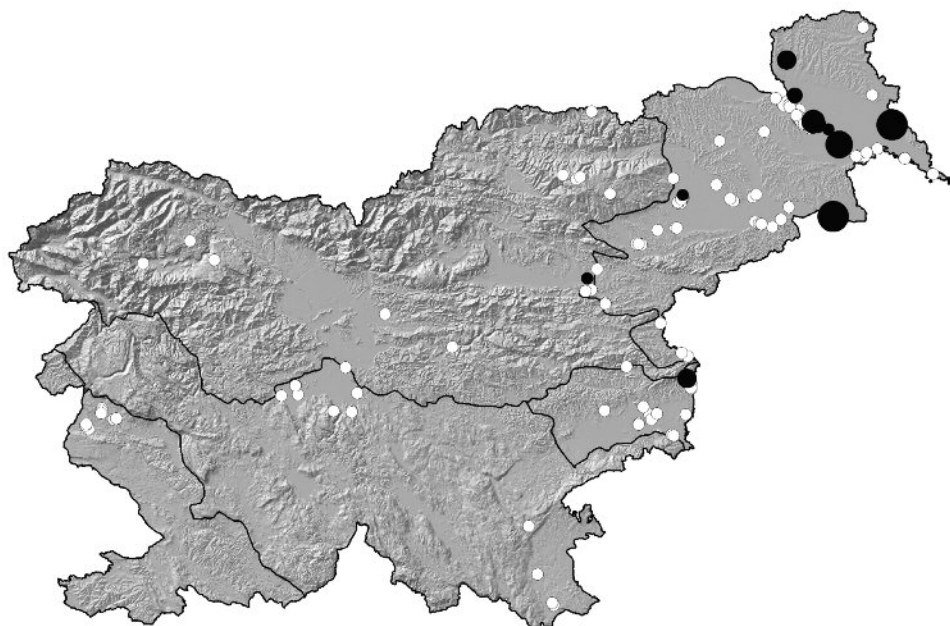
Glede na referenčne tabele relativnih abundanc izračunane na podlagi podatkov vzorčenja z vodnimi pastmi gladki plavač lokalno dosega višje gostote kot mali plavač (Tabela 2), a razlike med gostotami zaradi podobnosti median niso statistično značilne (Mann-Whitney $U=387,5$; $p > 0,05$).

Tabela 2: Referenčna tabela relativnih abundanc (RA) za malega (*Graphoderus austriacus*) in gladkega plavača (*G. cinereus*) ugotovljenih z vzorčenjem z vodnimi pastmi v Sloveniji.

Table 2: Reference table of relative abundances (RA) for *Graphoderus austriacus* and *G. cinereus* detected by sampling with bottle traps in Slovenia.

Vrsta	RA (št. osebkov / 10 lovnih noči)			
	Mediana	Q1-Q3	Maksimum	Št. lokacij
<i>Graphoderus austriacus</i>	1,50	0,78-3,13	7,00	23
<i>Graphoderus cinereus</i>	1,50	1,00-5,57	80,00	39

Mali plavač je bil prisoten v alpski in panonski makroregiji, vendar statistično nismo potrdili razlik med številom najdb med makroregijama glede na frekvenco vzorčenj ($\chi^2 = 2,65$; $p > 0,05$). Najvišje gostote za malega plavača smo potrdili na območju Ormoških lagun ob reki Dravi (Slika 9).



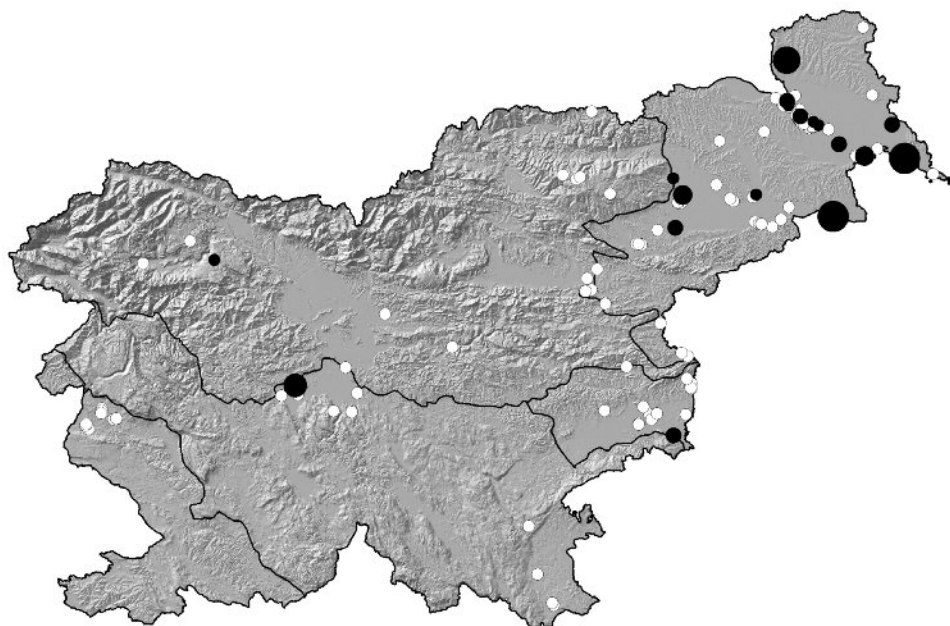
Slika 9: Prostorska razporejenost populacije malega plavača (*Graphoderus austriacus*) glede na relativne gostote vrste ugotovljene v Sloveniji med letoma 2008 in 2014. Beli krogi prikazujejo izvedbo metode brez potrditve vrste, črni krogi označujejo prisotnost vrste z izračunanimi gostotami.

Figure 9: The spatial distribution of *Graphoderus austriacus* population in Slovenia according to the relative densities sampled between 2008 and 2014. White dots indicate the execution method without species detection, the black dots indicate the presence of species with the calculated density.

Gladki plavač je bil prisoten v alpski, dinarski in panonski makroregiji, vendar razlik med številom najdb med makroregijami glede na frekvenco vzorčenj statistično nismo potrdili ($\chi^2 = 2,65$; $p > 0,05$). Najvišje gostote gladkega plavača smo potrdili na območju Ormoških lagun ob reki Dravi (Slika 10).

Gladki plavač je v Sloveniji najbolj pogosta vrsta iz rodu *Graphoderus*, saj smo ga potrdili na 50 lokacijah v Sloveniji, medtem ko malega plavača, drugo najpogostejšo vrsto pri nas, na zgolj 28 lokacijah od skupno 208 lokacij ($\chi^2 = 4,69$ $p < 0,05$).

Med letoma 2007 in 2014 smo pregledali 208 vzorčnih mest, ki so bila razporejena v višinskem razponu do 1 do 1519 m n.v. (Tabela 3). Ugotovili smo, da sta bila mali in gladki plavač največkrat potrjena na nadmorskih višinah okrog 200 metrov (Tabela 3), kjer je bilo tudi največ vzorčnih mest. Gladkega plavača smo sicer potrdili tudi na nadmorski višini 1042 m n.v. (Tabela 3).



Slika 10: Prostorska razporejenost populacije gladkega plavača (*Graphoderus cinereus*) glede na relativne gostote vrste ugotovljene v Sloveniji med letoma 2008 in 2014. Beli krogi prikazujejo izvedbo metode brez potrditve vrste, črni krogi označujejo prisotnost vrste z izračunanimi gostotami.

Figure 10: The spatial distribution of *Graphoderus cinereus* population in Slovenia according to the relative densities sampled between 2008 and 2014. White dots indicate the execution method without species detection, the black dots indicate the presence of species with the calculated density.

Tabela 3: Višinska razširjenost malega (*Graphoderus austriacus*) in gladkega plavača (*G. cinereus*) v Sloveniji glede na vzorčenja med letoma 2007 in 2014.

Table 3: Altitudinal distribution of *Graphoderus austriacus* and *G. cinereus* in Slovenia according to field samplings between 2007 and 2014.

	Med	Min	Max	Q1-Q3	Število lokacij
Vzorčna mesta	190	1	1519	175-250	208
<i>Graphoderus austriacus</i>	184	163	258	175-185	28
<i>Graphoderus cinereus</i>	185	1	1042	175-208	50

4. Razprava

V prispevku smo podali zgodovinski pregled podatkov o pojavljanju vrst rodu *Graphoderus* do leta 1950. Glede na zgodovinske podatke lahko sklepamo, da sta bila

mali in gladki plavač tudi v preteklosti bolj številčna in bolj razširjena kot ovratniški in barjanski plavač. Malega in gladkega plavača lahko opredelimo kot splošno razširjeni, vendar relativno redki vrsti, saj smo ju potrdili na manj kot 25 % pregledanih vzorčnih mest. Čeprav ju nismo potrdili v vseh regijah, je to morda posledica manjšega napora vzorčenja, saj se po številu najdb glede na napor vzorčenja regije med seboj niso razlikovale. Verjetnost najdb se seveda povečuje s povečanjem napora vzorčenja (Krebs 1999). Ovratniškega plavača smo sicer v Sloveniji ponovno potrdili, vendar trenutno le na eni lokaciji na območju reke Mure. Da je vrsta zares redka in da se tudi sicer pojavlja v zelo nizkem številu, priča podatek iz intenzivne raziskave združbe kozakov (Dytiscidae) na Švedskem, kjer so med 184 ujetimi hrošči iz rodu *Graphoderus* ujeli le en osebek ovratniškega plavača (Lundkvist s sod. 2002). Pred sistematičnimi raziskavami vodnih teles v Sloveniji je veljala domneva, da gre pri ovratniškem plavaču pri nas morda za izumrlo vrsto, saj je bil edini znani podatek starejši kot 100 let (Drovenik in Pirnat 2003, Vrezec s sod. 2011). V sosednjih državah je vrsta redka. Na Madžarskem je vrsta razširjena na poplavnih nižinah rek Bodrog, Tisza in Drava (Kalman s sod. 2007, 2008, Soós s sod. 2008, Kalman s sod. 2011), ravno tako na Hrvaškem v Kopačkem Ritu v nižinskem delu reke Drave ob meji z Madžarsko (Temunović s sod. 2011). Cuppen s sod. (2006) navaja vrsto tudi za Avstrijo in Italijo, recentne najdbe pa so znane tudi na Hrvaškem in v Srbiji (Kajzer 2001). V Sloveniji barjanskega plavača tekom intenzivnih terenskih raziskav nismo potrdili, zato lahko sklepamo, da gre pri nas za domnevno izumrlo vrsto. Vrsta je sicer bolj pogosta v severni Evropi (Lundkvist s sod. 2002).

Glede na pridobljene podatke smo ugotovili, da mali in gladki plavač pretežno naseljujeta nižje nadmorske višine (do 300 m), čeprav smo gladkega plavača potrdili tudi na nadmorski višini nad 1000 m n.v., mali plavač pa je bil vsaj v preteklosti najden na višinah prek 800 m n.v. (zbirka Vrezec). Težišče vzročnih mest v Sloveniji je bilo med 200 in 400 m nadmorske višine, kjer je v Sloveniji tudi največ ustreznih vodnih teles, ki so vezana predvsem na nižinska poplavna območja ob večjih rekah, predvsem reki Mura in Drava.

Na Rdeči seznam hroščev (Uradni list RS, št. 82/02) je uvrščenih pet vrst vodnih hroščev, vendar le ena vrsta iz rodu gladkih plavačev. Vodni hrošči so vse bolj ogroženi zaradi uničevanja mrtvic, gozdnih ribnikov oziroma mlak, ribolovne dejavnosti na nižinskih vodnih telesih, vnosa tujerodnih vrst rib, uničevanja vodnih ekosistemov (sekanje obrežne in odstranjevanje vodne vegetacije) ter intenzifikacije kmetijstva in s tem onesnaževanja vodnih okolij. Pregled zgodovinskih podatkov in sistematične raziskave v zadnjih desetih letih so dale ustrezne podlage za natančnejšo kategorizacijo ogroženosti gladkih plavačev, na podlagi česar smo pripravili revizijo Rdečega seznama (Tabela 4).

Tabela 4: Pregled statusa ogroženosti gladkih plavačev (*Graphoderus*) na trenutnem Rdečem seznamu ogroženih vrst Slovenije (Uradni list RS, št. 82/02) s predlogom revizije kategorij ogroženosti.

Table 4: Threat categories of species of the genus *Graphoderus* in Slovenia with an overview of current status (Uradni list RS, št. 82/02) and new proposal.

Vrsta	Trenutna kategorija ogroženosti RS	Predlagana kategorija ogroženosti RS
<i>Graphoderus austriacus</i>	-	R
<i>Graphoderus bilineatus</i>	K	E
<i>Graphoderus cinereus</i>	-	R
<i>Graphoderus zonatus</i>	-	Ex?

Mali (*Graphoderus austriacus*) in gladki plavač (*Graphoderus cinereus*) sta sicer v Sloveniji splošno razširjeni vrsti, vendar relativno redki. To pomeni, da lahko s stopnjevanjem degradacije okolja hitro preideta v višje stopnje ogroženosti. Zato predlagamo, da se ju doda na Rdeči seznam hroščev in se jima dodeli kategorijo ogroženosti **redka vrsta (R)** (Tabela 4).

Barjanskega plavača (*Graphoderus zonatus*) kljub intenzivnejšim raziskavam v Sloveniji v zadnjem obdobju nismo več potrdili. Vrsta je po podatkih iz literature še vedno prisotna na Hrvaškem in v Srbiji (Kajzer 2001), zato predlagamo, da se vrsto doda na Rdeči seznam hroščev in se ji opredeli kategorijo ogroženosti kot **domnevno izumrle vrste (Ex?)** (Tabela 4).

Ovratniški plavač (*Graphoderus bilineatus*) je na Rdečem seznamu označena kot premalo poznana vrsta (**K**). Cuppen s sod. (2006) navaja, da je ovratniški plavač redka vrsta po celotni Evropi in da v zahodni in srednji Evropi številčnost upada. Izkazalo se je, da so med vodnimi hrošči najbolj občutljive na spremembe vrste, ki so značilne za kisle in z nutrienti revne mlake ter vrste velikih, bogato zaraslih mezo- do evtrofnih stoječih voda v poplavnih območjih rek (Gerend 2003). Ekološko ovratniški plavač ustreza obema tipoma, zato njegova redkost ni presenetljiva. Hendrich in Balke (2000) navajata, da je vrsta po Evropi razširjena v osenčenih stoječih vodah s čisto vodo, v gozdnih barjanskih mlakah, tudi gramoznicah. Glede na intenzivna vzorčenja ovratniški plavač v novejšem času ni bil več potrjen v Račkih ribnikih, po letu 2011 pa ga kljub nekaj ponovljenim poskusom vzorčenja nismo več potrdili v Spodnjem Krapju niti kje drugje ob reki Muri. Ali je vrsta na območju Mure zares izginila ali ne, bodo pokazala nadaljnja vzorčenja, zagotovo pa gre za v Sloveniji **prizadeto vrsto (E)** (Tabela 4).

Ovratniški plavač je malo mobilna vrsta, ki potrebuje sklenjene komplekse vodnih teles (Iversen s sod. 2013). Zato je pomembno ohranjati povezanost vodnih okolij in ne samo varovati posamezna izbrana vodna telesa. Zaradi tega so potrebni učinkoviti ukrepi varovanja habitata vrste na območju reke Mure. Vrsta kljub intenzivnim raziskavam ob rekah Muri in Dravi (Vrezec s sod. 2013, 2014, Ambrožič s sod. 2015) ni bila odkrita, kar kaže, da gre zgolj še za izolirane maloštevilne ostanke populacije, vrsta pa je pri nas verjetno na robu izumrtja. Ovratniškemu plavaču je bolj kot mikrohabitatni vidik pomemben krajinski vidik, ki zajema povezanost kompleksa vodnih teles, kar je za tako slabo mobilno vrsto zelo pomembno (Iversen s sod. 2013). Zaradi redkosti in slabe mobilnosti in s tem velike ogroženosti vrste je potrebno za

ohranjanje populacije nujno vzpostaviti ustrezen varstveni režim na območjih, kjer se vrsta pojavlja. Zato je glede na trenutno védenje potrebno sistemu gramoznic Siget pri Spodnjih Krapjah določiti status zavarovanega območja, izvzeti območje iz ribiškega upravljanja in z varstvenim režimom prepovedati vse potencialno škodljive posege v prostor, ki bi imeli za posledico poslabšanje ugodnega stanja habitata za vrsto. Lokacija sicer leži znotraj Natura 2000 območja SI3000215 Mura, vendar trenutni ukrepi varstva na območju niso zadostni za učinkovito ohranjanje habitata in populacije ovratniškega plavača, ki brez strožjih varstvenih režimov niso možni. Zaradi predlaganega statusa ogroženosti v Sloveniji in mednarodne pomembnosti menimo, da je edini ustrezen ukrep varstva vodnih teles, kjer se potrdi prisotnost vrste, ukrep varstva zavarovanje območja s strožjim režimom varstva, kot je naravni ali celo strogi naravni rezervat. Poleg tega predlagamo, da se na vseh vodnih telesih ob rekah Muri in Dravi, ki so na varovanih območjih (bodisi zavarovanih ali območjih Natura 2000), ali so namenjena renaturaciji oziroma ohranjanju biodiverzitete, dosledno upoštevajo habitatne zahteve ovratniškega plavača, s čimer bo mogoče izboljšati stanje habitata vrste in njeno večjo populacijsko stabilnost v Sloveniji. Verjetno pa bo za dolgoročno ohranitev vrste pri nas potrebno po renaturacijah izvesti še doseljevanje oziroma reintrodukcijo vrste iz bližnjih, zlasti hrvaških nahajališč, kjer naj bi bil ovratniški plavač še dokaj številen (Temunović s sod. 2011).

