



# CADDISFLY (INSECTA: TRICHOPTERA) FAUNA OF ALTERED AND MAN-MADE HABITATS IN THE DRAVA RIVER, NW CROATIA

ANA PREVIŠIĆ, ZLATKO MIHALJEVIĆ & MLADEN KEROVEC

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

Previšić, A., Mihaljević, Z. & Kerovec, M.: Caddisfly (Insecta: Trichoptera) fauna of altered and man-made habitats in the Drava River, NW Croatia. *Nat. Croat.*, Vol. 16, No. 3., 181–187, 2007, Zagreb.

Adult caddisflies were collected in altered and man-made habitats of the hydro-electric power plant system in the Drava River in spring and autumn 2006. All sampled habitats (reservoir, drainage ditches, tailrace canals and old river channel) are greatly influenced by hydro-technical management. Altogether 24 species were recorded. Five species, *Hydroptila sparsa*, *Hydroptila vectis*, *Tinodes pallidulus*, *Mystacides longicornis* and *Oecetis ochracea* are new to the caddisfly fauna of Croatia. For five species, *Hydropsyche angustipennis*, *Hydropsyche contubernalis*, *Psychomyia pusilla*, *Ecnomus tenellus* and *Silo nigricornis* adult specimens are recorded for the first time in Croatia. Thus, the current study represents an important contribution to the knowledge of caddisfly fauna of Croatia.

**Key words:** Trichoptera, fauna, Drava River, Croatia

Previšić, A., Mihaljević, Z. & Kerovec, M.: Fauna tulara (Insecta: Trichoptera) čovjekom utjecanih i umjetnih staništa rijeke Drave, SZ Hrvatska. *Nat. Croat.*, Vol. 16, No. 3., 181–187, 2007, Zagreb.

Prikupljanje odraslih tulara u promijenjenim i umjetnim staništima hidroenergetskog sustava na rijeci Dravi provedeno je u proljeće i jesen 2006. godine. Sva su istraživana staništa (akumulacija, obodni jarci, odvodni derivacijski kanali i stari riječni tok) pod vrlo jakim utjecajem hidrotehničkih mjera i zahvata. Tijekom istraživanja zabilježene su ukupno 24 vrste, a od toga je pet vrsta, *Hydroptila sparsa*, *Hydroptila vectis*, *Tinodes pallidulus*, *Mystacides longicornis* i *Oecetis ochracea* novih za faunu Hrvatske. Osim toga, za pet vrsta, *Hydropsyche angustipennis*, *Hydropsyche contubernalis*, *Psychomyia pusilla*, *Ecnomus tenellus* i *Silo nigricornis*, po prvi puta je u Hrvatskoj ulovljen imago. Stoga ovo istraživanje predstavlja važan doprinos poznavanju faune tulara Hrvatske.

**Ključne riječi:** Trichoptera, fauna, Drava, Hrvatska

## INTRODUCTION

Excluding some older publications which encompassed Trichopteran fauna of Croatia (e.g. RADOVANOVIĆ, 1935) only few studies based upon adult caddisflies

