

CADDISFLY (INSECTA: TRICHOPTERA) FAUNA OF KUPA AND ČABRANKA RIVERS AND THEIR TRIBUTARIES, GORSKI KOTAR, W CROATIA

ANA PREVIŠIĆ* & ALEKSANDAR POPIJAČ

Department of Zoology, Faculty of Science, University of Zagreb,
Rooseveltova trg 6, HR-10000 Zagreb, Croatia

Previšić, A. & Popijač, A.: Caddisfly (Insecta: Trichoptera) fauna of Kupa and Čabranka rivers and their tributaries, Gorski kotar, W Croatia. *Nat. Croat.*, Vol. 19, No. 2, 357–368, 2010, Zagreb.

Adult caddisflies were collected monthly from October 2008 to October 2009 at 25 sites along the course of the rivers Kupa and Čabranka, and at various habitats in their tributaries. Altogether 38 species were recorded. Regarding the seasonal composition of caddisfly fauna, the highest number of species was recorded in the spring months, followed by the summer period. The occurrence of the most abundant species was mainly in accordance with their typical flight periods. Three species, *Rhyacophila palmeni*, *Wormaldia copiosa* and *Tinodes rostocki*, are new to the caddisfly fauna of Croatia. The current study represents an important contribution to the knowledge of caddisfly fauna of the Gorski kotar region, but also of Croatia in general.

Key words: Trichoptera, fauna, flight period, Gorski kotar, Croatia

Previšić, A. & Popijač, A.: Fauna tulara (Insecta: Trichoptera) Kupe, Čabranke i njihovih pritoka (Gorski kotar, zapadna Hrvatska). *Nat. Croat.*, Vol. 19, No. 2, 357–368, 2010, Zagreb.

Odrasli tulari prikupljeni su od listopada 2008. do listopada 2009. godine na ukupno 25 postaja duž toka Kupe i Čabranke te na različitim staništima u njihovim pritocima. Najveći broj vrsta zabilježen je tijekom proljetnih mjeseci, zatim tijekom ljetnih mjeseci. Sezonska dinamika zabilježena za najzastupljenije vrste u najvećoj mjeri odgovara njihovim uobičajenim razdobljima aktivnosti. Tijekom istraživanja zabilježeno je ukupno 38 vrsta, a od toga su tri vrste, *Rhyacophila palmeni*, *Wormaldia copiosa* i *Tinodes rostocki*, nove za faunu Hrvatske. Ovo istraživanje predstavlja važan doprinos poznavanju faune tulara Gorskog kotara, ali i Hrvatske općenito.

Ključne riječi: Trichoptera, fauna, razdoblje leta, Gorski kotar, Hrvatska

INTRODUCTION

Croatian caddisfly fauna is insufficiently investigated in general, although a considerable progress has been made in recent years (e. g. ČUK & VUČKOVIĆ, 2009,

* aprevis@zg.biol.pmf.hr

2010; KUČINIĆ, 2002, KUČINIĆ *et al.* in press; PREVIŠIĆ *et al.*, 2007a; 2007b; 2010; VUČKOVIĆ *et al.*, 2006). In some regions, particularly in the protected areas like the Plitvice Lakes National Park, a long term faunistic and ecological studies were conducted (e.g. KUČINIĆ, 2002; PREVIŠIĆ *et al.*, 2007a), whereas for the large parts of the country the caddisfly fauna is mainly unknown.

The Gorski kotar region is situated in the most western part of the Dinaric Alps. It is a mountainous region characterised by very complex geological structure, hydrological network and landscape topography (BIONDIĆ *et al.*, 2006; BOGNAR, 1996). River Kupa with its tributaries, such as Čabranka, is the largest watercourse in the region. Also, it represents the state borders between Croatia and Slovenia along a large part of its course. The catchment of the river Kupa is a typical Dinaric karst area rich in various springs and streams (BIONDIĆ *et al.*, 2006). Overall, the Gorski kotar region is still poorly explored but potentially very interesting in terms of caddisfly fauna, since a random collections in the region resulted in valuable findings, e.g. description of a new, endemic caddisfly species (MALICKY *et al.*, 2007). Moreover, some of the many isolated springs in the region seem to have acted as microrefugia for coldwater stenotherm insect species (POPIJAČ & SIVEC, 2009; PREVIŠIĆ *et al.*, 2009).