Zahvale

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Priloga 1: Lokacije**Lokacija:** Najdišče vrste**UTM:** kvadrat UTM 10 x 10 km**NMV:** nadmorska višina**Makroregija:** Naravnogeografska makroregija

Lokacija	UTM	NMV	Makroregija
Blato na Jelovici, Bohinjska Bistrica	VM22	1042	Alpska
Bobri, Dolnja Bistrica	WM95	169	Panonska
Črni les, Turnišče	XM06	162	Panonska
Dobravlje pri Tomaju, Sežana	VL16	320	Sredozemska
Dolnji Petanjci, Petanjci	WM86	195	Panonska
Gaberje pri Lendavi, Lendava	XM05	163	Panonska
Goče, Vipava	VL17	274	Sredozemska
Gračišče, Kubed	VL13	275	Sredozemska
Gramoznica pri Gederovcih, Radenci	WM86	199	Panonska
Gramoznica Radmožanci, Lendava	XM06	163	Panonska
Gramoznica v Malih Bakovcih, Bakovci	WM86	187	Panonska
Jovski, Brežice	WL58	144	Panonska
Koseze, Ljubljana	VM50	304	Alpska
Kostanjevica na Krki, Brežice	WL37	149	Panonska
Ledavsko jezero, Ropoča	WM77	220	Panonska
Ljubljana, Ljubljana	VL69	299	Alpska
Ljubljansko barje, Ljubljana	VL69	288	Dinarska
Mali plac, Bevke	VL59	297	Dinarska
Mali ribnik pri Račah, Maribor	WM54	257	Panonska
Maribor - okolica (ob Muri)	WM86	186	Panonska
Medvedce, Slovenska Bistrica	WM53	242	Panonska
Mlaka, Kranj	VM52	406	Alpska
Mrtvica Prilipe, Brežice	WL48	140	Panonska
Muriša, Lendava	XM14	153	Panonska
Murska šuma, Lendava	XM14	152	Panonska
Nagy Parlag, Lendava	XM05	160	Panonska
Okolica Celje	WM22	291	Panonska
Okolica Maribora	WM54	259	Panonska
Ormoške lagune, Ormož	WM93	185	Panonska
Petanjci, Radenci	WM86	198	Panonska
Petišovci, Lendava	XM15	159	Panonska
Pušča, Murska Sobota	WM86	190	Panonska
Rački ribniki, Maribor-Rače	WM54	257	Panonska
Ribnik pri Žepini, Ljubečna	WM22	252	Alpska
Ribnik Taškal, Dokležovje	WM96	181	Panonska
Ribniki pri Slivnici, Maribor	WM44	278	Panonska
Ribniki pri Vrhniku, Vrhnika	VL49	289	Dinarska

Lokacija	UTM	NMV	Regija
Sevnica, Spodnja Sava	WL29	192	Panonska
Smrečno, Pohorje	WM34	811	Alpska
Spodnje Krapje, Ljutomer	WM95	175	Panonska
Stara struga Ledave, Lendava	XM24	151	Panonska
Stari ribnik pri Račah, Maribor	WM54	257	Panonska
Škocjanski zatok, Koper	VL04	1	Sredozemska
Šturmovci, Ptuj	WM73	211	Panonska
Tišina, Murski Petrovci	WM86	200	Panonska
Veliki ribnik pri Podvincih, Ptuj	WM74	220	Panonska
Veliki ribnik pri Račah, Maribor	WM54	258	Panonska
Vrbje, Žalec	WM12	255	Alpska
Zaton, Petanjci	WM86	199	Panonska
Župjek, Kozjansko	WL59	187	Panonska
Župjek-peskokop, Kozjansko	WL59	187	Panonska

Priloga 2: Kratice

V pregledu in seznamu nahajališč smo uporabili kratice za osebna imena in imena zbirk, ki so razložene v naslednjem seznamu:

c – collectio, zbirka

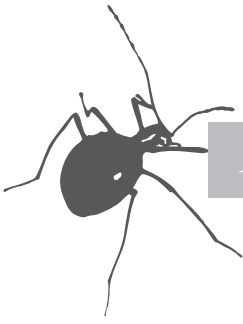
d – determinatio, določil

l – legit, zbral

r – redeterminatio, na novo določil

v – videl, pregledal, potrdil

AGs	Alfonz Gspan
AKa	Andrej Kapla
AKz	Alojz Kajzer
APi	Alja Pirnat
AVr	Al Vrezec
BIS	Koleopterska zbirka Biološkega inštituta Jovana Hadžija ZRC SAZU
Bsk	Barbara Skaberne
Carn.	Carniola
CCS	Osrednja zbirka hroščev Slovenije, Prirodoslovni muzej Slovenije
DBo	Dejan Bordjan
EzGV	Entomološka zbirka Gradskog muzeja Varaždin
FHe	Franz Hebauer
IBe	Irena Bertoncej
IEr	Ivo Ergaver
JPe	Josef Peyer
JSd	Josef Staudacher
JSs	Josef Stussiner
BDr	Božidar Drovenik
MHa	Mate Hafner
MVr	Martin Vernik
NMPO	Notranjskega muzeja Postojna
SBr	Savo Brelih
SPo	Slavko Polak
STo	Staša Tome
ŠAm	Špela Ambrožič
TJa	Tina Jaklič
ZVr	Zbirka Vrezec



**PARAPROPUS JASMINKOI SP. N., A NEW LEPTODIRINE BEETLE
(COLEOPTERA: LEIODIDAE, CHOLEVINAE)
FROM BOSNIA AND HERZEGOVINA**

Slavko POLAK

Notranjski muzej Postojna, Kolodvorska c. 3, SI-6230 Postojna, Slovenia

Abstract – New species of leptodirine beetle *Parapropus jasminkoi* sp.n. is described from Otlovića pečina on Černica planina in Northern Bosnia. Identification key to similar small species that share short pronotum, *P. brevicollis* Müller, *P. nonveilleri* Müller and *P. vitorogensis* Čurčić S., Pešić & Čurčić B.P.M. is provided.

KEY WORDS: Leptodirini, *Parapropus*, new species, troglobiont, Bosnia and Herzegovina.

Izvleček – *PARAPROPUS JASMINKOI* SP. N., NOVA VRSTA HROŠČA PODZEMLARJA (COLEOPTERA: LEIODIDAE, CHOLEVINAE) IZ BOSNE IN HERCEGOVINE

Opisana je nova vrsta hrošča podzemlarja *Parapropus jasminkoi* sp.n., odkrita v jami Otlovića pečina na planini Černica v severni Bosni. Podan je ključ za določanje podobnih vrst tega rodu, *P. brevicollis* Müller, *P. nonveilleri* Müller in *P. vitorogensis* Čurčić S., Pešić in Čurčić B.P.M., za katere je značilen kratek ovratnik.

KLJUČNE BESEDE: Leptodirini, *Parapropus*, nova vrsta, troglobiont, Bosna in Hercegovina.

Introduction

Soon after discovery and description of the first cave beetle *Leptodirus hohenwartii* from Postojnska jama by Ferdinand Schmidt on 1832 (Polak, 2005), he found and described similar species under the name *Leptoderus sericeus* (Schmidt, 1852), from Slugova jama in Dolenjsko region in Slovenia. Later Hampe (1870) described another species *Leptoderus intermedius* from caves near Ozalj in Croatia.

Ganglbauer (1899) established a new genus name *Parapropus* for this species and described third species *P. ganglbaueri* from caves near Glamoč in Western Bosnia. After that more new species and subspecies of the genus *Parapropus* have been discovered and described (Apfelbeck, 1907, 1908; Müller, 1911a, b, c; Reitter, 1914). On the basis of *Parapropus* specimens collected in Dragišica pećina near Smoljana by Leander Pfeifer (Sarajevo), Müller (1911a) described *P. brevicollis*. In his short description without figures, he noticed small size (4 mm) and pronotum only slightly longer than wide which is, as well as the short head, densely and strongly punctuated and densely pubescent. He did not describe genital structures. First revision, more or less still respected today was Jeannel's (1924) who recognised five species, among them *P. sericeus* with five subspecies and *P. ganglbaueri* with two subspecies. Later Müller (1937) described additional species *P. insignis* and *P. nonveilleri* from cave Trljica near Mlinišće in NW Bosnia and *P. s. augustae* from Cerovačke pećine near Gračac in Croatia (Müller, 1941). He reviewed taxonomical significance of morphological characters used by Jeannel and noticed informal group "brevicollis" consisted of two small species, *P. brevicollis* and *P. nonveilleri*, both with short pronotum. On the basis of material preserved in collection of Karel Absolon three additional subspecies were described (Absolon & Mařan, 1943). Quite recently, the last species *P. vitorogensis* (Ćurčić et al., 2012) had been described from the Vaganska pećina near Šipovo, Mt. Vitorog in NW Bosnia, with statement of its close relation to the small "brevicollis" group of species. Currently eight *Parapropus* species are known, among them *P. sericeus* with nine subspecies and *P. ganglbaueri* with five subspecies distributed from southern Dinaric part of Slovenia, through Croatia to north and western part of Bosnia and Herzegovina (Pretner, 1968; Perreau, 2000; Ćurčić et al., 2012).

Materials and methods

We visited Dragišica pećina and nearby Ciganska pećina in 2004 and Trljica pećina and nearby Jama Trljica in 2007 and succeeded to collect topotypic material of two similar small species that share short pronotum. In summer 2015, Jasminko Mulaomerović from Sarajevo gave me a specimen of an unknown leptodirine beetle collected in Otlovića pećina in Čemernica planina. Accompanied by young speleologists Ivan Napotnik and Mirko Vidović from Banja Luka, we visited Otlovića pećina and collected additional specimens described in this paper as a new *Parapropus* species. Studying recently collected specimens from Otlovića pećina it became evident that the new species belongs to informal "brevicollis" group as well. Unfortunately we did not obtain *P. vitorogensis* specimens and in this study we referenced and used data from Ćurčić et al. (2012).

Beside the type series of new species, declared under new species description section, following specimens were studied, some of them dissected.

Parapropus brevicollis; Ciganska pećina, Smoljana, Bosanski Petrovac (Muratovac), B&H, 2 ♂♂, 2 ♀♀, 19.7.2004, Polak, S. & Trontelj, P. leg.

Parapropus nonveilleri; Jama Trljica, kod Trljica pećine, Mlinišče, Mrkonjić Grad, B&H, 19.4.2007, 5 ♂♂, 5 ♀♀, Polak, S. & Mihevc, A. leg.

Parapropus sericeus simplicipes; Mačkića pećina, Sitnica, Ključ, B&H, 5 ♂♂, 5 ♀♀, 20.7.2004, Polak, S. & Trontelj, P. leg.

Parapropus sericeus muelleri; Hrustovača, Hrustovo, Sanski Most, B&H, 5 ♂♂, 5 ♀♀, 14.7.2007, Polak, S. & Mihevc, A. leg.

Parapropus sericeus sericeus; Slugova jama, Dolnji Globodol, Slovenia, 2 ♂♂, 2 ♀♀, 11.4.2007, Polak, S. leg.

Parapropus pfeiferi; Pećina uz Sanu, G. Kamičak, Sanski Most, B&H, 5 ♂♂, 5 ♀♀, 25.7.2004, Polak, S. & Trontelj, P. leg.

Part of the specimens were prepared as classical dried museum specimens. Some of selected specimens were dissected and studied under the microscope. Specimens were macerated in not heated 10 % KOH for 8 hours, washed in pure water and dehydrogenated in increasing ethanol concentration (50 – 96%). In concentrated ethanol specimens were dissected and studied, measured and photographed using Leica MZ7.5 stereomicroscope (0.63-5.0x). Significant morphological parts as antennae, protarsi and genital parts have been separated and immersed in glycerine or Solakryl BMX on microscope glass slides. Details have been studied, measured and photographed using Euromex ME2665 microscope (10x04, 10x10, 10x40). The photographs have been made using Nikon Coolpix 4500 digital camera and measured using “Image J” software program. Digital microscopic images were finalised to figures using Adobe Photoshop and CorelDRAW software programs. All measurements are in millimetres (mm). Voucher specimens of studied species, pinned dry and on microscopic slides, are deposited in the collection of Notranjska museum Postojna (NMPO). Two paratype specimens are deposited in Zemaljski muzej Bosne i Hercegovine in Sarajevo as stated in species description.

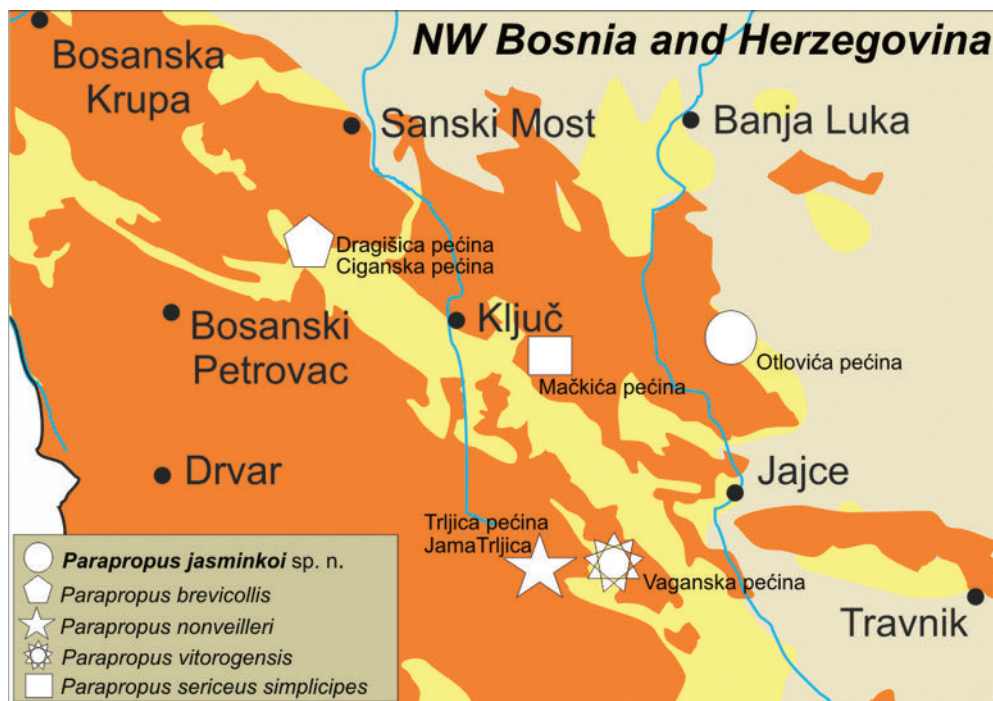
Parapropus jasminkoi sp.n.

Type locality: Otlovića pećina (= Pećina na Visu), Marići, Otlovići, on the eastern slope of Čemernica planina on right bank of Vrbas river (not Čemernica near Glamoč), Kneževo, Republic of Srpska, Bosnia and Herzegovina (Map).

Type series:

Holotype (HT): ♂, Otlovića pećina, Marići, Čemernica pl., Kneževo, BiH; 26.7.2015, Polak, S. leg. Pinned dry, locality printed on white label; *Parapropus jasminkoi* sp.n. HOLOTYPE, printed on red label, deposited in Notranjska museum Postojna, Slovenia (Inv. No. NMPO: C-4533),

Paratypes (PT): 1 ♂, 6 ♀, same data as holotype, pinned dry, partly dissected (right antennae, protarsi, genital segments) preserved on microscope slides, locality printed on white labels; *Parapropus jasminkoi* sp.n. PARATYPE, printed on yellow labels, deposited in Notranjska museum Postojna, Slovenia (Inv. No. NMPO: C-4534, 4535, 4536, 4537, 4538, 4539, 4540).



Map: Map of NW Bosnia and Herzegovina with distribution of *Parapropus* “brevicollis” group of species and *Parapropus sericeus simplicipes* as the geographically closest species to the *P. jasminkoi* sp. n. (Map after Milanolo).

1 ♀, same data as holotype and 1 ♂, Otlovića pećina, Marići, Čemernica pl., Knežev, BIH; 24.3.2011, Napotnik, I. & Friščić J. leg, pinned dry, not dissected, locality printed on white label, *Parapropus jasminkoi* sp.n. PARATYPE pinned on yellow labels, deposited in Entomological collection, Zemaljski muzej Bosne i Hercegovine, Sarajevo.

Diagnosis: *Parapropus jasminkoi* sp. n. differs from most other *Parapropus* species by smaller body size (less than 4.9 mm) and pronotum only slightly longer than wide (index pronotum length/pronotum width less than 1.25) except for the species *P. brevicollis*, *P. nonveilleri* and *P. vitorogensis* which are of similar size and have similar pronotum outline (Figs. 3 – 8). From those, new species clearly differs by male 1st protarsomere which is of prolonged trapezoidal shape, 1.70 – 1.81 times longer than wide (long 25 % of total male protarsi length) (Fig. 18) and female 1st protarsomere short (long 26 % of total female protarsi length) (Fig. 17). Among other *Parapropus* species new species has unique shape of male aedeagus that is in dorsal view widest at the apex (Fig. 21), tegmen in lateral view strongly curved on the apical half (Fig. 22), inner sac (endophallus) of median lobe without significant sclerotised



Fig. 1: *Parapropus jasminkoi* sp.n. in Otlovića pećina (Photo: S. Polak).

structures, only with well developed strong stylus in basal part and paramere apex with three long, equally strong setae (Fig. 23).

Description: Habitus leptodiroid as in Figs. 1, 2. Total body length (BL – measured with head in natural position) 4.10–4.40 mm in ♂♂ and 4.20–4.49 mm in ♀♀. Colour yellowish in young individuals or reddish-brown (Fig. 1), antennae and legs same colour.

Head rounded, slightly less wide than pronotum, covered with decumbent pale pubescence. Mouthparts as in other *Parapropus* not specialised for hydropetric style of filtering water. Antennae inserted in the middle of the head. Antennae total length (AtL – from scape to terminal segment), 4.59 – 4.66 mm in ♂♂ (longer than body), 3.78 – 3.80 mm in ♀♀ (shorter than body).