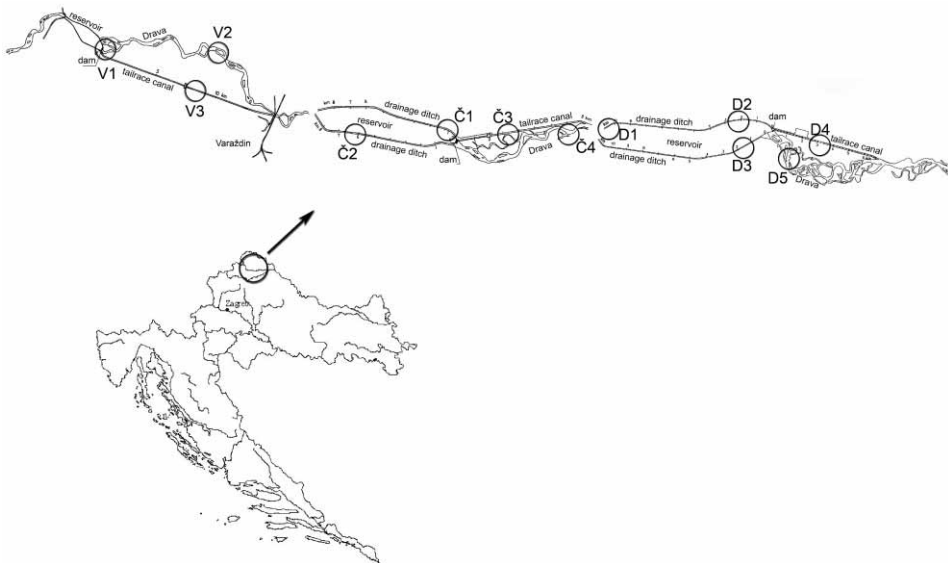
were published till recent days (e.g. KUČINIĆ, 2002; MARINKOVIĆ-GOSPODNETIĆ, 1979). Moreover, the mentioned studies were mainly conducted at karst region whereas continental region remained still insufficiently investigated with no data of Trichopteran fauna published. On the contrary, Trichopteran fauna of the regions of Slovenia and Hungary surrounding the continental region of Croatia were much better studied (e.g. URBANIČ, 2001; 2004; UHERKOVICH & NÓGRÁDI, 1992; 2005).

The Drava River rises in Italy and flows through Austria, Slovenia, Hungary and Croatia. It is a highly regulated river with a large number of hydroelectric power plants (HPP-s) along the whole length, the last three of them in the NW part of Croatia. The construction of the HPP-s has greatly influenced the water regime of the river, especially during low water periods (BONACCI *et al.*, 1992). Besides, the construction of HPP-s also resulted in formation of new, man-made habitats such as reservoirs, drainage ditches and tailrace canals.

The aim of the study was to investigate the faunal composition and distribution of caddisflies at mentioned habitats. Since caddisfly fauna of NW Croatia was generally poorly investigated, the current study also represents an important contribution to the knowledge of caddisfly fauna of Croatia.

## MATERIALS AND METHODS

Adult caddisflies were collected in late spring (31.05.2006) and autumn (02.10.2006) at twelve sampling sites along the whole hydroelectric power plant system (Fig. 1) covering all major habitat types of the system. The total length of the



**Fig. 1.** Map of the study area showing the location of sampling sites in the Drava River power plant system.

watercourse encompassed in the study was about 60 km. Sites Č1, Č2, D2 and D3 were situated in the drainage ditches, V3, Č3 and D4 in the tailrace canals, V1, V2, Č4 and D5 in the old river channel and site D1 was at the beginning of the Dubrava reservoir (Fig. 1). Caddisflies were collected using entomological nets at all sites whereas light traps were also used at sites Č1 in the spring and Č1, Č2, D1 and D5 in the autumn. The light trap used was 6 W or 8 W ultraviolet (UV) fluorescent tube powered by a 12 V battery, operated at mentioned sites for half an hour. Collected material was preserved in 70 % ethanol. Identification was based on MACAN (1973) and MALICKY (2004) and systematic review on BOTOSANEANU & MALICKY (1978).

## RESULTS AND DISCUSSION

A total of 645 individuals, belonging to 24 species, 18 genera and 10 families were recorded during the current study (Tab. 1). Most probably due to regularly cut riparian vegetation at almost all studied habitats collecting with entomological nets proved much more efficient than light traps. Usually the best insight into the community structure at particular habitat is provided by the combination of various methods, e.g. adults and larvae sampling, since with attractant traps such as light traps species from larger distances can be collected, especially if various habitats are found in a short distance (e.g. MALICKY, 1987).