The aim of this study was to investigate faunal composition and distribution of stoneflies and caddisflies along the course of the rivers Kupa and Čabranka, and the springs and streams in this region. However, in this paper only results dealing with caddisflies are presented, providing a valuable insight into the caddisfly fauna and distribution in this region.

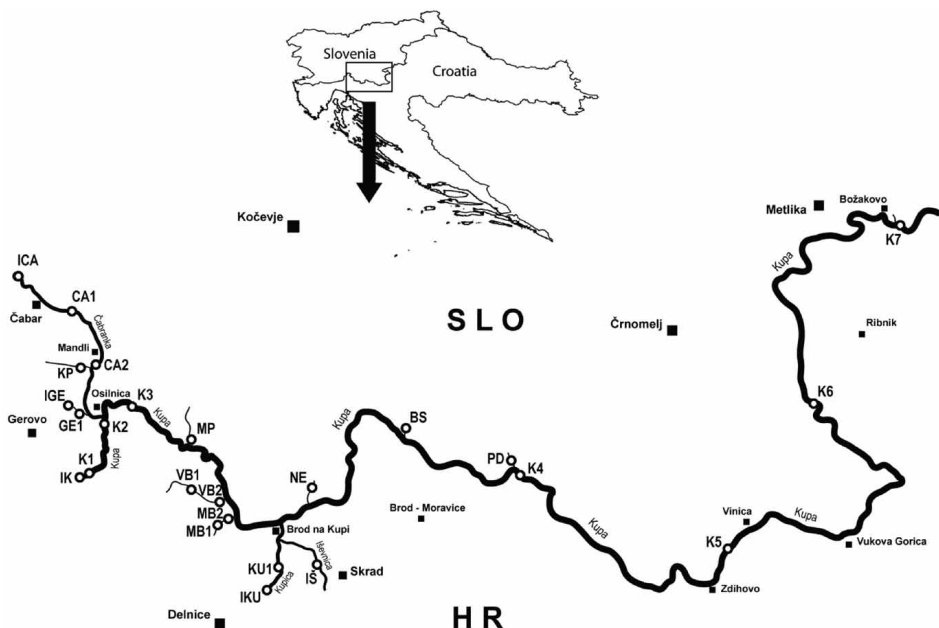


Fig. 1. Map of the study area showing the location of sampling sites at rivers Kupa and Čabranka and their tributaries. Names of sampling sites and corresponding locality codes are listed in Tab. 1.

Tab. 1. List of sampling sites, abbreviations (locality codes) and data on their geographic position.

Locality code	Sampling site and country code	Geographic coordinates and altitude
ICA	Čabranka spring (HR-SLO)	5472397 5050778, 549 m
CA1	Čabranka, bridge by Črni Potok (HR-SLO)	5475132 5049508, 447 m
CA2	Čabranka, downstream of Mandli (HR)	5476162 5045686, 330 m
KP	Kamenski potok, bridge (HR)	5476013 5045687, 333 m
IGE	Gerovčica spring (HR)	5475130 5042785, 467 m
GE1	Gerovčica, bridge before mouth (HR)	5476165 5042517, 306 m
IK	Kupa spring (HR)	5476174 5038562, 375 m
K1	Kupa, first wooden bridge (HR)	5476406 5038948, 345 m
K2	Kupa, bridge before Čabranka mouth (HR)	5476954 5042347, 290 m
K3	Kupa, downstream of Osilnica (SLO)	5478207 5043302, 282 m
MP	Mirtovički Potok, bridge (SLO)	5483052 5040494, 255 m
VB1	Velika Belica, first bridge (HR)	5483081 5037543, 262 m
VB2	Velika Belica, bridge at Kuželj (HR)	5485137 5036820, 242 m
MB1	Mala Belica, Ševalj (HR)	5485191 5035647, 256 m
MB2	Mala Belica, bridge at Grbajel (HR)	5485650 5035794, 241 m
IKU	Kupica spring (HR)	5488894 5031776, 276 m
KU1	Kupica, first bridge (HR)	5488794 5032769, 250 m
IŠ	Iševnica, 2 km downstream of Zeleni Vir (HR)	5491401 5032640, 280 m
NE	Nežica, upstream from the waterfall by the road (SLO)	5491206 5037919, 319 m
BS	Bilpa stream, bridge at Spodnja Bilpa (SLO)	5497419 5040934, 235 m
PD	Stream Potok v Dolu (SLO)	5504446 5039146, 188 m
K4	Kupa, Prelesje (SLO)	5504982 5038369, 186 m
K5	Kupa, Učakovci, Prokšljev mill (SLO)	5518902 5033676, 166 m
K6	Kupa, Pobrežje (SLO)	5524875 5043043, 146 m
K7	Kupa, Božakovo and Vidovec stream (SLO)	5530079 5055278, 128 m