Lengths of antennomeres (AmL in mm)

♂♂: 0.21; 0.33; 0.35; 0.40; 0.45; 0.47; 0.50;
0.40; 0.49; 0.44; 0.56

♀♀: 0.21; 0.30; 0.28; 0.34; 0.42; 0.40; 0.40;
0.32; 0.38; 0.33; 0.42

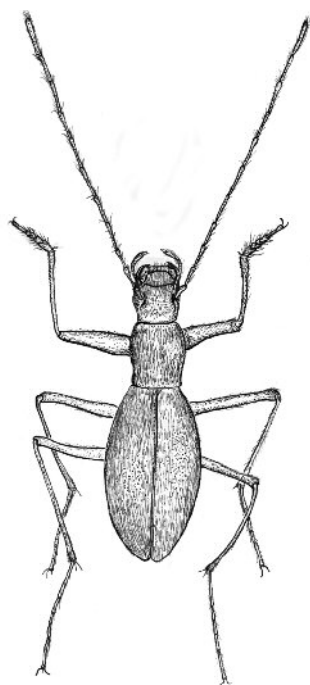


Fig. 2: *Parapropus jasminkoi* sp.n ♂
HOLOTYPE habitus.

Antennomere ratio (AtL / AmL in %)

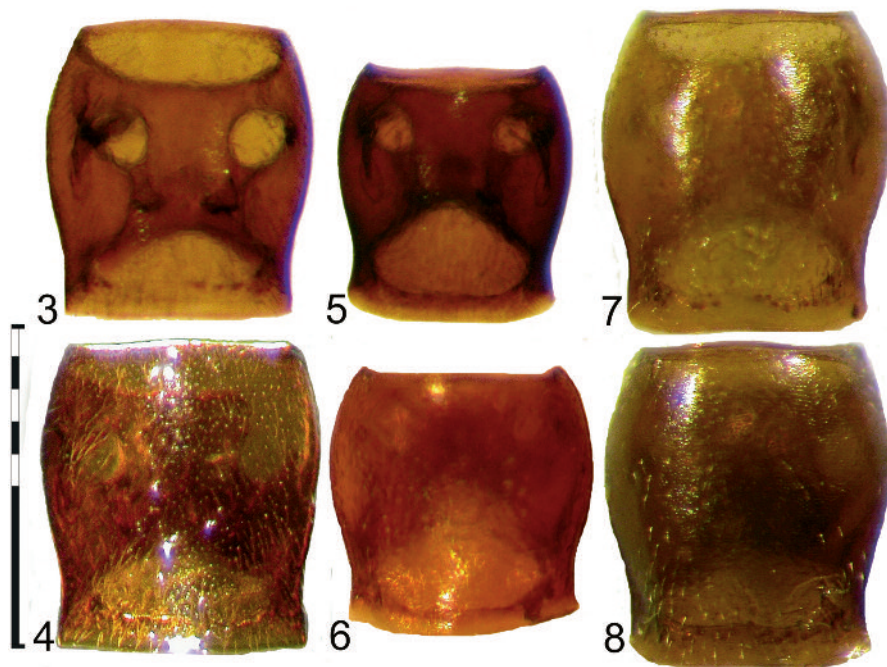
♂♂: 4.58; 6.85; 7.67; 8.74; 10.48; 9.86; 10.70; 8.83; 10.57; 9.67; 12.05

♀♀: 5.61; 7.70; 7.38; 8.62; 11.32; 10.61; 10.45; 8.44; 10.26; 8.67; 10.95

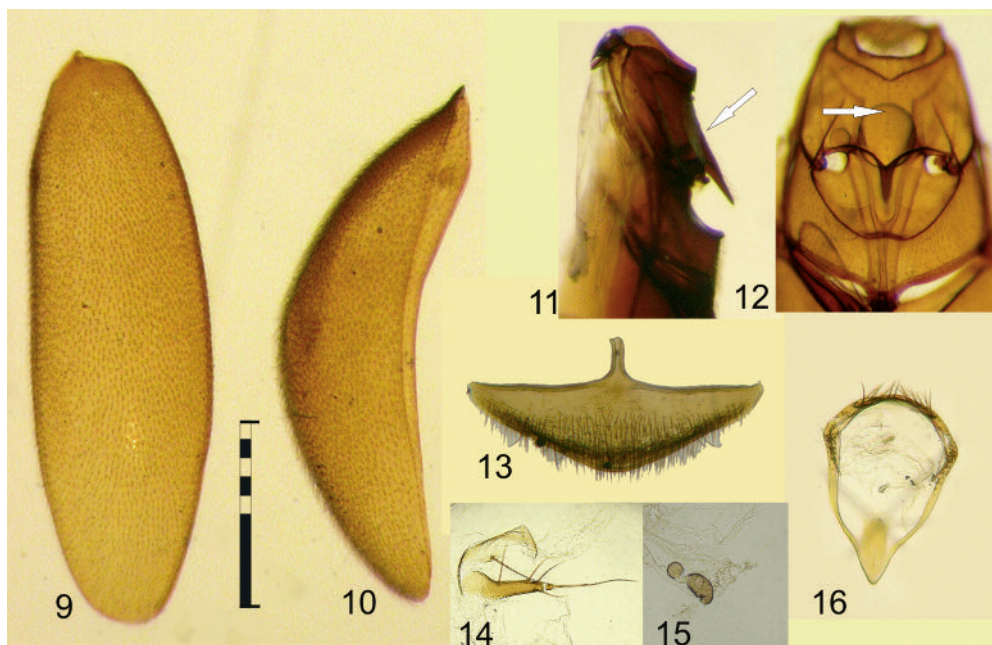
Ratio Antennae total length (AtL) / body length (BL): 1.06 – 1.12 in ♂♂, 0.87 – 0.91 in ♀♀.

Pronotum in dorsal view slightly longer than wide, maximal length (PL) 0.89–0.96 mm in ♂♂, 0.88–0.99 mm in ♀♀, maximal width (PW) 0.79 – 0.83 mm in ♂♂, 0.81 – 0.92 mm in ♀♀. Index PL / PW 1.12 – 1.17 in ♂♂ and 1.02 – 1.21 ♀♀. Lateral edge rounded on anterior half, only slightly sinuate concave in posterior half (♂ Fig. 3; ♀ Fig. 4), maximal width on anterior third. Punctuation and pubescence on dorsal face of pronotum evident, sparse, decumbent and regular on the whole pronotum.

Elytra elongate-ovate, strongly convex in ♂♂ and ♀♀ (Figs. 9, 10), maximum width approximately in the middle of elytra length, covered with pale, short, fine, dense pubescence on whole surface. Elytra length (EL) 2.65 – 3.07 mm in ♂♂, 2.92 – 3.15 mm in ♀♀. Elytra width (EW) 1.40 – 1.50 mm in ♂♂, 1.45 – 1.58 mm in ♀♀.



Figs. 3 – 8: Pronotum in dorsal view, 3 – *P. jasminkoi* sp.n. ♂; 4 – *P. jasminkoi* sp.n. ♀; 5 – *P. brevicollis* ♂; 6 – *P. brevicollis* ♀; 7 – *P. nonveilleri* ♂; 8 – *P. nonveilleri* ♀. (Scale bar = 1.0 mm).



Figs. 9 – 16: *Parapropus jasminkoi* sp.n., 9 – elytra ♂ dorsal view; 10 – elytra ♂ lateral view (slightly bent artificially); 11 – ♀ mesosternum in lateral view; 12 – ♂ mesosternum in ventral view, arrow indicates mesosternal carina; 13 – ♀ ventrite VIII; 14 – ♀ genital segment – ventrite IX; 15 – spermatheca; 16 – ♂ genital segment. (Figs. 9, 10, 11, 12 Scale bar = 1.0 mm; Figs. 13, 14, 16 Scale bar = 0.5 mm; Fig. 15 Scale bar = 0.1 mm).

Mesothorax, abdomen: Mesocoxal cavities strongly confluent (Figs. 11, 12). Mesosternal carina not elevated (absent), limited to the central line of strong, backwards curved bristles on the mesosternum and prolonged to the strong and straight dent protruding to the middle of mesocoxal cavities. Ventrite VIII at ♀♀ simple, apically strongly pubescent, with narrow, short and straight median expansion on anterior edge (Fig. 13).

Legs long and slender (Figs. 1, 2), covered with sparse decumbent pubescence. Femora straight, weakly widened at the base. Tibiae slim and straight, slightly curved inwards, strongly pubescent. Apex of protibia armed with trident spur on inner side. Apex of mesotibiae and metatibiae armed with 2 long spurs on inner side. Male protarsi 5-segmented, protarsomeres I – III significantly dilated (Fig. 18), female protarsi 4-segmented (Fig. 17) not dilated. All tarsomeres strongly chaetose, laterally with long bristles. Tarsal empodium bisetose. Claws long, sharp, not dilated (Figs. 17, 18).

♂♂ protarsomere length in mm (TL): 0.17; 0.13; 0.12; 0.11; 0.29
 Total length in natural tarsomere overlapping position TtL = 0.72

- ♂♂ protarsomere ratio (TL / TtL in %): 25.63; 20.59; 15.97; 18.07; 41.60
 ♂♂ protarsomere length / width ratio (TL / TW): 1.70 – 1.81; 1.41 – 1.58; 1.65 – 1.179; 2.13 – 2.43; 4.92 – 5.03
 ♀♀ protarsomere length in mm (TL): 0.15; 0.09; 0.12; 0.27
 Total length in natural tarsomere overlapping position TtL = 0.58
 ♀♀ protarsomere ratio (TL / TtL in %): 26.16; 16.01; 19.97; 47.16

Male genitalia: Aedeagus in dorsal view (Fig. 21) 0.86–0.98 mm long, straight and wide, widest and rounded at the apex. Aedeagus in lateral view (Fig. 22) wide, moderately curved at the apical third of length. Median lobe apex in lateral view finishes with short, sharp curved beak (Fig. 22). Inner sac (endophallus) of median lobe without significant sclerotised structures only with well developed strong stylus in basal part. Parameres strong, of same length as median lobe, laterally flattened, parallel with median lobe curves, curved inwards apically, armed with three equally strong setae; one apical and two preapical (one external and one internal respectively) (Fig. 23). Male genital segment reduced to angulated ring (Fig. 16), with long, slim sclerotised lateral processes and with wide triangular apophysis on ventral side.

Female genitalia: Genital segment – ventrite IX (urite) normally developed, with one long bristle on gonocoxites and in gonostylus three bristles laterally and one longest apically (Fig. 14). Spermatheca bi-bulbose (Fig.15), strongly sclerotised on proximal and on rounded distal part.



Figs. 17 – 20: Right protarsi, 17 – *P. jasminkoi* sp.n. ♀; 18 – *P. jasminkoi* sp.n. ♂; 19 – *P. brevicollis* ♂; 20 – *P. nonveilleri* ♂. (Scale bar = 1.0 mm).



Figs. 21 – 29: Aedeagus, 21 – *P. jasminkoi* sp.n. dorsal view (arrow indicates stylus); 22 – *P. jasminkoi* sp.n. lateral view; 23 – *P. jasminkoi* sp.n. paramere apex; 24 – *P. brevicollis* dorsal view; 25 – *P. brevicollis* lateral view; 26 – *P. brevicollis* paramere apex; 27 – *P. nonveilleri* dorsal view; 28 – *P. nonveilleri* lateral view; 29 – *P. nonveilleri* paramere apex (Figs. 21, 22, 24, 25, 27, 28 Scale bar =1.0 mm; Figs. 23, 26, 29. Scale bar = 0.5 mm).

Geographical distribution: So far the new species is known only from the type locality Otlovića pećina (= Pećina na Visu) (described in: Dujaković, G. 2004), Otlovići, Marići, Kneževo, Republic of Srpska, Bosna and Herzegovina (Fig. 30). Otlovića pećina is situated on the eastern slope of Čemernica planina near to the road Kneževo (ex Skender Vakuf) to Banja Luka, on right bank of Vrbas river. Type locality is situated about 64 km SE from Ciganska pećina (SW edge of Grmeč planina) where *P. brevicollis* and *P. neumanni* live and about 53 km NE from Trljica pećina with *P. nonveilleri* and *P. insignis* and from Vaganska pećina where *P. vitorogensis* was found. The closest other *Parapropus* species is *P. sericeus simplicipes* from Mačkića pećina (Manjača planina, left bank of Vrbas river) which is situated about 30 km W from Otlovići pećina (Fig. 30). Mountain Čemernica planina seems to be geographically isolated from other *Parapropus* species localities. Presence of *P. jasminkoi* sp. n. is to be expected in this mountain from other cavities as well.

Bionomy (ecology): Specimens of the new species were collected on wet flowstone deposits in the deeper part of Otlovića pećina in total darkness together with numerous leptodirine *Adelopidius* cf. *kuchtae* Breit.

Etymology: New species is named after Dr. Jasminko Mulaomerović from Sarajevo (Centar za Krš i Speleologiju), the tireless promoter of speleology and karstology in Bosnia and Herzegovina.

Identification key to the *Parapropus* “brevicollis” group of species

1. Pronotum in dorsal view slightly longer than wide, index pronotum length / pronotum width less than 1.25. Punctuation and pubescence on pronotum regular and evident on the whole pronotum. Smaller species, total body length less than 4.9 mm 2 (“brevicollis” group)
 - Pronotum in dorsal view more or less elongated, index pronotum length/pronotum width more than 1.26. Punctuation and pubescence on pronotum weak and not equal, sometimes almost absent. Bigger species, total body length more than 5.0 mm other species (*P. sericeus* Schmidt, *ganglbaueri* Ganglbauer, *pfeiferi* Apfelbeck, *neumanni* Müller, *insignis* Müller)
2. Pronotum lateral edges in dorsal view strongly rounded on anterior edge and deeply sinusoid on posterior edge (Figs. 5, 6). Male anterior 1st protarsomere elongated, weakly dilated (Fig. 19), 3.36 – 3.48 times longer than wide. Long 28.5 % of total male protarse length. Female 1st protarsomere long, long 37 % of total female protarse length. Aedeagus in dorsal view widest at the middle part (Fig. 24), tegmen in lateral view strongly curved on the middle part (Fig. 25). Antennomere VIII equally long as antennomere IX. Small species (4.0 mm)..... *brevicollis* Müller
 - Pronotum lateral edges in dorsal view less strongly rounded on anterior edge and less sinusoid on posterior edge (Figs. 3, 4, 7, 8). Male anterior tarsi strongly dilated (Figs. 18, 20). Antennomere VIII shorter than antennomere IV. Bigger species (4.1 – 4.75 mm)..... 3.
3. Male 1st protarsomere prolonged trapezoidal (Fig. 18), 1.7 – 1.8 times longer than wide. Long 25 % of total male protarse length. Female 1st protarsomere short (Fig. 17), long only 26 % of total female protarse length. Aedeagus in dorsal view widest at the apex (Fig. 21), tegmen in lateral view strongly curved on the apical half (Fig. 22), paramere apex with three long, equally strong setae..... *jasminkoi* sp. n.
 - Male aedeagus tegmen in lateral view straight, weakly curved in basal half (Fig. 28), parameres strongly flattened laterally, armed with one strong widest apical seta, one inner thin short and one outer long in pre-apical position (Fig. 29).....4.

4. Male 1st protarsomere prolonged elliptical, 2.26 – 2.39 times longer than wide, equally broad as tibia apex. Long 29 % of total male protarsomere length (Fig. 20). Female 1st protarsomere long, more than 39 % of total female protarsomere length. Aedeagus as in Figs. 27, 28, 29..... *nonveilleri* Müller
- Male 1st protarsomere 2.20 times longer than wide, broader than the tibia apex (according to original description) *vitorogensis* Ćurčić S., Pešić & B.P.M. Ćurčić

Discussion

With description of new *Parapropus* species and subspecies since Jeannel's monograph (1924), taxonomy and systematics of this genus became rather chaotic. It is evident that at least three groups of taxa exist; "sericeus" group on NW part of the genus distribution and "ganglbaueri" on SE part of genus distribution. These two groups meet directly in NW Bosnia where the third group "brevicollis" is present and morphological characters used by Jeannel are mixed here. From this reason serious morphologic revision, supported by molecular phylogenetic methods, is critically needed. Since we did not yet obtain specimens of all described taxa, in this paper we were therefore limited to description of the new species. We described for the first time particular morphological characters of *P. brevicollis* and *P. nonveilleri* needed to put new species into the context.

Despite similarities in size and pronotum dimensions it seems that informal group "brevicollis" is not phylogenetic one. Species *P. brevicollis* and *P. jasminkoi* sp.n. seems to be closely related, sharing together shape of aedeagus, lack of internal sclerotised structures in endophallus and presence of evident stylus in basal part of tegmen as well as the equally strong setae on paramere apex. In contrary, closely related species *P. nonveilleri* and *P. vitorogensis* have aedeagus much more similar to other groups of *Parapropus* species, making relative shortening of pronotum a result of probable homoplasy. From this reason proposed identification key to "brevicollis" species have to be considered provisional until all *Parapropus* species will be revised.

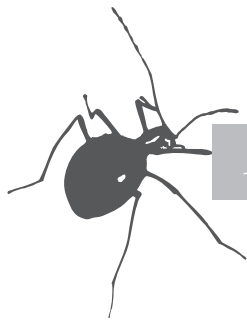
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**NEW CICADA SPECIES OF THE GENUS *GUYALNA*
(HEMIPTERA: CICADIDAE) FROM BRAZIL**

Matija GOGALA¹, Katja ŠPORAR², Allen F. SANBORN³
and Douglas H. B. MACCAGNAN⁴

¹ Slovenian Academy of Sciences and Arts, Novi trg 3, Ljubljana, Slovenia;
e-mail: matija.gogala@guest.arnes.si

² European Neuroscience Institute (ENI), Grisebachstraße 5, 37077 Göttingen;
e-mail: sporarkatja@gmail.com

³ Department of Biology, Barry University, Miami Shores, USA;
e-mail: asanborn@barry.edu

⁴ Universidade Estadual de Goiás - Câmpus Iporá, Brazil;
e-mail: douglas.hbm@ueg.br

Abstract – During the XXIV International BioAcoustic Congress (IBAC) in Pirenópolis, Brazil, two of us (MG and KŠ) found, recorded sounds and collected small cicadas, belonging to the genus *Guyalna* (Cicadidae, Fidicinini). After a comparison with other taxa of this genus, it is evident that we found a new species, which we are describing and naming *Guyalna nadae* sp. nova.