Leptoceridae was the most diverse family, represented with six species, followed by Limnephilidae represented with five species. Six species; *Rhyacophila dorsalis persimilis* McLachlan, 1879, *Silo nigricornis* (Pictet, 1834), *Hydropsyche contubernalis* (Curtis, 1834), *Hydroptila sparsa* Curtis, 1834, *Psychomyia pusilla* (Fabricius, 1781), *Mystacides azurea* (Linnaeus, 1761) and *Hydropsyche* spp. were caught in both seasons. *Hydroptila vectis* Curtis, 1834 and all Limnephilidae species were caught solely in the autumn, what is in accordance with their life history traits (WARINGER & GRAF, 1997; HICKIN, 1967; MALICKY, 1973). The remaining twelve species were recorded solely in the spring. Generally, higher number of species were collected in the spring than in the autumn, 18 and 12, respectively (excluding *Hydropsyche* spp.)

The highest species richness was recorded at drainage ditches where sixteen species were collected altogether. The old river channel follows with fourteen, than the tailrace canals with eight and reservoir with only three species recorded.

Almost 70% of total individuals were collected at drainage ditches, mainly due to *S. nigricornis* constituting about 50% and 34% of the catch at drainage ditches and altogether, respectively. *S. nigricornis* was considered to be a typical inhabitant of hypocrenal and epirithral habitats (GRAF *et al.*, 1995) although URBANIČ (2004; 2006) found that in the Pannonian lowland the species occurs in rivers of 4th-7th stream order. However, MIHALJEVIĆ *et al.* (2000) found that macroinvertebrate fauna of drainage ditches was composed of large numbers of pollution intolerant taxa. In the study of amphipods in the Drava River system, GOTTSTEIN *et al.* (2000) found however, that the dominant amphipod species in the drainage ditches is a species well adapted to artificial habitats. The reservoirs were formed by construction of

**Tab. 1.** List of caddisfly species collected in altered and man-made habitats of the hydro-electric power plant system in the Drava River, NE Croatia. \*new record for the caddisfly fauna of Croatia, \*\* first record of adult specimen in Croatia.

Taxa	Habitats	Number of specimens								
		drainage ditches		reservoir		tailrace canals		old river channel		Total
		♂	♀	♂	♀	♂	♀	♂	♀	
Rhyacophilidae										
<i>Rhyacophila dorsalis persimilis</i> McLachlan, 1879		3								3
Hydroptilidae										
* <i>Hydroptila sparsa</i> Curtis, 1834		8	4			7	3	11	6	39
* <i>Hydroptila vectis</i> Curtis, 1834		3	1							4
Hydropsychidae										
** <i>Hydropsyche angustipennis</i> (Curtis, 1834)		2								2
** <i>Hydropsyche contubernalis</i> McLachlan, 1865						4				4
<i>Hydropsyche</i> spp. (++)			1	2		15				18
Polycentropodidae										
<i>Neureclipsis bimaculata</i> (Linnaeus, 1758)		1				1				2
<i>Cyrnus trimaculatus</i> (Curtis, 1834)						1		1		2
Psychomyiidae										
** <i>Psychomyia pusilla</i> (Fabricius, 1781)		5	2			18	6	24	2	57
* <i>Tinodes pallidulus</i> McLachlan, 1878								2		2
Ecnomidae										
** <i>Ecnomus tenellus</i> (Rambur, 1842)								1		1
Limnephilidae										
<i>Limnephilus lunatus</i> Curtis, 1834			1	1					1	3
<i>Limnephilus rhombicus</i> (Linnaeus, 1758)								1		1
<i>Anabolia furcata</i> Brauer, 1857		80	26	36	3		2	23	5	175
<i>Potamophylax rotundipennis</i> (Brauer, 1857)			1							1
<i>Chaetopteryx fusca</i> Brauer, 1857		1								1
Goeridae										
<i>Goera pilosa</i> (Fabricius, 1775)		1				9	2	1		13
** <i>Silo nigricornis</i> (Pictet, 1834)		152	71					1		224
Leptoceridae										
<i>Athripsodes aterrimus</i> (Stephens, 1836)								2		2
<i>Athripsodes cinereus</i> (Curtis, 1834)						3				3
<i>Mystacides azurea</i> (Linnaeus, 1761)		1		1				1		3
* <i>Mystacides longicornis</i> (Linnaeus, 1758)		50						2		52
<i>Mystacides nigra</i> (Linnaeus, 1758)								2		2
* <i>Oecetis ochracea</i> (Curtis, 1825)		27								27
Sericostomatidae										
<i>Notidobia ciliaris</i> (Linnaeus, 1761)		3	1							4
Number of species		14	8	2	2	7	4	13	4	24