METHODS

Adult caddisflies were collected monthly from October 2008 to October 2009 using an entomological net (leg. A. Popijač, some specimen leg. I. Sivec). Altogether, 25 sites were sampled, encompassing sites along the course of the rivers Kupa and Čabranka but also various habitats (springs and streams) in many of their tributaries (e.g. Mala Belica, Velika Belica, Gerovčica etc.). Details on geographic position of all sampling sites are presented in Fig. 1 and Tab. 1. Occasionally, caddisfly larvae were also collected by hand-picking, however, with the exception of the findings of Drusinae (i.e. *Drusus discolor* (Rambur, 1942) and *Ecclisopteryx dalecarlica* Kolenati, 1848), these results were not included in this paper. Collected material was preserved in 96 % ethanol, identification was based on MALICKY (2004) and systematic review on MALICKY (2005).

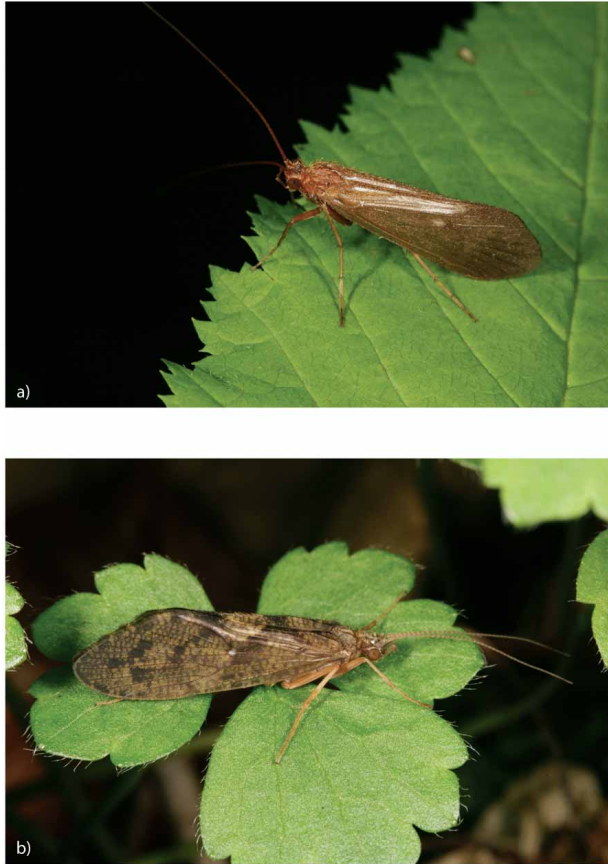


Fig. 2. Adult males of some species occurring in the Gorski kotar region;
 a) *Drusus croaticus* Marinković-Gospodnetić, 1971 and b) *Rhyacophila aurata* Brauer, 1857
 (Photos: I. Sivec)

RESULTS AND DISCUSSION

A total of 381 adult specimens, belonging to 38 species, 23 genera and 11 families were recorded during the current study (Tab. 2). Additionally, larvae of *D. discolor* were recorded, adding one more species to the list. Overall, Limnephilidae was the most diverse family, represented with eight species belonging to five genera, followed by Rhyacophilidae represented by six *Rhyacophila* species and Psychomyiidae represented with five species belonging to three genera.

Overall, *Tinodes dives* (Pictet, 1834) was the most abundant species with a total of 111 specimens collected. It was particularly abundant in the spring habitats (springs of Čabranka and Kupica), what is in accordance with its typical distribution in crenal and epirithral stream sections (GRAF *et al.*, 2002; 2008).