KEY WORDS: Fidicinini, Guyalnina, new species, Neotropics, Acoustics.

Izveleček – NOVA VRSTA ŠKRŽADA IZ RODU *GUYALNA* (HEMIPTERA: CICADIDAE) IZ BRAZILIJE

Dva izmed avtorjev (MG in KŠ) sva se udeležila Mednarodnega bioakustičnega kongresa (XXIV. IBAC) v Pirenópolisu, Brazilija. Takrat sva posnela napeve in tudi ujela majhne škržade, ki pripadajo rodu *Guyalna* (Cicadidae, Fidicinini). Po primerjavi z drugimi vrstami tega rodu se je pokazalo, da sva našla novo vrsto, ki jo v članku opisujemo in imenujemo *Guyalna nadae* sp. nova.

KLJUČNE BESEDE: Fidicinini, Guyalnina, nova vrsta, neotropska regija, akustika.

Introduction

In September 2013 two of us (MG and KŠ) visited Pirenópolis, Brazil, to attend the XXIV International BioAcoustic Congress (IBAC). This scientific meeting was devoted to bioacoustics and, therefore, we had with us the equipment for studies in animal acoustics. During our stay we observed, recorded and collected small cicadas that were later determined to be a new species belonging to the genus *Guyalna* Boulard & Martinelli 1996.

During the process of reviewing the original manuscript it turned out that one of the reviewers has additional material (specimens, sound recordings) about this new species, therefore we invited him (D.H.B. Maccagnan) to be coauthor of this paper.

Material and Methods

The exact locality, where we found these cicadas, is the hotel Pousada dos Pireneus, Pirenópolis, State of Goiás, Brazil. The geographic coordinates of the type locality are 15° 50.6'S, 48° 57.5'W. The type series consists of 2 females and one male of this species collected in this location. However, recently it turned out that additional material of this species exists in the collection of the Universidade Estadual de Goiás, Câmpus Iporá, which is reported below as additional material after the type series.

For acoustic recording we used an ultrasonic detector Pettersson D-200 (heterodyne system) with a Pettersson electret microphone (frequency range 10–120 kHz), mounted in a Renault R-4 front light reflector and connected to the solid state recorder Zoom H2 (sampling rate up to 96 kHz). Recordings of D.H.B. Maccagnan (see appendix) were made with a recorder Marantz PMD-660 or PMD-670 and a microphone Sennheiser ME66/K6.

For sound analyses we used Amadeus Pro 2.0 (HairerSoft), Raven 1.4 (Cornell) and Seewave package (Sueur et al. 2008) as a part of R software platform (R Development Core Team 2008) on a MacBook Pro computer. We first localized cicadas acoustically and then collected them with an entomological net.

Morphological investigations were made on dry prepared specimens. However, for the detailed analysis of a male genital capsule we pulled it out and isolated it after KOH treatment. The photographs of genitalia and some other structures were made with the multifocus system Leitz at the laboratory of the Jovan Hadži Institute of Biology (Scientific Research Centre of the Slovenian Academy of Sciences and Arts).

Morphological terminology follows Moulds (2005). Measurements were taken using Screen Ruler 4.1 with the photographs of the specimens and/or with the calibrated ocular micrometer in the WILD MZ8 stereo microscope. The type material is deposited in the collection of the Slovenian Museum of Natural History (PMSL). Song recordings are deposited in the Slovenian Wildlife Sound Archive of the same museum.

Results

Guyalna nadae sp. nova

Etymology

The species is dedicated to Prof. Nada Gogala, the wife of one of the authors (MG) and the grandmother of another (KŠ), who also took part in the field investigations in Pirenópolis, Brazil and sadly passed away just a couple of month later after returning home to Slovenia.

Morphology

The following material is available: Brazil, Goiás, Pirenópolis, 15° 50.6'S, 48° 57.5'W, 10. 9. 2013, K. Šporar, M. Gogala leg. (Holotype ♂, 2♀ paratypes).

Additional material: Brazil, Goiás, Iporá (Morro do Macaco), 30. 7. 2011, D.H.B. Maccagnan leg. (1♀) (CE-UEG 224). Brazil, Goiás, Iporá, 29.9.2011, D.H.B. Maccagnan leg. (4♂) (CE-UEG 225-228). Brazil, Goiás, Iporá, 16° 24.73'S, 51° 10.44'W, 14. 9. 2015, D.H.B. Maccagnan leg. (10♂, 2♀) (CE-UEG 234-244 and 253). Brazil, Goiás, Iporá, 16° 24.73'S, 51° 10.44'W, 27. 8. 2015, D.H.B. Maccagnan leg. (5♂, 3♀) (CE-UEG 245-252). Brazil, Goiás, Diorama, 21. 8. 2013, D.H.B. Maccagnan leg. (4♀) (CE-UEG 229-232). Brazil, Goiás, Diorama, 16° 14.85'S, 51° 16.93', Cerrado Stricto Sensu, Ligth Trap, 20. 9. 2013, D.H.B. Maccagnan leg. (1♀) (CE-UEG 233).

The body length of *Guyalna nadae* sp. nova is 13.5 mm in the male and 12.9 and 13.6 mm in the females (Figs. 1, 2). Measurements were made only on type material.

The ground colour of the body is dark brown to pale yellow marked with black.

The **head** is wider than mesonotum, dark brown, black transverse mark across vertex enclosing ocelli extending around medial margin of eye to black behind the eye. Dorsal head with short silvery and golden pile, longer posterior to eye. Ocelli red, eyes ochraceous. The head width is 5.9 mm for males and 5.6 – 5.8 mm for females. Width of the eyes seen from above is 1.4 mm and the distance between the eyes 3.4 mm. Ventral head with black fascia between postclypeus and eye. The postclypeus is dark brown, centrally sulcate with transverse ridges pale yellow, a black median fascia on dorsal surface that extends along the ventral side of the postclypeus. The anteclypeus is also dark brown with the exception of the median yellow keel. Rostrum dark brown with a black tip reaching sternite III in males or the middle of sternite V in females (Fig. 6). Antennal segments black, flagellum dark brown.

The **pronotum** is trapezoidal with straight lateral part of pronotal collar, brown with ochraceous anterior margin, with black marks on either side of midline or black band along the midline (see Figs. 12, 13), anterior mark pyramidal, medial mark extending into paramedian fissure, posterior transverse mark across midline, black mark within lateral fissure encircling scute as it continues through ambient fissure, which extends laterally across lateral pronotal collar (Figs. 1, 2, 8). Width of pronotum is 5.8 (♂) and 5.5 mm (♀) and the anterior width 4.5 mm (♂) and 4.3 mm (♀). The

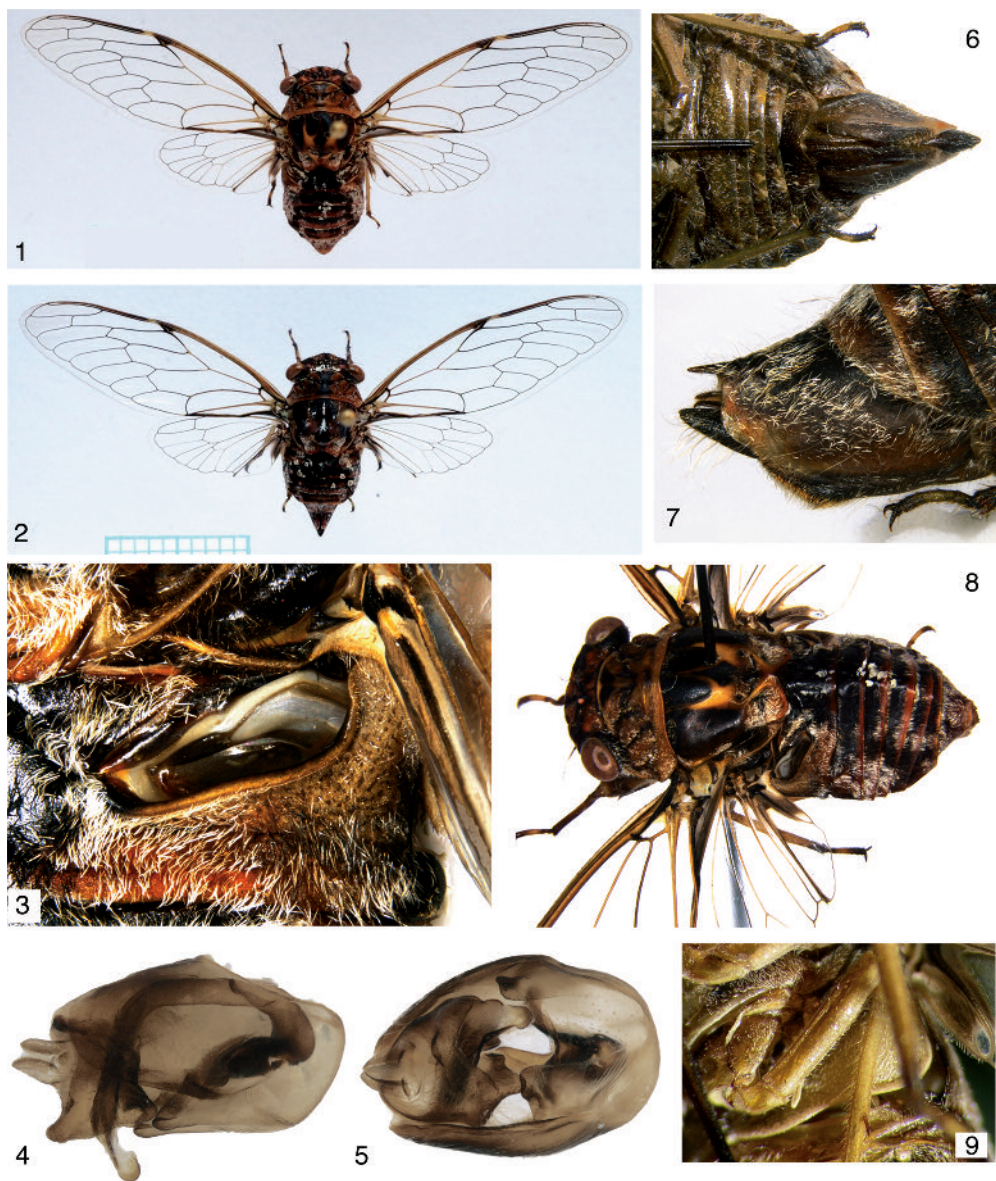
length of the pronotum is 2.2 (♂) and 2.1 (♀) mm. The **mesonotum** is dark brown with orange yellow markings between lateral and submedian sigilla (Fig. 8). This orange yellow coloration also surrounds the submedian sigilla with the exception of the brown middle deltoid field in front of the cruciform elevation and anterior half of lateral surface. Sigillae, lateral margin, and scutal depressions black. The **cruciform elevation** (scutellum) is also yellow darker on posterior with black transverse mark between anterior arms and laterally between anterior and posterior arms. Wing groove dark brown with ochraceous lateral margin. Mesonotum with short silvery pile along anterior margin and laterally, longer pile between arms of cruciform elevation and in wing groove (Fig. 8). **Metanotum** black, laterally yellow. Ventral thoracic segments dark brown with lighter margins covered with short white pubescence.

The fore **wings** (tegmina) are slender and much longer than the hind wings (Figs. 1, 2). The length of tegmina in males is 19.6 and in females 19.6 – 19.7 and the width 6.5 (♂) and 6.4 mm (♀). The length-width ratio of the tegmina is 3 (♂) and 3.1 (♀). The length of the hind wings is 9.4 mm (♂) and 9.9 mm (♀). The number of **apical cells** is 8 in the fore wings and 6 in the hind wings. Fore and hind wings hyaline, venation black except ochraceous costal margin, proximal median vein almost to node, proximal median vein 3+4, proximal cubitus anterior, proximal cubitus posterior+anal vein 1, and spot on costal margin just distal to node. Cubitus anterior curving forming arched cubital cell. Hind wing venation similarly colored. Basal membranes grayish black.

The **legs** are pale yellow, coxae and femora darker, tawny around the tibio-tarsal joints and distal tarsus and do not differ in the sexes. Fore femora with three spines, ochraceous primary spine angled, ochraceous secondary spine largest and upright with small, black, upright tertiary spine. Pretarsal claws tawny with setiform parempodia. Legs with short white pile, tibial spurs and tibial combs castaneous.

Operculum yellow, in the form of right triangle with rounded posterolateral angles, with sinuate posterior margin, barely covering tympanal cavity, covered with short white pubescence (Fig. 9). Medial margin rounded not reaching midline. **Meracanthus** is yellow, more or less triangular, very long in females, with outer lateral edges folded ventrally (Fig. 9). The female operculum reaches medially only to meracanthus. Basal part black.

Timbal has a large timbal plate with 2 long ribs and is partly covered by the timbal cover (Fig. 3). Tergites of the **abdomen** are black with the posterior margins castaneous. Tergites covered with long silvery and black pile, silvery pile more dense laterally and posteriorly, golden pile centrally especially on the anterior tergites. Black pile forms an arch on dorsum. Timbal cover tawny, incomplete exposing timbal dorsally, anterior margin curled posteriorly, straight to anterior extension, black along anterior margin of timbal cavity, anterior apex semicircular, ventral margin slightly angled ventrally. Abdominal sternites are more or less brown to yellow covered with short white and also golden pile. Sternites and epipleurites are anteriorly darker. Sternite VIII in males much shorter (0.6x) than sternite VII. The structure of the female genitalia is seen in Figs 6 and 7. Female sternite VII with single medial notch, posterior margin straight, angled to curved lateral posterior margins. Female abdominal segment



Figs 1-9: 1 - *Guyalna nadae* sp. nova habitus male; 2 - *Guyalna nadae* sp. nova habitus female, same scale; 3 - right timbal with timbal cover; 4 - male genital segment, treated with KOH, lateral view; 5 - idem, ventral view; 6 - female ventrum with terminalia and tip of the rostrum; 7 - idem, lateral view; 8 - latero-dorsal view of the male holotype; 9 - male, sternum with the left operculum and meracanthus. Figures 3 - 8 made with the Leitz multifocus system.

9 black dorsally and along ventral medial margins, dark brown laterally, ochraceous posteriorly, covered with long silvery pile, dense golden pile on posteroventral margin. Dorsal beak extending just beyond black anal styles. Posterior margin of abdominal segment 9 sinuate.

The **male genital segment** is shown in Figs 4 and 5. Pygofer black with rounded distal shoulder, dorsal beak absent. Pygofer upper lobe flattened against pygofer, pygofer basal lobe flattened with straight apex. Median uncus lobes short, recurved dorsally and rounded at terminus. Lateral uncus lobes curving under median uncus lobes, lateral margin curving away from median uncus lobe, posterior margin with curved extension under median uncus lobe, medial margins angled toward midline. Aedeagus strongly curved with a long basal plate attached at the lower lobe of the pygofer.

Female gonocoxite IX dark brown. Gonapophysis IX and X black. Ovipositor sheath extends beyond dorsal beak. Dorsal beak extending just beyond anal styles. Long golden pile on ovipositor sheath.

Acoustics

We were able to record two types of song produced by *G. nadae* sp. nova, the calling song and the courtship song. The calling song is a simple repetition of long echemes with a repetition rate of 1.6 s^{-1} (Table 1, Fig. 10). The duration of echemes is 535 ± 70 ms (mean \pm st.dev.) and the interecheme interval is 79 ± 18 ms (N=214). The courtship song we were able to record just once and therefore the number of the measured echemes is much smaller (N=39) (Table 2). The duration of echemes during the courtship song was much shorter, 72 ± 15 ms and the interecheme intervals 307 ± 154 ms but the repetition rate was slowly changing (average: 2.6 s^{-1} , Fig. 11).

Table 1. *Guyalna nadae* sp. nova, calling song temporal characteristics - see sonagram Fig. 10.

	echeme duration (ms)	Interval (ms)	ratio dur/int	Period	rep. rate (s^{-1})
AVERAGE	535	79	6.807	0.613	1.631
STDEVA	70	18			
MEDIAN	542	81			
QUART 1	511	74			
QUART 3	577	87			
COUNT	214	213			

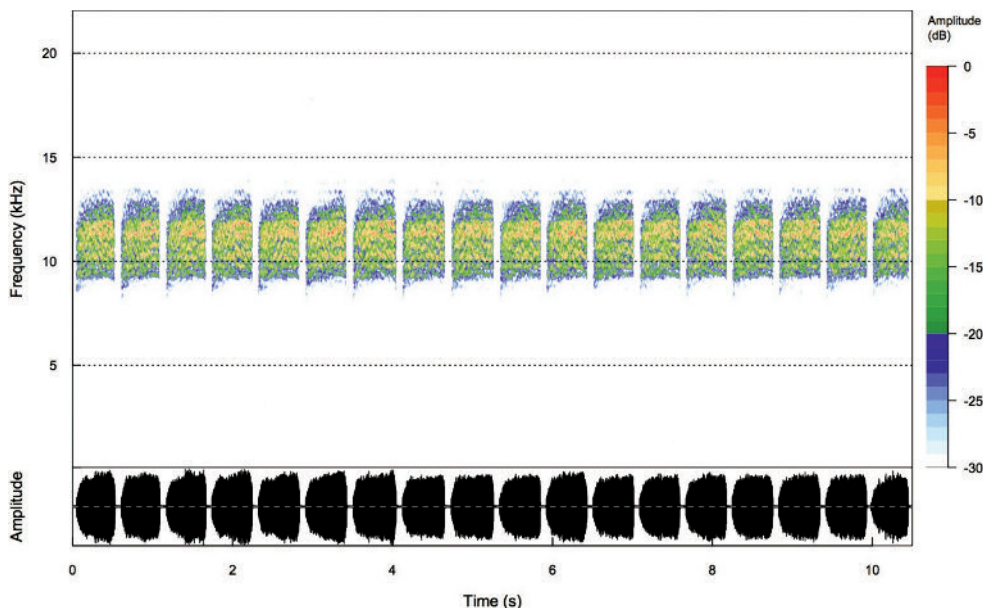


Fig. 10. *Guyalna nadae* sp. nova, oscillogram and spectrogram (above) of the calling song selection (made by Seewave package in R platform: wl = 512, wn = “hanning”).