gravel embankments on highly permeable gravel layers and there is a great amount of seepage water feeding the drainage ditches (FRANKOVIĆ *et al.*, 1998). Obviously, the specific habitat conditions, e.g. low yearly variation of physical and chemical parameters of the water (MRAKOVČIĆ *et al.*, 2005), at these man-made habitats highly influence the overall community structure, as well as the composition of trichopteran community.

*Anabolia furcata* Brauer, 1857 was the only species recorded at all habitat types (Tab. 1). Five species were recorded at three habitat types, four species at two, whereas fourteen species were collected at only one habitat type (Tab. 1).

Only few studies investigated Croatian caddisfly fauna (e.g. KUČINIĆ, 2002; MARINKOVIĆ-GOSPODNETIĆ, 1979; PREVIŠIĆ *et al.*, 2007; RADOVANOVIĆ, 1935) and there were no published data of the north western part of the country. Hence, five species collected in the current study are first records for the caddisfly fauna of Croatia; *H. sparsa*, *H. vectis*, *Tinodes pallidulus* McLachlan, 1878, *Mystacides longicornis* (Linnaeus, 1758) and *Oecetis ochracea* (Curtis, 1825). Moreover, for another five species, *Hydropsyche angustipennis* (Curtis, 1834), *H. contubernalis*, *P. pusilla*, *Ecnomus tenellus* (Rambur, 1842) and *S. nigricornis* larvae were already recorded (MRAKOVČIĆ *et al.*, 2005; unpublished data) but adult specimens are recorded for the first time in Croatia. Since most of these species (e.g. *S. nigricornis*, *H. angustipennis*, *H. contubernalis*, *H. sparsa*, *P. pusilla*, *E. tenellus* etc.) are common in the Drava River in Hungary (UHERKOVICH & NÓGRÁDI, 1992; 2005), in the eastern part of Slovenia (URBANIČ, 2001) but also in other European large rivers, e.g. Danube (WARINGER, 1989), this is apparently the consequence of a small number of Croatian caddisfly data published.

Regarding the rare published data on caddisfly fauna of continental region of Croatia and the number of species recorded in the neighbouring countries, e.g. 113 species were recorded in the Hungarian part of the Drava river so far (UHERKOVICH & NÓGRÁDI, 2005), other new records for this region are expected. Further studies are also necessary to fully document trichopteran community structure at each habitat type of the investigated area. However, considerable differences in the community structure based upon this preliminary study and specific environmental conditions of each of the habitat types can be expected.

## ACKNOWLEDGEMENT

This study was supported by Croatian Ministry of Science, Education and Sports as a part of the Project number 119–1193080–3076.