There is no clear trend in differences in species richness between different habitat types included in the study, e.g. highest number of species (ten species) was col-

lected at the spring of Čabranka, followed by a site at the Bilpa stream (BS) and a site along the course of the river Kupa (K6) (nine species at both sites). However, this is not surprising, since only one collection method was applied and usually the best insight into the community structure at particular habitat is provided by the combination of various methods (e.g. MALICKY, 1987).

Regarding seasonal composition of caddisfly fauna, the highest number of species was recorded in the spring (a total of 25 species), followed by the summer (a total of 17 species). In the autumn months a total of 12 species was collected, whereas only two species were collected in the winter period. Among the six most abundant species (collected with more than 20 specimens throughout the study period) differences in seasonal occurrence were observed (Tab. 3). *Rhyacophila fasciata fasciata* Brauer, 1857 was the only species recorded in all seasons throughout the study (Tab. 3), what is in accordance with the life cycle of this species (PREVIŠIĆ *et al.*, 2007a). *Rhyacophila tristis* Pictet, 1834 and *Odontocerum albicorne* (Scopoli, 1763) were both collected in the spring and summer months (Tab. 3), corresponding with the typical flight season of the latter (WARINGER & GRAF, 1997). *Rhyacophila* species, however, usually show long flight periods with erratic emergence peaks (MALICKY, 1973). *T. dives*, typically occurring from spring to autumn (PREVIŠIĆ *et al.*, 2007a; WARINGER & GRAF, 1997) was on the wing throughout the spring, summer and autumn months (Tab. 3). Similarly, the occurrence of *Micrasema setiferum* (Pictet, 1834) in the spring months (May and June) and of *Annitella apfelbecki* (Klapalek, 1899) in the autumn months (Tab. 3) corresponded with their typical flight periods (MALICKY, 1973; WARINGER & GRAF, 1997; WARINGER *et al.*, 2009).

The Croatian caddisfly fauna is still not completely investigated, and in contrast to some other regions (e.g. ČUK & VUČKOVIĆ, 2009, 2010; KUČINIĆ, 2002; KUČINIĆ *et al.* 2010; MALICKY, 2009; MARINKOVIĆ-GOSPODNETIĆ, 1979; PREVIŠIĆ *et al.*, 2007a, 2007b, 2010; RADOVANOVIĆ, 1935; VUČKOVIĆ *et al.*, 2006), there were almost no data published regarding caddisflies of the Gorski kotar region (but see MALICKY *et al.*, 2007). Hence, the following three species collected in the current study are first records for the caddisfly fauna of Croatia; *Rhyacophila palmeni* McLachlan, 1879, *Wormaldia copiosa* (McLachlan, 1868) and *Tinodes rostocki* McLachlan, 1878. *R. palmeni* is distributed in the southern Balkan Peninsula and in the south-eastern Alps (MALICKY 2004), however, it was also recorded in the Dinaric part of Slovenia (URBANIČ, 2004). Additionally, larvae that could possibly belong to this species (W. Graf, pers. comm.) were also collected recently in this region (A. PREVIŠIĆ, unpublished data). *W. copiosa* occurs in most countries of central Europe (MALICKY & BARNARD, 2009), including Slovenia (i.e. Dinaric part of Slovenia, URBANIČ, 2004). Similarly, *T. rostocki* occurs in most countries of central Europe (MALICKY & BARNARD, 2009), but also in Dinaric region (e.g. in Slovenia; URBANIČ, 2004, in Bosnia and Herzegovina; STANIĆ-KOŠTROMAN, 2009). Both species, *W. copiosa* and *T. rostocki* were recently also found at some sites in the Gorski kotar region not encompassed by the current study (W. GRAF & A. PREVIŠIĆ, unpublished data).

Due to the collection of *D. discolor* within the current study, the distribution range of this species is extended to the western part of the Dinaric region. In Slovenia, *D. discolor* was previously recorded in the Alpine region (URBANIČ, 2004), whereas in Croatia so far only larvae were recorded in the Mrežnica river (HABDIJA, 1979). Thus, larvae collected within this study, and also recently collected exuviae

Tab. 2. Continued.