Table 2. *Guyalna nadae* sp. nova, courtship song temporal characteristics - see sonagram Fig. 11.

	echeme duration (ms)	Interval (ms)	ratio dur/int	Period	rep. rate (s ⁻¹)
AVERAGE	72	307	0.235	0.379	2.640
STDEVA	15	154			
MEDIAN	72	251			
QUART 1	65	188			
QUART 3	77	407			
COUNT	39	39			

Frequency spectrum of the calling song has the maximum at 11 kHz, 5% and 95% frequencies at 9.4 and 12.4 kHz (measured with special routine in Raven software). The courtship song has these values slightly shifted to lower frequencies (10, 8.8 and 11.7 kHz).

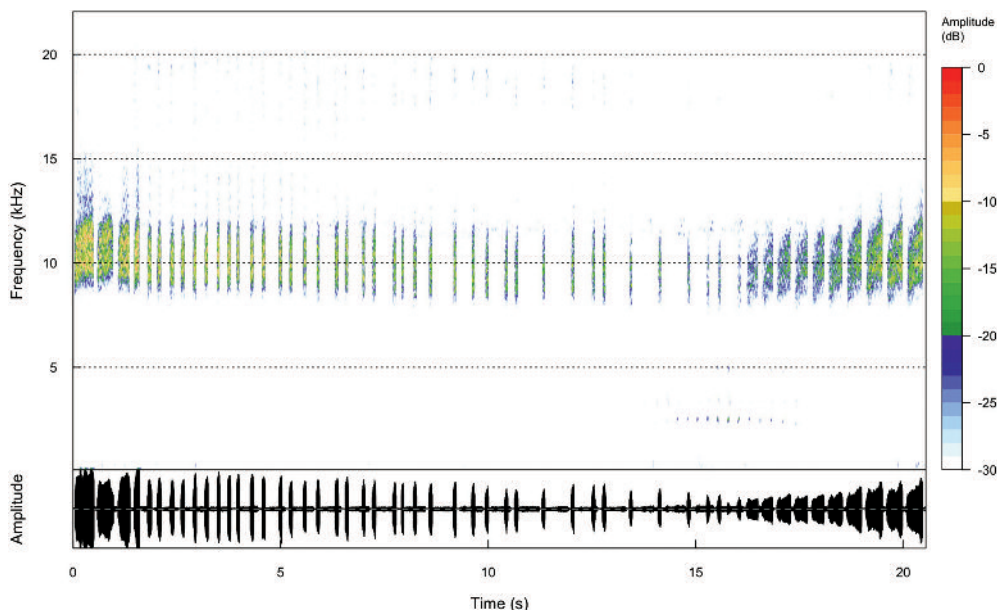


Fig. 11. *Guyalna nadae* sp. nova, oscillogram and spectrogram (above) of the courtship song with transitions from and toward a normal calling song (made by Seewave package in R platform, for details see Fig. 10).

Ecology

We found the first specimens near the hotel Pousada dos Pireneus on a small tree (Fig. 12) near the soccer field. One of the authors (DHBM) found this species in the municipality of Iporá and Diorama (about 300 kilometres from Pirenópolis) with high abundance in the urban areas and beside highways. Its distribution is probably bound to the open spaces of biome Cerrado, Brazilian Savanna, a hotspot of biodiversity (Myers et al. 2000) surrounding Pirenópolis and the Iporá region. The occurrence of the adults of *Guyalna nadae* is from August until the beginning of October at the end of a dry season (with relative humidity about 25% and temperatures reaching over 30°C). Between September and October begins in the same area the emergence of several other species of cicadas (e.g. *G. cuta*, *G. platyrhina*, *Fidicinoides pronoe* (Walker 1850), different species of *Ariasa* spp. and *Dorisiana* sp.). They are all singing at the same time. In general, you can find *G. nadae* also singing in chorus with a synchronization on the echeme production.

Discussion

This new species belongs with certainty to the genus *Guyalna*, described by Boulard & Martinelli (1996). For this statement speaks clearly its habitus with relatively long front wings and short body, the shape of a timbal cover, pronotum



Fig. 12. Female *Guyalna nadae* sp. nova, sitting and about to start feeding on a tree.

clearly shorter than mesonotum, head slightly wider than mesonotum, three segmented tarsi and the shape of male genitalia.

Currently the following species of this genus were described (Boulard 1998, 1999, Boulard & Martinelli 2011, Sanborn & Heath 2014) or transferred (Boulard & Martinelli 1996, Boulard 1999, Boulard & Martinelli 2011) from other genera of Fidicinini (Sanborn 2013): *Guyalna bonaerensis* (Berg 1879), *G. cuta* (Walker 1850), *G. chlorogena* (Walker 1850), *G. rufapicalis* Boulard 1998, *G. nigra* Boulard 1999, *G. atalapa* Boulard & Martinelli 2011, *G. bleuzeni* Boulard & Martinelli 2011, *G. densusa* Boulard & Martinelli 2011, *G. jauffreti* Boulard & Martinelli 2011, and *G. platyrhina* Sanborn & Heath 2014. Compared to all these species, *Guyalna nadae* sp. nova is the smallest (Table 3).

Table 3. Body dimensions of all currently known species of *Guyalna*

Species	Body length [mm]	Fore wing length [mm]
<i>G. bonaerensis</i>	32 – 36	40 – 43
<i>G. atalapae</i>	32	41
<i>G. chlorogena</i>	31.8	43
<i>G. rufapicalis</i>	26	35
<i>G. densusa</i>	25	35 – 37
<i>G. jauffreti</i>	24.3	28 – 28.5
<i>G. bleuzeni</i>	23.1	33
<i>G. nigra</i>	22	29
<i>G. cuta</i>	16.9	24-25
<i>G. platyrhina</i>	13.5-17.3	18.9-24.1
<i>G. nadae</i> sp. nova	12.9 – 13.6	19.2 – 20.1

The closest species in body size are *G. cuta* and *G. platyrhina*. The new species can be distinguished from *G. platyrhina* by the more extensive black coloration particularly on the thorax and arching pattern of the abdomen, the median terminus of the lateral uncus lobes are longer and the medial notch on sternite VII of the female has straight margins toward the central curve in the new species rather than being semicircular. Compared to *G. cuta*, the notch in sternite VII of the female has a straight posterior margin extending from the notch rather than the arching posterior margin found in *G. cuta*, the female meracanthus is folded dorsally on the lateral margins, and the median uncus lobes lack the narrow dorsal extension found in *G. cuta* and the lateral uncus lobes are not recurved and possess a curved extension along their posterior margin in the new species that is lacking in *G. cuta*. In addition, *G. cuta* and *G. nadae* sp. nova are easily distinguished by their songs. The calling song of *G. cuta* is continuous (Boulard 1999) in contrast to *G. nadae* sp. nova. *Guyalna atalapae* has a distinct coloration of the wings clearly different to other members of the genus. The body coloration of the new species is similar to the *G. densusa* and *G. bleuzeni* but the body size of these species is almost two times larger (see Table 3). The published characteristics of the song of the *G. nigra* are similar, but again clearly different from the calling song of *G. nadae* sp. nova. The repetition rate of *G. nigra* is about 3.4 s^{-1} and 1.6 s^{-1} for *G. nadae* sp. nova. Also different is the ratio between the echeme duration and the interecheme interval.

Sanborn (submitted) has also described two new species and transferred *Dorisiana bicolor* (Olivier 1790), *Diceroprocta sublaqueatus* (Uhler 1903) and *Fidicina parvula* Jacobi 1904 to *Guyalna*. The two new species and *D. bicolor* have body lengths greater than 20 mm. *Diceroprocta sublaqueatus* has a body length about 16.5 mm but is black with a primarily brown pronotum and brown posterior abdominal segments. *Fidicina*

parvula is also small (body size about 14 mm) but is greenish with light black markings on the anterior of the mesothorax and a strongly bent costal margin so that these species can also be easily distinguished from the new species described here.

Conclusion

The morphological characters of these specimens are very typical for the genus *Guyalna* as established by Boulard and Martinelli (1996). However, the morphology and the song analysis support the description of a new species for our cicadas. Therefore we name this species ***Guyalna nadae* sp. nova.**

Acknowledgements

For the help with the literature we are indebted to Prof. Michel Boulard, MNHN Paris. We are grateful to the organizers of the XXIV IBAC congress who covered travel costs and lodging for one of us (MG). We are also grateful to Dr. Matjaž Kuntner, the Head of the Evolutionary Zoological Lab of the Jovan Hadži Biological Institute, Scientific Research Centre of the Slovenian Academy of Sciences and Arts (ZRC SAZU), Ljubljana, Slovenia for the possibility to use their Leitz multifocal system for some photographs. Preparation of the specimens was carefully done by Dr. Andrej Gogala, PMSL.

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Appendix

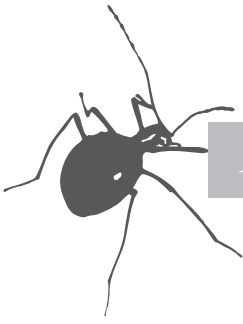
Additional data provided by D.H.B. Maccagnan

Additional recordings of the calling song of *G. nadae* are deposited in the collection DHBM:

Localities, dates and file numbers: Brazil, Goiás, Iporá, Área urbana, 31. 8. 2011: SC-DHBM 01-03, 7. 9. 2011: SC-DHBM 04, 11. 9. 2011: SC-DHBM 05-09, and Brazil, Goiás, Iporá, GO 060, 23. 9. 2011: SC-DHBM 41-44, 21. 9. 2015: SC-DHBM 201, 210-212, 14. 9. 2015: SC-DHBM 175, 179.



Fig. 13. A male specimen of *Guyalna nadae* sp. nova from the Iporá collection (CE_UEG 251).



THE DISTRIBUTION OF *CRYPHIA OCHSI* BOURSIN, 1940 AND *CRYPHIA ALGAE* (FABRICIUS, 1775) (LEPIDOPTERA: NOCTUIDAE) IN SLOVENIA AND CROATIA

Stanislav GOMBOC¹, Toni KOREN²

¹ EGEA, Institution for Nature, Šiškovsko naselje 19, SI - 4000 Kranj,
stanislav.gomboc@siol.net

² Croatian Herpetological Society - Hyla, I. Lipovac 7, 10 000 Zagreb,
koren.toni1@gmail.com

Abstract - The distribution of the *C. algae/ochsi* species complex in Slovenia and Croatia was never a target of any systematic survey. Until now, *C. ochsi* was known only from the Krk island, Croatia, while no records from Slovenia or other parts of Croatia existed. We carried out a study of these two species in Slovenia and Croatia, based exclusively on the examination of the male and female genitalia to gain an insight into the distribution, phenology and altitudinal range of these two species. The results show that *C. ochsi* is present mostly in the coastal, generally Mediterranean and Sub-Mediterranean areas of Slovenia and Croatia. On the other hand, *C. algae* is a widely distributed species, present in most parts of both countries, but is less frequent in the Mediterranean region. *C. ochsi* is new to Slovenian Lepidoptera fauna. Both species prefer the lower altitudes, i.e. *C. ochsi* occurs mostly below 200 m a.s.l. The flight periods of both species range from June to end of September, in a single, long generation. The peak in their activity is in July and August, with some outstanding findings in April and October.

KEY WORDS: *Cryphia ochsi*, *Cryphia algae*, Noctuidae, Northern Adriatic fauna, phaeology, vertical distribution, new records, genital structure

Izveček - RAZŠIRJENOST VRST *CRYPHIA OCHSI* BOURSIN, 1940 IN *CRYPHIA ALGAE* (FABRICIUS, 1775) (LEPIDOPTERA: NOCTUIDAE) V SLOVENIJI IN NA HRVAŠKEM

Razširjenost kompleksa vrst *C. algae/ochsi* v Sloveniji in na Hrvaškem doslej ni bil predmet sistematičnih študij. Vrsta *C. ochsi* je bila znana le iz Hrvaške, z otoka Krka, za ostale dele Hrvaške in Slovenije pa ni bilo znanih podatkov. V prispevku

predstavljamo pregled novih podatkov za Slovenijo in Hrvaško, preverjenih na podlagi preiskav struktur spolnih organov samčkov in samic. Podajamo tudi nove podatke o razširjenosti, fenologiji in višinski razširjenosti vrst. Vrsta *C. ochsi* je razširjena v glavnem ob obali, predvsem v mediteranskem in submediteranskem delu Slovenije in Hrvaške. Vrsta *C. algae* je širše razširjena, pogosta predvsem v celinskem delu obeh držav in manj pogosta v sredozemskem območju. *C. ochsi* je nova vrsta za slovensko favno metuljev. Obe vrsti se pojavljata na nižjih nadmorskih višinah, *C. ochsi* pretežno pod 200 m nadmorske višine. Sezoni aktivnosti metuljev obeh vrst sta v času od junija do septembra v eni raztegnjeni generaciji, z največjo številčnostjo v juliju in avgustu in nekaj izstopajočimi podatki v aprilu in oktobru.

KLJUČNE BESEDE: *Cryphia ochsi*, *Cryphia algae*, Noctuidae, severni Jadran, favna, sovke, fenologija, višinska razširjenost, nove najdbe, strukture genitalij

Introduction

The Bryophilinae is a predominantly Holarctic Noctuidae subfamily, with about 150 species present in the Palaearctic region and 36 species occurring in Europe (Fibiger et al. 2009; Witt & Ronkay 2013). The members of this subfamily are small to medium-sized noctuids, usually of conspicuous colour, mimicking mosses and lichens, on which their larvae feed. Due to their similar appearance, the identification based solely on their external morphology can be difficult and imprecise (Fibiger et al. 2009).

Cryphia ochsi Boursin, 1940 is a small noctuid species, belonging to the *Cryphia algae* Fabricius, 1775 species complex. There are four externally very similar species of this complex occurring in Europe which are easily distinguishable by the differences in the genitalia, which are prominent and diagnostic in both sexes (Fibiger et al. 2009). As *C. ochsi* was described rather late, only in the middle of the 20th century (Boursin 1940), all historical records of *C. algae* prior to that time are open to doubt as they could refer to *C. ochsi*.

C. ochsi is distributed in the Mediterranean area of Europe, eastern Turkey and Iran (Fibiger et al. 2009); a record is known, however, from central Europe (Switzerland, Rezbanyai-Reser 1990), showing the need of a thorough survey to clarify the distribution of this species (Patočka & Turčani 2009).

According to the known distribution, *C. ochsi* is a xerothermophilic species preferring the Mediterranean area, while *C. algae* is more widely distributed, ranging from the Mediterranean to the northern part of Europe. The revision of the literature data of both species is needed, especially in the areas where they (may) occur sympatrically.

Our main goal was to gain an insight into the distribution, phaenology and vertical distribution of *C. ochsi* in the eastern Adriatic shoreline, in Slovenia and Croatia.

Material and methods

Specimens from the *C. algae/ochsi* species complex were collected during the last 20 years by S. Gomboc, and during the last several years by T. Koren. All individuals

of both species were collected in Slovenia and Croatia wherever they were found (Appendix I). To attract specimens, pyramid-shaped tents with two UV tube-shaped superactinic Philips TLD 05/15 W bulbs, powered with lead-acid batteries were used.

After collecting, specimens were set and placed into the authors' collections. In order to their correct identification, the abdomen of each collected specimen was removed and boiled in 10% KOH. After that, the genitals were removed from the abdomen, cleaned and placed into lactic acid for five minutes and, after then, in pure ethanol for five minutes. Later they were stored in microvials filled with glycerol or fixed in Euparal. For the identification of specimens we used the illustrations and diagnoses of Fibiger et al. (2009).

Dates used in the text follow the format: day.month.year.

Results

In total, more than 300 specimens belonging to the *C. algae/ochsi* species complex were collected throughout Slovenia and Croatia. After the examination of the genitalia, 239 specimens were identified as *C. algae*, and 61 as *C. ochsi*.

The distribution of *C. ochsi* is limited to the Mediterranean and Sub-Mediterranean parts of both Slovenia and Croatia, while *C. algae* is present in all other regions of both countries (Fig. 1). A clear lack of data in inland Croatia is still visible on the map

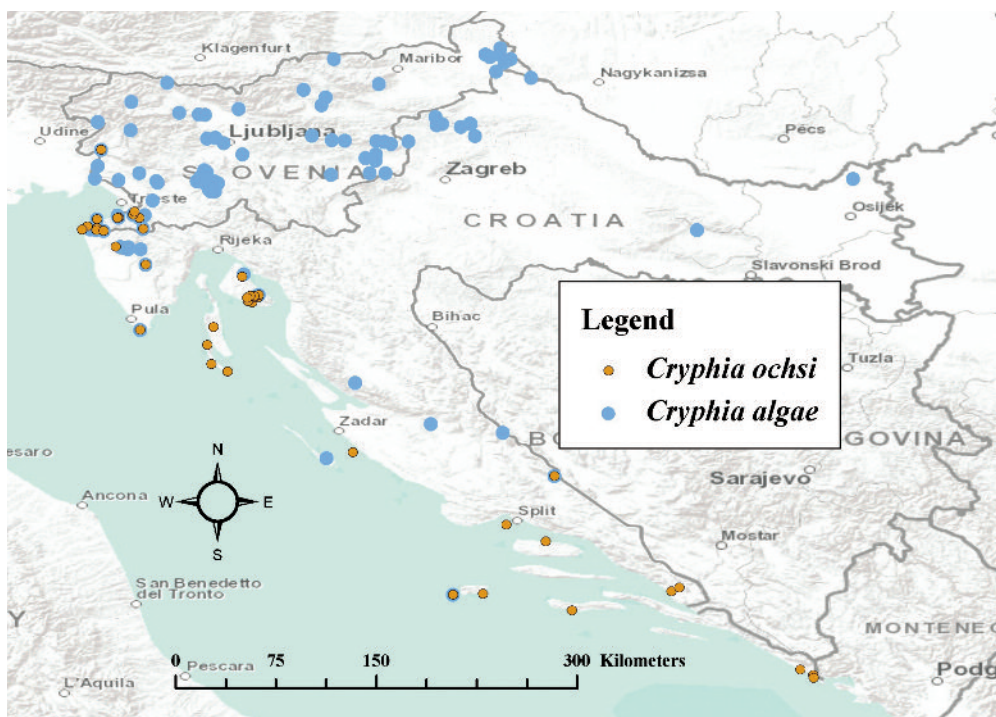


Fig. 1. Distribution of *C. ochsi* and *C. algae* in Slovenia and Croatia.

as this gap is supposedly a result of unsystematic data collecting.