*Received November 23, 2006*

## REFERENCES

- BONACCI, O., Z. TADIĆ & D. TRNINIĆ, 1992: Effects of dams and reservoirs on the hydrological characteristics of the lower Drava River. *Regulated Rivers: Research & Management* **7**, 349–357.
- BOTOSANEANU, L. & H. MALICKY, 1978: Trichoptera. In: ILLIES, J. (ed.), *Limnofauna Europaea*. Gustav Fischer Verlag, Stuttgart, p. 333–359.
- FRANKOVIĆ, B., ŽARKOVIĆ, V. & V. JURIC, 1998: Dubrava multipurpose Scheme earthfill embankments safety. In: BERGA, L. (ed.), *Dam safety, Proceedings of the international symposium on new trends and guidelines on dam safety*. A. A. Balkema, Rotterdam, Brookfield, pp 949–956.
- GOTTSTEIN, S., Z. MIHALJEVIĆ, G. PEROVIĆ & M. KEROVEC, 2000: The distribution of Amphipods (Crustacea) in different habitats along the Mura and Drava River systems in Croatia. *Internat. Assoc. Danube Res.* **33**, 231–236.
- GRAF, W., U. GRASSER & J. WARINGER, 1995: Trichoptera. Part III, 41 pp. In: MOOG, O. (ed.), *Fauna Aquatica Austriaca, Version 1995*. Wasserwirtschaftskataster, Bundesministerium für Land- und Forstwirtschaft, Wien.
- HICKIN, N. E., 1967: *Caddis Larvae*. Hutchinson, London, 476 pp.
- KUČINIĆ, M., 2002: Biodiversity and distribution of caddisflies (Trichoptera, Insecta) of Plitvice Lakes. PhD-Thesis, Faculty of Science, University of Zagreb. 139 pp.
- MACAN, T. T., 1973: A Key to the Adults of the British Trichoptera. *Freshwater Biological Association, Scientific Publication* **28**, Ambleside, 151 pp.
- 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, Ludwigsburg. 114 pp.
- MALICKY, H., 1987: Anflugdistanz und Fallenfangbarkeit von Köcherfliegen (Trichoptera) bei Lichtfallen. *Jber. Biol. Stn. Lunz*, **10**, 140–157.
- MALICKY, H., 2004: *Atlas of European Trichoptera*. Springer, Dordrecht. 359 pp.
- MARINKOVIĆ-GOSPODNETIĆ, M., 1979: Trichoptera (Insecta) velikih karstnih izvora u Dinaridima. In: RAUŠ, Đ. (ed.), *Second Congress of Ecologists of Yugoslavia. Savez društava ekologa Jugoslavije*. Zagreb, pp. 1837–1849.
- MIHALJEVIĆ, Z., V. TAVČAR, M. KEROVEC, S. GOTTSTEIN, I. TERNJEJ, M. MRAKOVČIĆ & A. PLENKOVIĆ-MORAJ, 2000: Macrozoobenthos of drainage ditches at two reservoirs in the Drava River. *Internat. Assoc. Danube Res.* **33**, 257–262.
- MRAKOVČIĆ, M., P. MUSTAFIĆ, S. MIŠETIĆ, A. PLENKOVIĆ-MORAJ, Z. MIHALJEVIĆ, M. KEROVEC, D. ZANELLA, M. ČALETA, I. BUJ, A. BRIGIĆ, I. TERNJEJ, M. GLIGORA & K. KRALJ, 2005: Fizikalno-kemijske, biološke i ihtiološke značajke nadzemnih voda hidroenergetskog sustava HE Varaždin, HE Čakovec i HE Dubrava u 2004. godini. Faculty of Science, Zagreb. 135 pp.
- PREVIŠIĆ, A., M. KEROVEC & M. KUČINIĆ, 2007: Emergence and composition of Trichoptera from karst habitats, Plitvice Lakes region, Croatia. *Internat. Rev. Hydrobiol.* **92**, 61–83.
- RADOVANOVIĆ, M., 1935: Trioptere Jugoslavije. *Glasnik Zem. Muz. Bosn. Herceg.*, **47**, 73–84.
- UHERKOVICH, Á. & S. NÓGRÁDI, 1992: Some data to the Trichoptera fauna of Drava River, Hungary. *Somogyi Múzeumok Közleményei*, **9**, 269–278.
- UHERKOVICH, Á. & S. NÓGRÁDI, 2005: Middle-term changes in caddisfly (Trichoptera) communities of the Hungarian part of Drava river during years 1992–2004. *Natura Somogyiensis*, **7**, 49–62.
- URBANIČ, G., 2001: Contribution to the knowledge of caddisflies (Trichoptera) of the reservoir Ledavsko jezero, NE Slovenia. *Acta ent. sloven.* **9** (2), 129–134.
- URBANIČ, G., 2004: Ecology and distribution of caddisflies (Insecta: Trichoptera) in some water-courses in Slovenia. PhD-Thesis, Biotechnical Faculty, University of Ljubljana. 188 pp.