Species	ICA		CA1		CA2		KP		IGE		GE1		IK		K1		K2		K3		MP		VB1		VB2				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	L	M	F	M	F	M	F			
<i>Brachycentrus subnubilus</i> Curtis, 1834					1														1										
<i>Micrasema setiferum</i> (Pictet, 1834)																								1	1	1			
GOERIDAE																													
<i>Lithax niger</i> (Hagen, 1859)									1																				
<i>Silo pallipes</i> (Fabricius, 1781)	1	1								1	1																		
<i>Silo picus</i> (Brauer, 1857)																										1			
LIMNETHILIDAE																													
<i>Annitella apfelbecki</i> (Klapalek, 1899)														1		3													
<i>Drusus croaticus</i> Marinković-Gospodnetić, 1971																													
<i>Drusus discolor</i> (Pictet, 1834)	20**																												
<i>Chaetopteryx fusca</i> Brauer, 1857	2	2																						1	1				
<i>Chaetopteryx major</i> McLachlan, 1876																													
<i>Ecdisopteryx dalecarlica</i> Kolenati, 1848										1								1	1	2**						1			
SERICOSTOMATIDAE																													
<i>Sericostoma cf. personatum</i> Kirby & Spence, 1826																		1											
ODONTOCERIDAE																													
<i>Odontoceron albicorne</i> (Scopoli, 1763)																													

**caddisfly larvae collected

Tab. 3. Seasonal occurrence of the six most abundant caddisfly species (collected with more than 20 specimens) from October 2008 to October 2009 at 25 sites along the course of the rivers Kupa and Čabranka and their tributaries.

Species	Month												
	X	XI	XI	I	II	III	IV	V	VI	VII	VIII	IX	X
<i>Rhyacophila fasciata</i>	•				•	•	•	•			•	•	•
<i>Rhyacophila tristis</i>								•	•	•			
<i>Tinodes dives</i>								•	•	•	•	•	•
<i>Micrasema setiferum</i>								•	•				
<i>Annitella apfelbecki</i>	•												•
<i>Odontocerum albicorne</i>									•	•	•		

and one adult male at the Čabranka spring (W. GRAF & I. SIVEC, unpublished data), show that this widely distributed European species with disjunct distribution also occurs in the Gorski kotar region.

Findings of some species support the previous knowledge of distribution ranges of these species, for instance, springs in the Gorski kotar region represent the westernmost part of the distribution range of *Annitella apfelbecki* so far (WARINGER *et al.*, 2009).

Endemic *Rhyacophila cabrankensis* Malicky, Previšić & Kučinić, 2007 was described from the Čabranka spring and it was also recorded in some other localities in the region (KUČINIĆ M., unpublished data; MALICKY *et al.*, 2007), however, it was not recorded within this study.

The current study represents an important contribution to the knowledge of caddisfly fauna of the Gorski kotar region, but also of Croatia in general. Regarding the number of species recorded in the Dinaric part of the neighbouring Slovenia (URBANIČ, 2004), other new records are expected for this region. Moreover, further studies employing variety of collection methods are necessary to fully document trichopteran community structure at different habitats in the investigated area.

ACKNOWLEDGEMENTS

We thank Dr. Ignac Sivec, Slovenian Museum of Natural History, Ljubljana, for providing us photographs and for permission to use his data on caddisflies in this paper. Slovenian Museum of Natural History in Ljubljana is thanked for providing their car and financially supporting the field trips. This study was financially supported by The National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ; grant to A. Popijač). It is also a part of the outcome of the project funded by the Croatian Ministry of Science, Education and Sports (No. 119-1193080-3076).