The altitudinal distribution of *C. algae* ranged from 0 to 1100 m a.s.l., with most of the records occurring below 500 m a.s.l., with one record on 1680 m a.s.l. in the Julian Alps, on Planina Krstenica. *C. ochsi* was recorded at altitudes from 0 to 841 m a.s.l., on Mt. Dinara. Most of the records are from altitudes below 200 m (Fig.2).

According to studied data, the flight period of *C. algae* ranges from the beginning of June to the beginning of September, with the peak in activity from mid of July to the end of August, with outstanding records in April and October.

Flight period of *C. ochsi* ranges from mid-June to mid-September, with the peak of activities in July and one outstanding record also in October.

Discussion

Even in the most recent publication dealing with the genus *Cryphia* in Europe, the distribution of *C. ochsi* in the Northern Balkans was not clearly defined. A clear gap existed between Slovenia and Montenegro, and its known range did not include either Slovenia or Croatia (Fibiger et al. 2009). In general, not many published records exist for this species from the Balkans. In Serbia, *C. ochsi* is known from the central-west

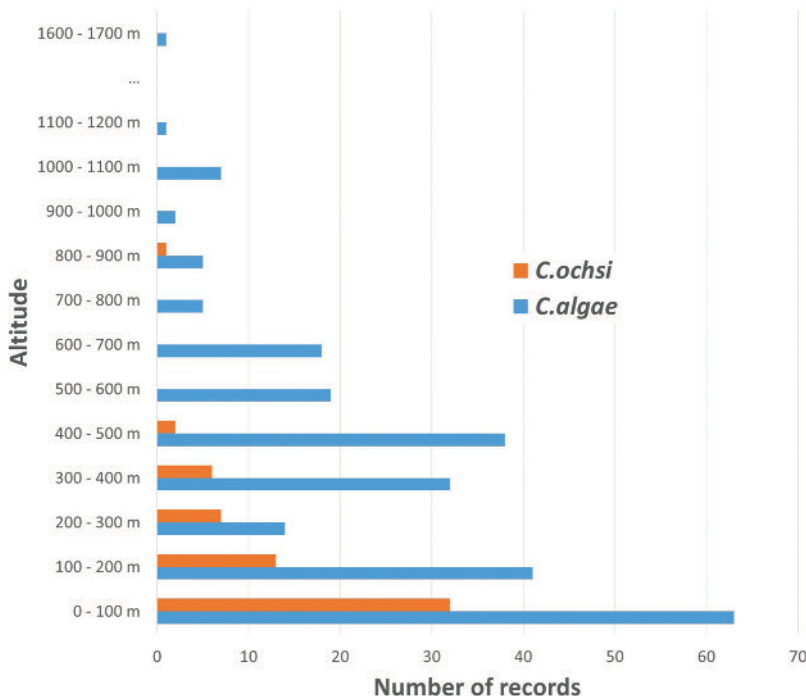


Fig. 2. Altitudinal range of *C. ochsi* and *C. algae* in Slovenia and Croatia.

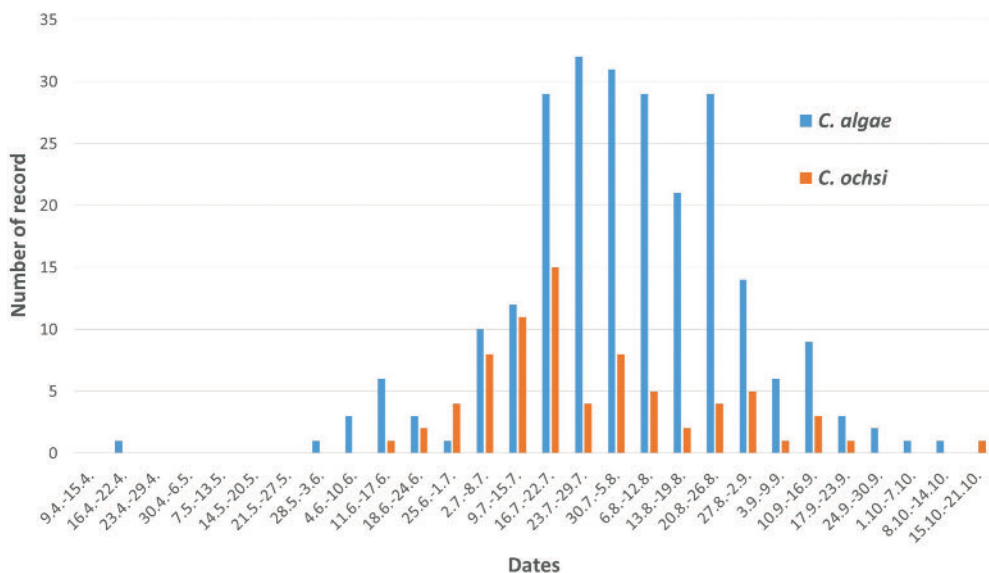


Fig. 3. The flight period of *C. ochsi* and *C. algae* in Slovenia and Croatia.

and east Serbia (Stojanović & Čurčić 2011), in the Republic of Macedonia it occurs in central and western parts of the country (Kasy 1961, Thurner 1964), in Romania in the southern Dobrogea region (Rákossy 1996), it is also present in Greece (Hacker 1989) and Bulgaria. Regarding the neighbouring countries, no data are known from Bosnia and Herzegovina (Lelo 2004) or Montenegro.

Our records of *C. ochsi* from Slovenia represent the first records for the country, as no literature records are available. The species is known from Croatia by a few records. A single male specimen from Croatia (without exact locality) was used by Patočka & Turčani (2009) to describe its pupa. The only records with exact data originate from the island Krk, where Habeler (2008) recorded it on five localities; no further records of this species were found for the country.

Our newly collected data closed the distribution gap that existed along the Adriatic coastline (Fibiger et al. 2009), and showed that *C. ochsi* is present from the coastline of Slovenia, throughout peninsular Istria, the Kvarner islands of Cres, Lošinj and Krk, towards northern Dalmatia and south Dalmatia including the islands of Brač, Korčula, Vis, the Neretva river delta, across the whole Konavle region, down to the border with Montenegro.

While *C. ochsi* is present mainly in the Mediterranean region, *C. algae* is distributed in all regions of both countries. As it seems, the contact zone of these two species is still incompletely known. While most records from the coastline and the islands belong to *C. ochsi*, several specimens of *C. algae* were also recorded from the same area. The two species occur here sympatrically, rendering the identification based solely on the geographic location unreliable. Both species prefer lower altitudes, with only occasional records from the higher altitudes.

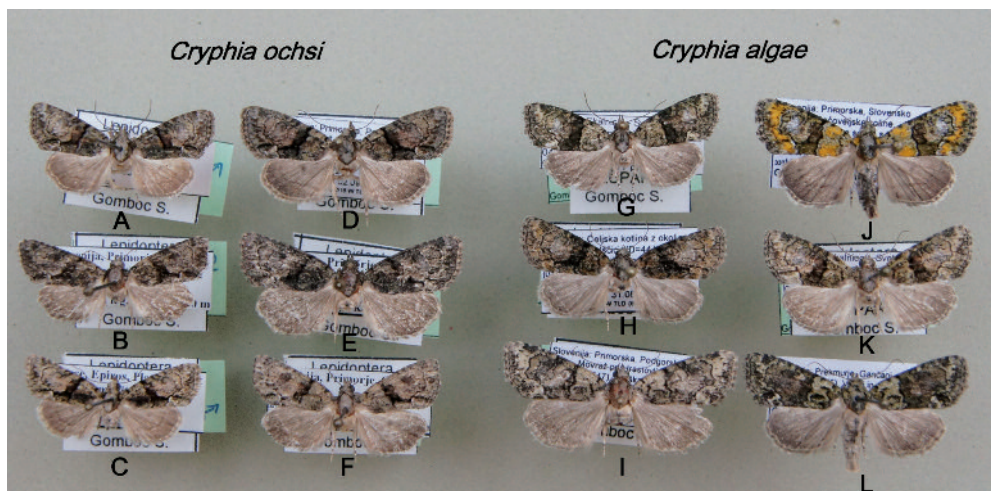


Fig. 4. Specimens of *C. ochsi* and *C. algae*:

A – *C. ochsi*, male, Croatia, Krk island, Konobe camp near Punat, 16.6.2001, Gomboc S. leg., Euparal slide nr. 320.

B – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 322.

C – *C. ochsi*, male, Greece, Epiros, Plataria near Igoumenitsa, 5.7.2000, Gomboc S. leg., Euparal slide nr. 318.

D – *C. ochsi*, female, Slovenia, Primorska, Podgorski kras, Movraž near Hrastovlje, 2.9.2006, Gomboc S. leg., Euparal slide nr. 323.

E – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 326.

F – *C. ochsi*, male, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 324.

G – *C. algae*, male, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 321.

H – *C. algae*, female, Slovenia, Celjska kotlina, Lom near Topolščica, 31.8.2002, Gomboc S. leg., Euparal slide nr. 319.

I – *C. algae*, female, Slovenia, Primorska, Podgorski kras, Movraž near Hrastovlje, 2.9.2006, Gomboc S. leg., Euparal slide nr. 329.

J – *C. algae*, male, Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline's with halophytes, 4.9.2010, Gomboc S. leg.

K – *C. algae*, male, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 328.

L – *C. algae*, male, Slovenia, Prekmurje, Gančani, 15.6.2007, Gomboc S. leg.

In the butterfly fauna of the Adriatic islands, there is a clear differentiation between coastal species, and species inhabiting both the islands and the coastline, which are usually more common and widely distributed (Withrington & Verovnik 2008). This

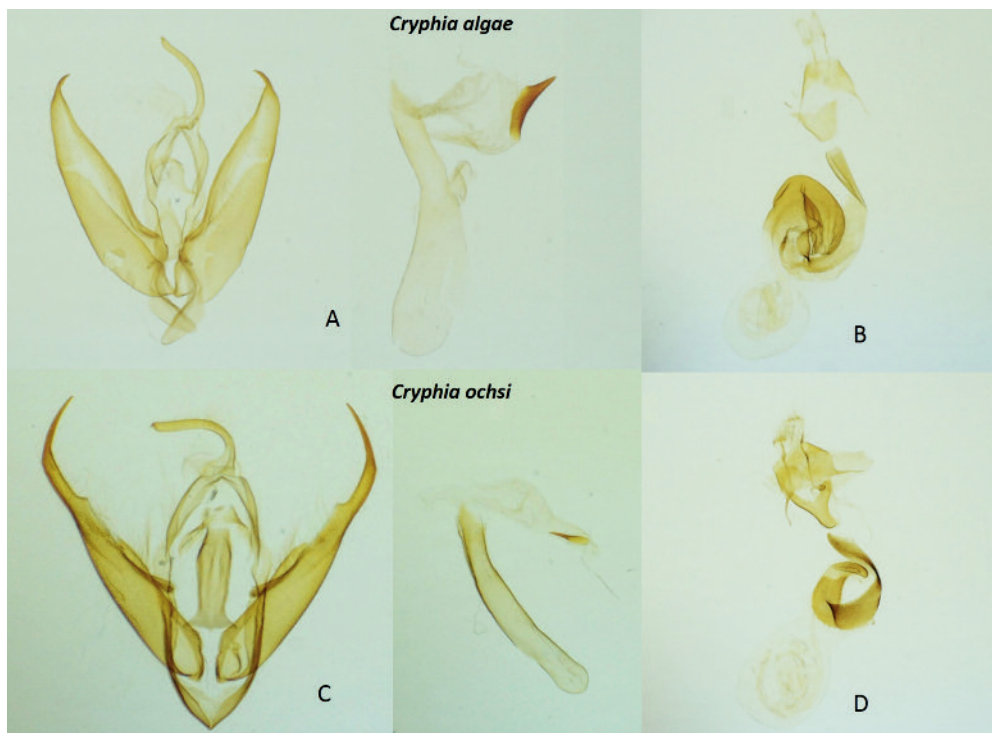


Fig. 5. Male and female genitalia of *C. algae* and *C. ochsi*:

A – *C. algae*, male with everted vesica, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 321.

B – *C. algae*, female, Slovenia, Celjska kotlina, Lom near Topolščica, 31.8.2002, Gomboc S. leg., Euparal slide nr. 313.

C – *C. ochsi*, male with everted vesica, Greece, Plataria near Igoumenitsa, 5.7.2000, Gomboc S. leg., Euparal slide nr. 318.

D – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 322.

may indicate that *C. ochsi* can be regarded as a common species, and many new records are to be expected from other islands, as well as from the coastline.

While most of our records originate from the islands and the coastline, we have several records from the inner part of Istria and Dalmatia, which indicates that this species could be present in other warmer parts of the country. Especially interesting is the record from the Dinara Mt., where *C. algae* and *C. ochsi* were recorded sympatrically. Accordingly, records of *C. ochsi* from Bosnia and Herzegovina are also to be expected, as the locality on Mt. Dinara is located only a few kilometres from the Bosnia and Herzegovina border. Also, this species will probably be recorded in the coastal part of Bosnia and Herzegovina, in the vicinity of Neum.

Our records on the phaenology of *C. ochsi* somewhat widened the known flight period of this species, from July-September (Fibiger 2009) to June-October. The records from April and October of *C. algae/ochsi* can be regarded as unusual deviation from the main flight period.

To gain a more complete knowledge on the distribution of *C. ochsi* in the Balkans, additional surveys of the inner parts of Croatia, as well as other Balkan countries, are needed and recommended.

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Appendix I. Records of *C. ochsi* and *C. algae* used in this study.

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
<i>Cryphia algae</i>					
HR: Baranja, Podolje - Branjina, hill	25.08.2012	KT	45.80977	18.698926	198
HR: Brezovac valley, Mount Dinara	04.08.2012	KT	44.10471	16.345163	1027
HR: Dalmatia, Vis island, Komiža surroundings, Podhumlje, maquis	17.7.2015	GS	43.01638	16.009693	255
HR: Dinara, Kruškovac, Kodžomanove staje	05.08.2015	KT	43.81327	16.692615	841
HR: Dugi Otok, Kruševo Polje	02.07.2014	KT	43.93285	15.160478	39
HR: Hrvatsko Zagorje, Klimen village	07.07.2012	KT	46.09811	16.157557	248
HR: Istra, Livade, 500m S from the village	14.08.2012	KT	45.35038	13.830685	19
HR: Istra, Motovun, inside the village	10.09.2011	KT	45.33601	13.827880	253
HR: Istra, Pazin, Drazej	18.07.2008	KT	45.23463	13.944495	316
HR: Istra, Ponte Porton, 2 km E of the village	05.06.2012	KT	45.35092	13.777430	21
HR: Istra, Ponte Porton, 500 m E from the village	17.04.2013	KT	45.35224	13.774108	9
HR: Istra, Premantura near Pula, Kamenjak, near the pond	31.7.2015	GS, KT	44.7934	13.9075762	17
HR: Istra, Trombal, 1.5 km NE of the village	20.06.2012	KT	45.34623	13.801922	10
HR: Istra, Valica village	02.06.2011	KT	45.4701	13.573231	99
HR: Istra, Valice-Krti, forest path near the village	06.06.2012, 17.08.2012	KT	45.33685	13.910153	25
HR: Ivanščica, vojni poligon na vrhu	10.08.2015	KT	46.17927	16.130032	1020
HR: Krapinsko-Zagorska županija, Đurmanec, Gornje Jesenje, Lužani Zagorski	4.7.2015	GS, KT	46.22663	15.892777	400
HR: Krapinsko-zagorska županija, Ivanščica, Lobor, stone-pit	2.8.2014	GS, KT	46.15702	16.063817	296
HR: Krapinsko-zagorska županija, Ivanščica, peak of Ivanščica	2.8.2014, 30.8.2014, 24.7.2015	GS	46.18014	16.124256	1015
HR: Krapinsko-zagorska županija, Klanjec, Risvica, Sv. Marija Risvica church	3.7.2015, 25.7.2015	GS, KT	46.06173	15.711178	295
HR: Krapinsko-Zagorska županija, Strahinjščica, Radoboj, Sv. Jakov, Plat, xerotherm meadows	20.7.2014, 29.8.2014, 9.9.2014	GS, KT	46.17689	15.939217	490
HR: Krapinsko-zagorska županija, Strahinjščica, Strahinje Radobojsko, south part	23.7.2015	GS, KT	46.1704	15.900504	390
HR: Krapinsko-zagorska županija, Strahinjščica, Strahinje Radobojsko, thermophile forest on south slope	20.7.2014, 3.8.2014	GS, KT	46.17638	15.910485	356
HR: Krk island, Čižiči-Rudine	20.8.2001	GS	45.17019	14.605460	1