- URBANIČ, G., 2006: Distribution and structure of Trichoptera assemblages in the ecoregion »Hungarian lowland« in Slovenia. In: Proceedings 36th International Conference of IAD, Vienna, Austria. Austrian Committee Danube Research / IAD, Vienna. ISBN 13, 978–3–9500723–2–7, 285–289.
- WARINGER, J. A., 1989: The abundance and temporal distribution of caddisflies (Insecta: Trichoptera) caught by light traps on the Austrian Danube from 1986 to 1987. *Freshwater biol.* **21**, 387–399.
- WARINGER, J. & W. GRAF, 1997: Atlas der österreichischen Köcherfliegenlarven unter Einschluß angrenzender Gebiete. Facultas Universitätsverlag, Wien. 286 pp.

## SAŽETAK

### Fauna tulara (Insecta: Trichoptera) čovjekom utjecanih i umjetnih staništa rijeke Drave, SZ Hrvatska

A. Previšić, Z. Mihaljević & M. Kerovec

Fauna tulara Hrvatske nedovoljno je istražena, a posebice fauna kontinentalnog dijela. Suprotno tome, fauna tulara susjednih zemalja (Slovenije i Mađarske) koje okružuju kontinentalni dio Hrvatske, znatno je bolje istražena. Cilj ovog istraživanja je bio utvrditi faunistički sastav i distribuciju tulara na različitim staništima hidroenergetskog sustava rijeke Drave.

Prikupljanje odraslih tulara u promijenjenim i umjetnim staništima hidroenergetskog sustava na rijeci Dravi provedeno je u proljeće i jesen 2006. godine. Sva staništa obuhvaćena ovim istraživanjem (akumulacija, obodni jarci, odvodni derivacijski kanali i stari riječni tok) pod vrlo su jakim utjecajem hidrotehničkih mjera i zahvata.

Tijekom istraživanja prikupljeno je ukupno 645 primjeraka tulara. Zabilježene su ukupno 24 vrste, 18 rodova i 10 porodica, a od toga je pet vrsta; *Hydroptila sparsa*, *Hydroptila vectis*, *Tinodes pallidulus*, *Mystacides longicornis* i *Oecetis ochracea* novo za faunu tulara Hrvatske. Osim toga, za pet vrsta; *Hydropsyche angustipennis*, *Hydropsyche contubernalis*, *Psychomyia pusilla*, *Ecnomus tenellus* i *Silo nigricornis* po prvi puta je u Hrvatskoj ulovljen imago. Najveći broj vrsta zabilježen je na obodnim jarcima, zatim na starom riječnom toku te na odvodnim derivacijskim kanalima, dok je najmanji broj vrsta zabilježen na postaji koja se nalazi na samom početku akumulacijskog jezera. Vrsta zastupljena s najvećim brojem primjeraka u ulovu je *Silo nigricornis*. Navedena vrsta dominira u zajednicama na obodnim jarcima koji se napajaju podzemnom procjednom vodom iz akumulacija. Jedina vrsta zabilježena na svim tipovima staništa je *Anabolia furcata*. Pet vrsta je zabilježeno na tri tipa staništa, četiri vrste na dva, a četrnaest vrsta samo na jednom tipu staništa.

S obzirom na nedostatak istraživanja ove skupine kukaca u kontinentalnom dijelu Hrvatske i činjenice da je na području rijeke Drave u Mađarskoj zabilježeno 113 vrsta tulara, u budućim istraživanjima očekuje se znatno veći broj vrsta tulara na ovom području.