Received March 9, 2010

REFERENCES

- BIONDIĆ, B., R. BIONDIĆ & S. KAPELJ, 2006: Karst groundwater protection in the Kupa River catchment area and sustainable development. *Environmental Geology*, **49**, 828–839.
- BOGNAR, A., 1996: Croatia – the land and natural features. *GeoJournal*, **38**, 407–416.
- ČUK, R. & I. VUČKOVIĆ, 2009: First record of caddisfly *Rhyacophila laevis* Pictet, 1834 (Insecta: Trichoptera) in Croatia. *Natura Croatica*, **18** (2), 449–453.
- ČUK, R. & I. VUČKOVIĆ, 2010: *Ironoquia dubia* Stephens, 1837 (Insecta: Trichoptera), a caddisfly species new for Croatia. *Natura Croatica*, **19** (1), 231–237.
- GRAF, W., U. GRASSER & J. WARINGER, 2002: Trichoptera. – Teile IIIA, IIIB, IIIC, IIID, 41 pp. In: MOOG, O. (ed.), *Fauna Aquatica Austriaca*, second edition, Wasserwirtschaftskataster, Bundesministerium für Land- und Forstwirtschaft Wien.
- GRAF, W., J. MURPHY, J. DAHL, C. ZAMORA-MUÑOZ & M. J. LÓPEZ RODRÍGUEZ, 2008: Distribution & ecological preferences of European freshwater organisms. Vol. 1: Trichoptera. Pensoft, Sofia-Moscow, 388 pp.
- HABDIJA, I., 1979: Ličinke Trichoptera kao indikatori ekoloških prilika u bentosu krških voda. In: RAUŠ, Đ. (ed.), *Second Congress of Ecologists of Yugoslavia. Savez društava ekologa Jugoslavije*. Zagreb, pp. 1433–1446.
- KUČINIĆ, M., 2002: Diversity and distribution of caddisflies (Trichoptera, Insecta) of Plitvice Lakes. PhD-Thesis, University of Zagreb, 139 pp.
- KUČINIĆ, M., I. VUČKOVIĆ, H. KUTNJAK, L. ŠERIĆ JELASKA & D. MARGUŠ (in press): Diversity, distribution, ecology and biogeography of caddisflies (Insecta: Trichoptera) in the Krka River (National Park »Krka«, Croatia). *Zoosymposia*.
- MALICKY, H., 1973: 29. Trichoptera (Köcherfliegen). In: BEIER, M. (ed.), IV. Band: Arthropoda – 2. Hälfte: Insecta. *Handbuch der Zoologie*. Helmecke J.-G., D. Starck and H. Wermuth, Berlin, Frankfurt, Ludwigsb. 114 pp.
- MALICKY, H., 1987: Anflugdistanz und Fallenfangbarkeit von Köcherfliegen (Trichoptera) bei Lichtfallen. *Jahresberichte der Biologischen Station Lunz*, **10**, 140–157.
- MALICKY, H., 2004: *Atlas of European Trichoptera*. Springer, Dordrecht. 359 pp.
- MALICKY, H., 2005: Ein kommentiertes Verzeichnis der Köcherfliegen (Trichoptera) Europas und des Mittelmeergebietes. *Linzer biologische Beiträge*, **37** (1), 533–596.
- MALICKY, H., 2009: Die Köcherfliegen (Insecta, Trichoptera) der Sammlung von Franjo Košćec im Museum Varaždin, Kroatien. *Natura Croatica*, **18**, 129–134.
- MALICKY, H. & P. BARNARD, 2009: *Fauna Europaea: Trichoptera*. *Europaea* version 2.1, <http://www.faunaeur.org> (accessed March 1, 2010)
- MALICKY, H., A. PREVIŠIĆ & M. KUČINIĆ, 2007: *Rhyacophila cabrankensis* nov. spec. from Croatia. *Braueria*, **34**, 14.
- MARINKOVIĆ-GOSPODNETIĆ, M., 1979: Trichoptera (Insecta) velikih karstnih izvora u Dinari-dima. In: RAUŠ, Đ. (ed.), *Second Congress of Ecologists of Yugoslavia. Savez društava ekologa Jugoslavije*. Zagreb, pp. 1837–1849.
- POPIJAČ, A., & I. SIVEC, 2009: First records of the alpine stonefly species *Protonemura julia*, Nicolai, 1983 (Insecta, Plecoptera) in Croatia. *Natura Croatica*, **18** (1), 83–89.
- PREVIŠIĆ, A., M. KEROVEC & M. KUČINIĆ, 2007a: Emergence and composition of Trichoptera from karst habitats, Plitvice Lakes region, Croatia. *International Review of Hydrobiology*, **92** (1), 61–83.
- PREVIŠIĆ, A., Z. MIHALJEVIĆ & M. KEROVEC, 2007b: Caddisfly (Insecta: Trichoptera) fauna of altered and man-made habitats in the Drava River, NW Croatia. *Natura Croatica*, **16** (3), 181–189.
- PREVIŠIĆ, A., C. WALTON, M. KUČINIĆ, P. T. MITRIKESKI & M. KEROVEC, 2009: Pleistocene divergence of Dinaric *Drusus* endemics (Trichoptera, Limnephilidae) in multiple microrefugia within the Balkan Peninsula. *Molecular Ecology*, **18**, 634–647.