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
HR: Krk island, Doline under Hlam	17.6.2001	GS	45.02546	14.695897	200
HR: Krk island, Mali Hlam, path to the sheep pastures	18.8.2001, 24.8.2001	GS	45.02953	14.704049	400
HR: Lika, Kaštel Žegarski village surroundings	03.07.2010	KT	44.16211	15.861761	58
HR: Slavonija, Papuk, Vranduk	09.06.2012, 24.08.2012	KT	45.46574	17.652506	297
HR: Velebit, Visočica, Jadrina Poljana	12.08.2015	KT	44.43816	15.353560	1185
SI: Benečija, Goriška brda, Skalnica N.G., peak	4.8.2001	GS	46.00584	13.646981	500
SI: Celjska kotlina z okolico, Kale near Šempeter	3.7.2002, 14.7.2002, 19.7.2002, 21.7.2002, 26.7.2002	GS	46.30321	15.128203	440
SI: Celjska kotlina z okolico, Lipje near Velenje	12.7.2002, 14.7.2002, 19.7.2002, 21.7.2002, 24.7.2002, 29.7.2002, 1.8.2002, 2.8.2002, 4.8.2002, 6.8.2002, 8.8.2002, 10.8.2002, 19.8.2002, 21.8.2002, 22.8.2002, 23.8.2002, 24.8.2002, 28.8.2002	GS	46.35638	15.156330	480
SI: Celjska kotlina z okolico, Lom near Topolščica	9.7.2002, 28.7.2002, 5.8.2002, 14.8.2002, 31.8.2002, 21.8.2002, 26.7.2002	GS	46.40646	15.008060	580
SI: Dolenjska, Gorjanci, Kamence (Brežice)	19.7.2006	GS	45.8493	15.558979	388
SI: Dolenjska, Žadovinec pri Krškem, dry meadows at Sava river	5.9.2014	GS	45.93084	15.490580	155
SI: Gorenjska, Jeseniška planina, Javorniški Rovt	18.8.2011	GS	46.45428	14.091400	978
SI: Gorenjska, Kamniško- Savinjske Alpe, Kamniški vrh, Slevo	16.8.2006	GS	46.27742	14.570661	720

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Goričko, Bukovnica	22.7.1994, 22.7.1994	GS	46.68705	16.327859	200
SI: Gotjanci, Novomeška dolina, Trška gora near Novo mesto	2.8.2003, 18.7.2003, 31.7.2003	GS	45.83672	15.191105	350
SI: Julijske Alpe, Stara Fužina, Planina Krstenica	26.7.2013	GS	46.32501	13.850636	1658
SI: Krško hribovje, Ajdovska cave near N. vas	17.6.1999	GS	45.94863	15.424480	450
SI: Krško hribovje, Podsreda, Oslica, dry grasslands	25.8.2005	GS	46.06246	15.496475	650
SI: Krško hribovje, Sremič, vinogradi, Krško	12.8.2003	GS	45.97384	15.494521	400
SI: Krško hribovje, Vetrnik, Kozjansko	9.8.2003	GS	46.05812	15.551493	650
SI: Krško hribovje, Zavode pri Kostanjevici	19.7.2004	GS	45.84724	15.451760	300
SI: Ljubljanska kotlina, Gajniče, wet meadows	2.8.2012	GS	45.97343	14.595793	302
SI: Ljubljanska kotlina, Kranj, Stražišče	29.7.2006, 8.8.2006, 25.7.2008, 3.8.2008, 4.8.2008, 4.9.2008, 2.8.2009, 18.8.2009, 18.8.2004, 27.8.2004	GS	46.23828	14.345612	380
SI: Ljubljanska kotlina, Ljubljana, Vič, Biotechnical Faculty	27.7.2006	GS	46.05058	14.469832	297
SI: Ljubljanska kotlina, Sv. Jošt near Kranj	19.7.2004	GS	46.24239	14.302732	830
SI: Notranjska, Cerkniško jezero, Dolenje Jezero	16.8.2009	GS	45.77207	14.354313	549
SI: Notranjska, Cerkniško jezero, Gorenje Jezero, wet grasslands	29.7.2009	GS	45.72392	14.412576	548
SI: Notranjska, Cerkniško jezero, Otok (Cerknica), Otočec	2.9.2009	GS	45.74025	14.368572	552
SI: Notranjska, Cerkniško jezero, Otok (Cerknica), Otoški grič	12.8.2008, 22.8.2008	GS	45.74117	14.37734	548
SI: Notranjska, Cerkniško jezero, Otok (Cerknica), Tresenec	18.7.2007	GS	45.72653	14.384092	550
SI: Notranjska, Hrušica, Nanos, Strmec	30.7.2005, 16.7.2014	GS	45.79377	14.018947	782
SI: Notranjska, Menišija, Begunje pri Cerknici, Ruparjev vikend	26.8.2009	GS	45.82083	14.359683	625
SI: Notranjska, Menišija, Bezuljak, Senožeti	23.7.2007, 14.7.2009	GS	45.84174	14.354577	606

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Notranjska, Menišija, Dobec	5.9.2008, 21.8.2009	GS	45.85165	14.358260	677
SI: Notranjska, Menišija, Padež (Vrhnika), Brejnice	31.7.2008	GS	45.86755	14.339398	591
SI: Notranjska, Menišija, Rakek, Rjava luža	28.7.2008, 18.8.2008	GS	45.82829	14.320843	660
SI: Notranjska, Rakov Škocjan, Naravni most	6.8.2009	GS	45.79515	14.287733	550
SI: Notranjska, Slivnica, Cerknica, Velika Slivnica, peak	24.7.2008	GS	45.79107	14.410251	1097
SI: Notranjska, Slivnica, Grahovo, Strmec	16.8.2007	GS	45.77981	14.430556	628
SI: Notranjska, Suha krajina, Rakov Škocjan, Rak	1.7.2008	GS	45.79237	14.291091	517
SI: Podgorski Kras, Brkini, Debeli hrib pri Podgorju, south slope	11.7.2011, 14.7.2012	GS	45.54299	13.917032	500
SI: Podgorski Kras, Brkini, Prešnica, grasslands with shrubs	17.7.1996, 2.7.2002	GS	45.56523	13.938485	460
SI: Podgorski Kras, Brkini, Škocjan pri Divači, Škocjanske jame, cemetery	23.8.2012, 31.7.2013, 29.7.2015	GS	45.66477	13.993329	424
SI: Pohorje, Hmeljišče, Radlje at Drava river	25.7.2001, 8.8.2004	GS, VD	46.61362	15.211393	370
SI: Pohorje, Smrečno, Kolonija	13.8.2000, 9.8.2001	GS	46.44505	15.514186	800
SI: Prekmurje, Dobrovnik	28.7.2001, 9.6.2000, 21.7.2004, 14.7.2007, 17.7.2010, 16.7.2010, 28.7.2012, 24.8.2012, 20.7.2013, 22.8.2015	GS	46.64606	16.322334	174
SI: Prekmurje, Dolnja Bistrica	20.8.1990	LM	46.53126	16.302519	170
SI: Prekmurje, Gančani	13.7.1996, 19.8.1993, 13.6.1993, 6.8.1991, 20.7.1988, 13.8.1993, 6.7.1999, 9.8.1999, 19.8.2007, 15.6.2007, 21.6.2008, 2.8.2008,	GS	46.62842	16.259323	179

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	17.7.2009, 27.7.2012				
SI: Prekmurje, Gančani, Pišnjače	25.7.1998	GS	46.64354	16.227357	180
SI: Prekmurje, Genterovci	13.7.1983	GŠ	46.61271	16.399950	165
SI: Prekmurje, Mala Polana, Črni log	23.6.2002, 20.7.2004	GS	46.59229	16.356545	166
SI: Prekmurje, Mala Polana, Črni log, pond in the forest	21.7.2013	GS	46.59449	16.361237	163
SI: Prekmurje, Murska šuma	16.7.1998, 16.7.1998, 14.8.1998, 24.7.1998	GS	46.48707	16.535209	160
SI: Primorska, Benečija, Goriška brda, Kolovrat, Livške Ravne	23.8.2011	GS	46.19231	13.624129	1073
SI: Primorska, Komenski kras, Komen, Volčji Grad	28.9.2014	GS	45.80103	13.764589	241
SI: Primorska, Koprsko primorje, Koper/Capodistria, Srmin, reeds	3.9.2006, 27.7.2007	GS	45.56445	13.758642	2
SI: Primorska, Krajinski park Strunjan, Strunjan/Strugnano, Rtič Ronek	9.8.2013	GS	45.53759	13.617540	41
SI: Primorska, Podgorski Kras, Črnotiče, Klavznik, Kraški rob	13.7.2012	GS	45.54767	13.902074	427
SI: Primorska, Podgorski Kras, Movraž pri Hrastovljah, Kraški rob	2.9.2006, 23.9.2006	GS	45.47313	13.929102	284
SI: Primorska, Šentviška planota, Ponikve (Tolmin), Lovska koča Ponikve	22.7.2011	GS	46.13672	13.843727	813
SI: Primorska, Sežanski Kras, Planina (Ajdovščina), Koboli	19.7.2012	GS	45.84719	13.901964	386
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	13.7.2010, 17.8.2010, 11.9.2010, 20.7.2012	GS	45.5491	13.762284	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline's with halophytes	24.6.2010, 11.7.2010, 20.7.2010, 23.7.2010, 2.8.2010, 10.8.2010, 21.8.2010, 26.8.2010, 4.9.2010, 14.9.2010, 2.8.2011, 27.8.2011, 21.7.2012, 7.9.2012,	GS	45.46486	13.612567	1

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	27.9.2012, 11.8.2013, 13.9.2013, 10.8.2014				
SI: Primorska, Slovensko primorje, Sečoveljske soline, old mine, reeds	28.7.2010, 11.8.2010, 2.9.2010, 15.7.2011, 14.9.2012, 10.8.2013, 13.8.2013	GS	45.47918	13.619327	1
SI: Sežanski Kras, Brestovica pri Komnu	4.10.2012, 26.9.2013, 20.7.1998	GS	45.81269	13.603130	25
SI: Škofjeloško-Polhograjsko hribovje, Belo, Polhov Gradec	5.8.1995	GS	46.0794	14.358827	630
SI: Škofjeloško-Polhograjsko hribovje, Dražgoše	5.8.1999	GS	46.2521	14.170555	700
SI: Škofjeloško-Polhograjsko hribovje, Toško čelo	21.8.2000	GS	46.08435	14.414134	400
SI: Slovensko primorje, Osp, cave depression, Osapska jama	4.8.1999, 23.8.1999	GS	45.57232	13.861229	60
SI: Slovensko primorje, Osp, Pod Steno near village	1.9.2011	GS	45.56748	13.861477	60
SI: Slovensko primorje, Sv. Peter at Dragonja	20.8.1998	GS	45.45919	13.662420	125
SI: Štajerska, Kozjansko, Kozjanski park, Podsreda, Stara sveta gora	16.8.2011, 26.8.2011, 3.8.2012, 6.8.2013, 17.7.2014	GS	46.04277	15.594339	349
SI: Štajerska, Kozjansko, Kozjanski park, Vetrnik, forest road and clearings	13.8.2014	GS	46.05854	15.546676	610
SI: Štajerska, Posavsko hribovje, Dobovec, Kum, Lontovž, abandoned ski slope	12.8.2014	GS	46.09842	15.063603	891
SI: Štajerska, Posavsko hribovje, Radeče, Čelovnik, Obrežje	1.9.2015	GS	46.07015	15.197182	466
SI: Štajerska, Zasavje, Lisca, Tončkov dom	23.8.2013	GS	46.06723	15.285057	921
SI: Trnovski gozd, Hrušica, Nanos, Strmec, 900 m, south slopes	16.7.2014	GS	45.78436	14.025966	869
SI: Vipavska dolina, Bilje near Nova Gorica	23.8.1995, 21.8.1995, 6.9.1995, 25.8.1995, 19.8.1995, 17.8.1995, 12.8.1995,	GS, CB	45.8963	13.624489	48

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	7.8.1995, 4.8.1995, 1.8.1995, 29.7.1995, 28.7.1995				
<i>Cryphia ochsi</i>					
HR: Čiovo island, Slatine, along roads and tracks above chapel of Gospa Prizidnica	17.07.2013	KT	43.48562	16.368627	50
HR: Cres island, between Hrasta i Grmov	17.07.2015	KT	44.81478	14.399491	193
HR: Dalmacija, otok Brač, Postira, settlement	9.7.2015	RN	43.37374	16.632625	30
HR: Dalmacija, otok Korčula, Općina Blato, Prižba, local field road from Prižba to Blato	2.7.2014, 6.7.2014	GS	42.91065	16.809907	133
HR: Dalmatia, Vis Island, Komiža surroundings, Podhumlje, maquis	17.7.2015	GS	43.01638	16.009693	255
HR: Dalmatia, Vis Island, Rukavac, village, parking to the beach	15.7.2015	GS	43.02155	16.211200	20
HR: Dinara, Kruškovac, Kodžomanove staj	05.08.2015	KT	43.81327	16.692615	841
HR: Istra, Crveni Vrh, Parenzana	15.09.2014	KT	45.48909	13.553014	61
HR: Istra, Pazin, Drazej	18.07.2008	KT	45.23463	13.944495	316
HR: Istra, Pazin, Vela Traba village	24.08.2009,	KT	45.46891	13.517807	300
HR: Istra, Premantura near Pula, Kamenjak, entry point at Premantura	10.07.2014				
HR: Istra, Premantura near Pula, Kamenjak, entry point at Premantura	31.7.2015	GS, KT	44.7934	13.907576	17
HR: Istra, Žudetići, 400 m souther of the village, Motovun forest	22.07.2012	KT	45.35297	13.744194	31
HR: Konavle, Mikulići, 500m E of the village	29.07.2012	KT	42.47864	18.430648	168
HR: Konavle, Molunat	30.07.2012	KT	42.45818	18.432475	70
HR: Konavle, Radovčići, 500 m N of the village	30.07.2012	KT	42.5143	18.343512	182
HR: Krk island, Čižići	18.7.1999	GS	45.15134	14.594771	3
HR: Krk island, Draga Bašćinska	18.07.2015	KT	45.01296	14.69949	119
HR: Krk island, Hrusta	23.7.1996, 19.7.1999, 21.7.1999	GS	44.97833	14.661488	150
HR: Krk island, Konobe	21.7.1996, 12.7.1999, 16.6.2001	GS	44.98688	14.632308	50
HR: Krk island, Mali Hlam, path to the sheep pastures	22.6.2005, 18.8.2001	GS	45.02953	14.704049	400
HR: Krk island, Malmašuta, forest clearings with <i>Pinus nigra</i>	17.7.1999, 22.8.2001	GS	45.01556	14.676985	350

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
HR: Krk island, Malmašuta, forest road	23.8.1997, 24.7.1996, 29.8.2005	GS	45.01961	14.674803	290
HR: Krk island, Punat surroundings, footpath on Veli vrh	20.7.1999	GS	45.0249	14.645606	240
HR: Krk island, Punat, maquis near the coast	25.8.1997, 16.7.1999	GS	45.00961	14.625681	20
HR: Lošinj island, Osor, Osorščica, northern slopes	20.10.2014	GS, KT	44.69342	14.359089	130
HR: Lošinj, western from Artatore	15.07.2014	KT	44.56599	14.386524	43
HR: Mali Lošinj island, Mali Lošinj, south part, stony pastures, Kalvarija	30.6.2012	GS	44.51633	14.494283	170
HR: Mali Lošinj, south part, stony pastures, Kalvarija	30.06.2012	KT	44.51633	14.494283	136
HR: Neretva, Rogotin, 500 m S	07.08.2012	KT	43.04005	17.477583	21
HR: Neretva, Strimen village surroundings	07.09.2012	KT	43.0637	17.529805	50
HR: Pašman island, SW of village Neviđane	27.07.2015	KT	43.97344	15.335652	36
SI: Benečija, Goriška brda, Skalnica at nova Gorica, hill peak	4.8.2001	GS	46.00584	13.646981	500
SI: Primorska, Krajinski park Strunjan, Strunjan/Strugnano, Rtič Ronk	9.8.2013	GS	45.53759	13.617540	41
SI: Primorska, Podgorski Kras, Črnotiče, kraška planota, Klavznik, Kraški rob	13.7.2012	GS	45.54767	13.902074	427
SI: Primorska, Podgorski Kras, Movraž pri Hrastovljah, Kraški rob	2.9.2006	GS	45.47313	13.929102	284
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	17.8.2010	GS	45.5491	13.762284	1
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	20.7.2012	GS	45.54698	13.755927	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline with halophytes	24.6.2010, 11.7.2010, 2.8.2011, 27.8.2011, 7.9.2012, 10.8.2014	GS	45.46486	13.612567	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, old mine, reeds	2.9.2010, 10.7.2012, 14.9.2012	GS	45.47918	13.619327	1
SI: Primorska, Slovensko primorje, Sečovlje/Sicciole, Fontannige, shrubs with <i>Prunus spinosa</i>	10.7.2012	GS	45.46575	13.614936	1

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Slovensko primorje, Osp, cave depression, Osapska jama	23.8.1999	GS	45.57232	13.861229	60
SI: Slovensko primorje, Osp, cave depression, Pod Steno	1.9.2011	GS	45.56748	13.861477	60
SI: Slovensko primorje, Socerb, on the plateau	1.8.1996	LM	45.58842	13.869255	400
SI: Slovensko primorje, Sv. Peter near Dragonja	10.7.1998	LM	45.45919	13.662420	125

Legend to legit authors:

CB – CARLEVARIS Branko

GS – GOMBOC Stanislav

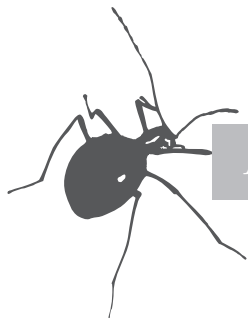
GŠ – GALIČ Štefan

KT – KOREN Toni

LM – LASAN Mojmir

RN – RABUZA Nejc

VD – VRHOVNIK Davorin



FAVNISTIČNI ZAPISKI / FAUNISTICAL NOTES

***SPOLADEA RECURVALIS* (FABRICIUS, 1775) (LEPIDOPTERA: CRAMBIDAE), NOVA VRSTA METULJA V SLOVENIJI**

Matjaž JEŽ¹, Mirko KASTELIC², Janez KAMIN³

¹ Borštnikova ulica 99, 2000 Maribor, Slovenija. E-mail: matjaz.jez@gmail.com

² Cesta na Markovec 3, 6000 Koper, Slovenija. E-mail: mirko.kastelic@siol.net

³ Gradnikove brigade 47, 5000 Nova Gorica. E-mail: janez.kamin@kate.si

Abstract – *SPOLADEA RECURVALIS* (FABRICIUS, 1775) (LEPIDOPTERA: CRAMBIDAE), NEW MOTH SPECIES IN SLOVENIA

First data on the occurrence of the moth species *Spoladea recurvalis* (Fabricius, 1775) in Slovenia are presented. It was recorded first by M. Kastelic on Nov. 7 2013 at Debeli Rtič in west Slovenia. Next year he observed it in almost the same place on Oct. 13 2014. Next day, Oct. 14 2014, J. Kamin found it in Nova Gorica. Finally M. Jež found the species during night moth watching on Nov. 16 2014 on light trap at the settlement Brda in Pohorje. The species is new to the fauna of Slovenia.

KEY WORDS: Lepidoptera, Crambidae, *Spoladea recurvalis*, fauna of Slovenia, first record.

Izvleček – V prispevku so predstavljeni prvi podatki o pojavljanju vrste *Spoladea recurvalis* (Fabricius, 1775) v Sloveniji. M. Kastelic je vrsto prvič zabeležil 7. 11. 2013 pri Debelem Rtiču v zahodni Sloveniji. Naslednje leto jo je 13. 10. 2014 zasledil skoraj na istem mestu. Naslednjega dne, 14. 10. 2014, jo je našel J. Kamin v Novi Gorici. M. Jež pa je vrsto našel pri nočnem opazovanju metuljev, 16. 11. 2014, na svetlobni pasti pri naselju Brda na Pohorju. Vrsta je nova za favno Slovenije.

KLJUČNE BESEDE: Lepidoptera, Crambidae, *Spoladea recurvalis*, favna Slovenije, prvi podatek.

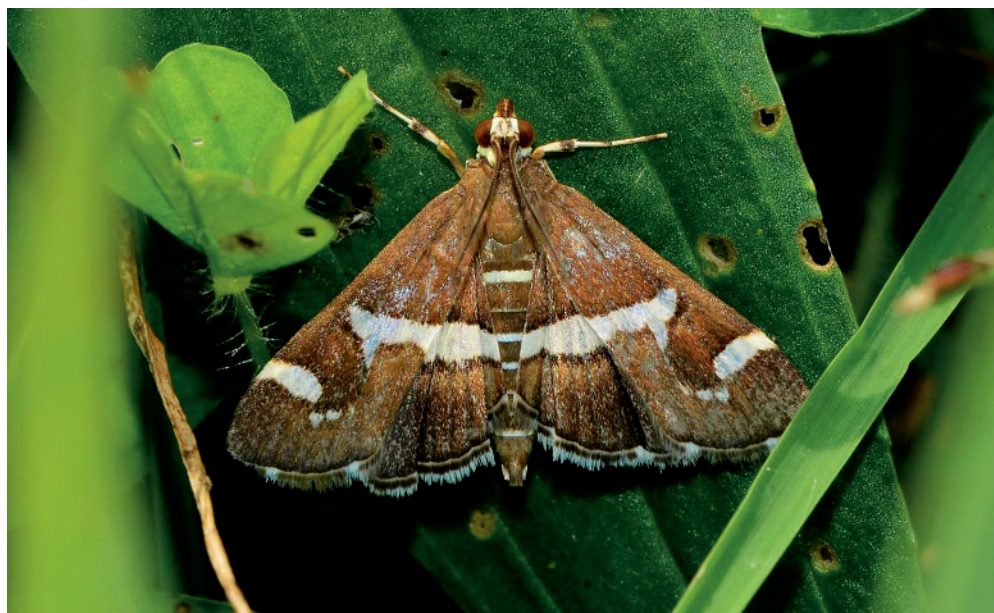
Uvod

Spoladea recurvalis je pantropska vrsta travniške veščice, ki je razširjena v Avstraliji, Novi Zelandiji, na otočjih Fidži in Havaji ter v Južni, Srednji in Severni Ameriki (Leraut 2012). Razširjena je tudi v Afriki (African moths 2015), na Arabskem polotoku in v Aziji (Lepi Forum 2015).

Po viru Fauna Europaea (2015) je vrsta v Evropi prisotna v osmih državah: v Veliki Britaniji, Franciji (vključno s Korziko), Španiji, Portugalski, Danski, Belgiji, Nizozemski in Nemčiji. V Angliji je znana kot migrant že od leta 1951, na Škotskem pa od leta 2009 (UK Moths 2015). Slamka (1997) jo omenja kot tropsko vrsto, ki se kot migrant občasno pojavi v Evropi in sicer na severnem Bavarskem, v Angliji, na Nizozemskem in na Danskem.

Na Madžarskem je bila *S. recurvalis* prvič opažena 6. 11. 2008 na območju Nacionalnega parka Órseg (Szaboky 2010). Najdena je bila na svetlobni pasti pri kraju Alsoszer v bližini meje s Slovenijo, zato preseneča, da v Sloveniji tako dolgo ni bila opažena. Szaboky domneva, da je bila najdba vrte povezana s suhim in toplim poletjem v tistem letu.

Od leta 2013 je *S. recurvalis* znana tudi iz Avstrije (Lichtenberger in Längauer 2014). Najdena je bila 29. 10. 2013 v kraju St. Georgen am Reith v deželi Niederösterreich. Tudi v tem primeru je šlo za najdbo na svetlobni pasti. Po navedbah spletnih medijev je *S. recurvalis* znana tudi v Italiji in to tako na Siciliji (24. 11. 2006) kot na celine (Genova 12. 10. 2014) (European Butterflies and Moths 2015).



Sl. 1: *Spoladea recurvalis* 13. 10. 2014 na Debelem Rtiču. Foto: M. Kastelic.



Sl. 2: Lokacija najdbe *Spoladea recurvalis* na Brdah na Pohorju, kjer je vrsta zabeležena 16. 11. 2014. V ospredju travnik in sadovnjak. Foto: M. Jež.

Odrasli osebki imajo premer sprednjih kril od 22 do 24 mm. So čokoladno rjave barve in imajo na sprednjih krilih po dve, na zadnjih pa po eno belo prečno liso (Slika 1). Letajo od maja do septembra, odvisno od lokacije. Gosenice so polifage in se hranijo z različnimi kulturnimi rastlinami, kot so špinača (*Spinacia*), pesa (*Beta*), bombaž (*Gossypium*), koruza (*Zea*), soja (*Glycina*), ščir (*Amaranthus*) in tolščak (*Portulaca*). V naravi se hranijo z različnimi divjimi rastlinami. Gosenice so zelenkaste barve in odrasle merijo okrog 19 mm. Zabubijo se v rahlem zapredku v zapognjenem delu lista. Bube so svetlo rjave barve. Metulji se v tropskem podnebjju izležejo v 10 do 12 dneh (Wikipedia 2015).

Najdbe v Sloveniji

Vrsto *S. recurvalis* je v Sloveniji prvi našel v naravi, fotografiral in določil M. Kastelic 7. 11. 2013 na Debelem Rtiču v zahodni Sloveniji v bližini meje z Italijo. Naslednje leto je M. Kastelic 13. 10. 2014, skoraj na istem mestu na Debelem Rtiču, vrsto ponovno zasledil in fotografiral (Slika 1). J. Kamin pa je 14. 10. 2014 vrsto našel sredi mesta Nova Gorica na vhodnih vratih stanovanjskega bloka, ulica Gradnikove brigade 47. Ta primerek je določil in prepariral Bojan Zadravec in se nahaja v njegovi zbirki metuljev v Novi Gorici (Zadravec 2014, ustna informacija).

V izjemno topli jeseni 2014, za katero je bilo značilno daljše obdobje toplih jugozahodnih vetrov, je 16. 11. 2014 našel M. Jež en primerek vrste *S. recurvalis* pri

nočnem opazovanju metuljev na Brdah, na zahodnem Pohorju, v severovzhodni Sloveniji. Vrsta je bila najdena na svetlobni pasti. Habitat, v katerem je bila najdena, je tipična redko poseljena podeželska pokrajina s prepletom travnikov, sadovnjakov, vrtov in gozdov. Lokacija je na južnem pobočju Pohorja na območju zaselka Brda na nadmorski višini 705 m pri kmetiji Perše, Brda št. 35 (Slika 2). Svetlobna past z UV sijalko je bila postavljena na meji med sadovnjakom in travnikom. Opazovanje metuljev je potekalo od 17,45 h do 20,45 h. V tem času je bila temperatura zraka med 11,2° C in 9,7° C, relativna vlažnost zraka pa med 62 % in 77 %. Ob 19,30 h je priletel na luč en samček *S. recurvalis* (identifikacija M. Jež). Ta primerek je bil prepariran in je shranjen v zbirki M. Jež v Mariboru.

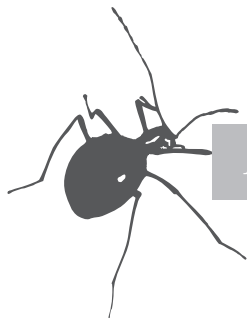
Zahvala

Zahvaljujem se Borutu Krenkerju, ki mi je omogočil opazovanje nočnih metuljev na njegovem posestvu in Stanislavu Gombocu za posredovanje literature o vrsti *S. recurvalis* v Avstriji. Zahvaljujem se tudi dr. Tomiju Trilarju in Prirodoslovnemu muzeju Slovenije za posredovanje informacij o vrsti *S. recurvalis*.

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Prejeto / Received: 22. 10. 2015



**NEW DATA ON *OECOPHORA BRACTELLA* (LINNAEUS, 1758)
IN SERBIA (LEPIDOPTERA: OECOPHORIDAE)**

Predrag JAKŠIĆ

University of Niš, Faculty of Sciences, Višegradska Str. 33, 18000 Niš, Serbia;
jaksicpredrag@gmail.com

Abstract - New distributional data of the little known species *Oecophora bractella* in Serbia are reported.

KEY WORDS: *Oecophora bractella*, new records, Serbia

Izvleček – NOVI PODATKI O VRSTI *OECOPHORA BRACTELLA* (LINNAEUS, 1758) V SRBIJI (LEPIDOPTERA: OECOPHORIDAE)

Navedeni so novi podatki o slabše poznani vrsti *Oecophora bractella* v Srbiji.

KLJUČNE BESEDE: *Oecophora bractella*, novi podatki, Srbija

Representatives of the family Oecophoridae in Serbia have not been sufficiently examined yet. The first data were published by Živojinović (1950), who outlined *Alobonia staintoniella* (Zeller 1767) and *Harpella forficella* (Scopoli 1763) for Majdanpek area. The same species were published later by Zečević (1999, 2002) for Zaječar and Mt. Stol. Fazekas (2009) recorded *Crassa unitella* (Hübner, 1976) for some Balkan countries, including Serbia. Finally, Stojanović et al. (2014) reported *Denisia stipella* (L, 1758) for Tara Mt., Kaluđerske Bare, Western Serbia. According to Karsholt & Razowski (1996), 44 species of Oecophoridae occur in former Yugoslavia. When it comes to *Oecophora bractella* (Linnaeus, 1758), only few data are known from former Yugoslavia. Following literature, this species was mentioned by Rebel (1904) for Bosnia and Herzegovina, Prenj Mt; Abafi-Aigner (1910) for Croatia, Bakar (Buccari); Kasy (1961) for Macedonia, Treska; Klimesch (1968) for Macedonia, Treska, Brodec, Petrina, Planina Mt. and Lesar & Govedič (2010) for Slovenia.

The first records of *Oecophora bractella* (L., 1758) in Serbia were published by Stojanović (2012). He observed this species in two localities in Fruška Gora Mt.: Ledinci Stokuća (UTM: DR00) and Sremski Karlovci Stražilovo (DR10).

New data

West Serbia region towards Bosnia and Herzegovina and Montenegro border in geologic–tectonic term belongs to Inner Dinarides, while in phytogeographical terms it belongs to Moesian phytogeographic province of the Balkan floristical subregion (Horvatić, 1967). In the first place due to lack of exploration, we decided to get to know the composition of the Lepidoptera fauna in the river Lim valley and Mts. Jadovnik, Zlatar and Pobijenik massif. We would like to know the influence of Kopaonik Mt. in the East, Tara Mt. in the North, Prokletije Mt. in the South-West and Durmitor Mt. in the West to the fauna of this region. Rich faunistic material had been collected during several years.

Oecophora bractella is one of more interesting species. It was recorded on June 1st, 2014 in Mt. Jadovnik, Sopotnica, 986 m, CN99, N 43°18'19", E 19°44'18", Gauss–Krüger coordinate system (Photo).



Fig. 1: *Oecophora bractella*: Serbia, Mt. Jadovnik, Sopotnica. Photo: P. Jakšić.

The species was found in developed and well preserved beech forest [ass. *Fagetum submontanum mixtum* Mišić (1963) 1972]. According to Tokár et al. (2005) *Fagus* und *Carpinus* are preferred hosts but several other genera from the families Betulaceae, Salicaceae, Rosacea, Aceraceae and occasionally Pinaceae have been recorded. Caterpillars feed in the dead bark of rotten deciduous trunks, or on lichens or fungi growing on the trunks. Sterling (1984) noticed: "It seems that larvae prefer to live under thin bark in which there is some moisture, but not so much that the wood has rotted beneath, and in trunks which have probably been dead for between two to five years". Explored area of Jadovnik Mt. is rich in such habitats. The adults are on the wing from early evening to the morning and they are easily attracted to artificial light.

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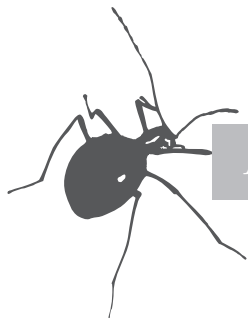
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**FIRST RECORDS OF AQUATIC HETEROPTERA
FROM FRIULI-VENEZIA GIULIA (ITALY)**

Fabio CIANFERONI^{1,2} and Simone CIANFANELLI¹

¹ Natural History Museum of the University of Florence, Zoological Section
“La Specola”, via Romana 17, I-50125, Florence, Italy;

E-mail: fabio.cianferoni@unifi.it

² Institute of Agroenvironmental and Forest Biology, CNR - National Research
Council of Italy, via Salaria 29.300, I-00015, Monterotondo Scalo (Rome), Italy

Abstract – Two species of aquatic Heteroptera are recorded for Friuli-Venezia Giulia (Italy) for the first time: *Anisops sardeus sardeus* Herrich-Schäffer, 1849 (Nepomorpha, Notonectidae) and *Gerris (Gerris) argentatus* Schummel, 1832 (Gerromorpha, Gerridae). Remarks on their general distribution are also given.

KEY WORDS: Hemiptera, Nepomorpha, Gerromorpha, *Anisops sardeus*, *Gerris argentatus*, Friuli-Venezia Giulia, first records.

Izvešček – PRVI NAJDBI VODNIH STENIC (HETEROPTERA) V FURLANIJI-JULIJSKI KRAJINI (ITALIJA)

Dve vrsti vodnih stenic sta prvič zabeleženi za Furlanijo-Juljsko krajino (Italija): *Anisops sardeus sardeus* Herrich-Schäffer, 1849 (Nepomorpha, Notonectidae) in *Gerris (Gerris) argentatus* Schummel, 1832 (Gerromorpha, Gerridae). Podane so tudi pripombe o njihovi splošni razširjenosti.

KLJUČNE BESEDE: Hemiptera, Nepomorpha, Gerromorpha, *Anisops sardeus*, *Gerris argentatus*, Furlanija-Juljska krajina, prvi podatki.

The knowledge of the aquatic Heteroptera (*sensu* Polhemus & Polhemus 2008) is still far from perfect in Italy, especially concerning their distribution (Cianferoni & Terzani 2013).

The study of some recently collected samples in Friuli-Venezia Giulia (Italy) allowed us to identify two species which were not previously recorded for this region:

Anisops sardeus sardeus Herrich-Schäffer, 1849 (Nepomorpha, Notonectidae) and *Gerris (Gerris) argentatus* Schummel, 1832 (Gerromorpha, Gerridae).

Material examined: Ospedaletto, Lago [=Lake] Minisini, 46.2976° N 13.1242° E (WGS84), Gemona del Friuli (UD), 208 m a.s.l., 15.VIII.2014, S. Cianfanelli & M. Calcagno leg., *A. sardeus*—1 male, 2 females, 1 V instar nymph; *G. argentatus*—1 micropterous female (alcohol entomological collection: Natural History Museum of the University of Florence, Zoological Section “La Specola”).

Anisops sardeus is a widespread species, occurring from the Afrotropical region to the Mediterranean Basin, and reaching India and Myanmar eastwards (see Cianferoni & Pinna 2012 for its updated distribution in Italy). This element recently showed a tendency to spread its range northwards, with new records in Europe from southern Russia, Hungary, Romania, and Slovakia (see Reduciendo Klementová & Svitok 2014 for a review). In Italy it has been discovered in Veneto (Cianferoni & Pinna 2012) and frequently recorded in central-northern Italy (Cianferoni & Terzani 2013; unpublished data). It has been also rediscovered in the Middle Dalmatian Islands (Croatia) after a long time (Kment & Beran 2011). Due to this trend and to the present record for Friuli-Venezia Giulia we can expect to find this species also in the neighboring countries like Slovenia and Austria.

Gerris argentatus is a Sibero-European species, known to date in almost all Italian regions (except Valle d’Aosta, Friuli-Venezia Giulia, and Molise), and in the countries neighboring Friuli: Slovenia and Austrian Carinthia (Servadei 1967; Gogala 2003; Rabitsch 2003; Bacchi & Rizzotti Vlach 2007; Cianferoni & Mazza 2012). Due to the scant and scattered records, its distribution in most of Italy requires further investigation (Cianferoni & Mazza 2012).

Dioli (1987) presented a comprehensive checklist of the Heteroptera of Friuli-Venezia Giulia, but up to date it is still not possible to know the exact number of the aquatic taxa living there because some records (cf. Servadei 1967; Dioli 1979) need verification.

Riassunto

Due specie di Eterotteri acquatici sono segnalate per la prima volta per la regione Friuli-Venezia Giulia: *Anisops sardeus sardeus* Herrich-Schäffer, 1849 (Nepomorpha, Notonectidae) e *Gerris (Gerris) argentatus* Schummel, 1832 (Gerromorpha, Gerridae). Inoltre vengono fornite note sulla distribuzione generale dei due taxa.

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