- PREVIŠIĆ, A., GRAF, W. & M. KUČINIĆ, 2010: Caddisfly (Trichoptera) fauna of the Plitvice Lakes National Park, Croatia. *Denisia*, **29**, 287–294.
- RADOVANOVIĆ, M., 1935: Trioptere Jugoslavije. *Glasnik Zemaljskog Muzeja u Bosni i Hercegovini*, **47**, 73–84.
- STANIĆ-KOŠTROMAN, S., 2009: Faunal, ecological and biogeographical features of caddisflies (Insecta: Trichoptera) in the Bosnia and Herzegovina. PhD-Thesis, University of Zagreb. 151 pp.
- URBANIČ, G., 2004: Ecology and distribution of caddisflies (Insecta: Trichoptera) in some watercourses in Slovenia. PhD-Thesis, Biotechnical Faculty, University of Ljubljana. 188 pp.
- VUČKOVIĆ, I., M. KUČINIĆ, S. ŠIRAC, M. KEROVEC, I. BOŽAK & I. ZRINSKI, 2006: Faunal characteristics and distribution of Trichoptera (Insecta) at the Cetina river. 12th International Symposium on Trichoptera. Mexico City, Mexico. 45–46.
- WARINGER, J. & W. GRAF, 1997: Atlas der österreichischen Köcherfliegenlarven. Facultas Universitätsverlag, Wien. 286 pp.
- WARINGER J., W. GRAF, M. KUČINIĆ, A. PREVIŠIĆ & I. VUČKOVIĆ, 2009: The larva and life cycle of *Annitella apfelbecki* Klapalek, 1899, including a redescription of *Melampophylax nepos* McLachlan, 1880 (Trichoptera: Limnephilidae). *Aquatic Insects*, **31**, 71–80.

SAŽETAK

Fauna tulara (Insecta: Trichoptera) Kupe, Čabranke i njihovih pritoka (Gorski kotar, zapadna Hrvatska)

A. Previšić & A. Popijač

Fauna tulara Hrvatske još uvijek nije u potpunosti istražena, iako je posljednjih godina znatno veći broj istraživanja ove skupine životinja (e.g. KUČINIĆ, 2002; MALICKY *et al.*, 2007; PREVIŠIĆ *et al.*, 2007a; 2007b; VUČKOVIĆ *et al.*, 2006). Gorski kotar je jedno od područja koja su u tom aspektu još uvijek relativno slabo istražena. Cilj ovog istraživanja je bio utvrditi faunistički sastav i distribuciju tulara duž toka Kupe i Čabranke te na različitim manjih vodotocima u njihovom slivnom području.

Odrasli tulari prikupljeni su svaki mjesec od listopada 2008. do listopada 2009. godine pomoću entomološke mrežice, na ukupno 25 postaja duž toka Kupe i Čabranke te na različitim staništima u njihovim pritocima. Tijekom istraživanja prikupljena je ukupno 381 jedinka odraslih tulara. Zabilježeno je ukupno 38 vrsta, 23 roda i 11 porodica, a od toga su tri vrste, *Rhyacophila palmeni*, *Wormaldia copiosa* i *Tinodes rostocki*, nove za faunu Hrvatske. Vrsta zastupljena s najvećim brojem primjeraka u ulovu je *Tinodes dives*.

Najveći broj vrsta zabilježen je tijekom proljetnih mjeseci (ukupno 25 vrsta), zatim tijekom ljetnih mjeseci (ukupno 17 vrsta). Tijekom jesenski mjeseci zabilježeno je ukupno 12 vrsta, dok su tijekom zime zabilježene samo dvije vrste. Sezonska dinamika zabilježena za najzastupljenije vrste u najvećoj mjeri odgovara njihovim uobičajenim razdobljima aktivnosti.

Ovo istraživanje predstavlja važan doprinos poznavanju faune tulara Gorskog kotara, ali i Hrvatske općenito. Obzirom na broj vrsta tulara utvrđenih u dinaridskom području Slovenije (URBANIČ, 2004) u budućim istraživanjima očekuje se znatno veći broj vrsta na području Gorskog kotara.