The impact of the light tube and the distance of the light trap from a stream on a caddisfly (Insecta: Trichoptera) catch

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Abstract. The author studied the impact of the light tube and the distance of the light trap from the Poltarica stream on a caddisfly catch. Four light traps, containing blacklight and bluelight tubes, respectively, were placed at different distances from the stream bank. The most efficient was the light trap placed 10 m away, followed by the light trap at the stream bank and the light trap 50 m away. However, males of the most abundant species *Potamophylax cingulatus*, which belonged to two subspecies, showed different distributional pattern. Among the used light traps, the one containing bluelight tube was less efficient than those with blacklight tubes.

Keywords: light trap, flight distance, Trichoptera, fauna, Slovenia

Izvleček. VPLIV VIRA SVETLOBE IN ODDALJENOSTI SVETLOBNE PASTI OD VODOTOKA NA ULOV MLADOLETNIC (INSECTA: TRICHOPTERA) - Ob vodotoku Poltarica je avtor opazoval vpliv vira svetlobe in oddaljenosti svetlobne pasti od vodotoka na ulov mladoletnic. Štiri svetlobne pasti so bile postavljene na različnih oddaljenostih od brega vodotoka. Najučinkovitejša je bila past v oddaljenosti 10 metrov, sledili pa sta ji past na bregu in past v oddaljenosti 50 metrov. Drugačna razporeditev osebkov je bila opažena pri samcih najpogostejše vrste *Potamophylax cingulatus*, ki so pripadali dvema različnima podvrstama. Svetlobna past z modrim virom svetlobe je bila manj učinkovita kot tiste z ultravijoličnimi viri.

Ključne besede: svetlobna past, letna razdalja, mladoletnice, favna, Slovenija

Introduction

Many insects with night flight activity are attracted by light sources. Therefore light traps are frequently used in faunistic investigation. In aquatic insects, this method is especially useful for caddisflies (e.g. Chantaramongokol 1983, Malicky 1981, 1987, 1999, Waringer 1989, Urbanič 1999). Most caddisfly species are attracted by light, although some species do not

show preferences to light sources (Malicky 1987, Urbanič 1999). Moreover, Malicky (1987) observed differences in flight range and in the distance of direct attraction. In addition, it has been known that the wavelength of the light source has an impact on the quantity and quality of the catch.

Study area

The study site is located in the spring area of the Poltarica stream, the first tributary to the river Krka, southeasterly from Ljubljana (Figs. 1-2). A typical karst spring, 7 m wide, finds its source at an altitude of 290 m and is well saturated over the whole year (85-100 %). The stream is characteristic of relative low annual temperature fluctuations (9,4-10,4°C) and slightly alkaline pH (7,2-7,5). The dominating bottom substrate, mainly covered with mosses, consists of cobbles and rocks, with rare patches of pebble and sand in-between. Wooded riparian vegetation mainly of autumn-shed trees is present on the stream banks; therefore the stream is well shaded in the active vegetation period.

Figure 1. Location of the study site in Slovenia.
Slika 1. Lega vzorčnega mesta v Sloveniji.

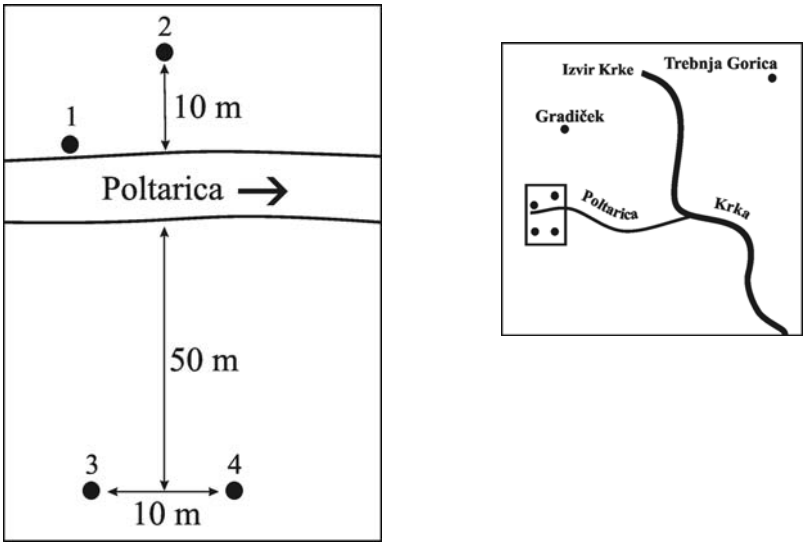

Figure 2. Sketch of the study area with positions of the light-traps.
Slika 2. Skica vzorčnega mesta in razporeditve svetlobnih pasti.

Material and methods

Adult caddisflies were collected using four light-traps including three black and one blue lamp, placed in different distances from the stream (Table 1). The positions of the light-traps are shown in Figure 2. Light-traps 1 and 2 were positioned on the left bank side of the stream at distances of 0 m and 10 m, respectively. Due to the dense riparian vegetation, it was impossible to detect light of other lamp at any of these traps. The last two traps were positioned on the opposite side of the stream at a distance of 50 m. In contrast to previous traps, they had a direct impact on each other, but were positioned 10 m in-between. All four traps were in continuous operation for four hours, from the sunset on 30th August 2000. The collected specimens were preserved in 70 % ethanol in the field, and identified in the laboratory using a SZH 10 stereomicroscope (Olympus, Japan) and the identification keys of various authors (Malicky 1983, Robert & Schmidt 1990, Pitsch 1993a, Moretti et al. 1994). The nomenclature follows Limnofauna Europaea (Botosaneanu & Malicky 1978).

Table 1. Characteristics of light-traps used at the Poltarica stream.
Tabela 1. Značilnosti svetlobnih pasti, uporabljenih ob vodotoku Poltarica.

Light-trap	Light source	Distance from the stream (m)
1	Blacklight tube (Osram L 18W)	0
2	Blacklight tube (Osram L 18W)	10
3	Blacklight tube (Osram L 18W)	50
4	Bluelight tube (Osram L 18W)	50

Results and discussion

A total of 314 specimens belonging to eight families and sixteen species were collected (Table 2). *Potamophylax cingulatus* was predominant with 65 %, whereas each other species did not exceed 6 % (Fig. 3). The fact that *P. cingulatus* is common caddisfly in the Poltarica stream was also confirmed by larval samples. However, the question was raised as to which subspecies the specimens belonged. In Europe, Moretti et al. (1994) defined four subspecies of *P. cingulatus*. Those of special interest for Slovenia are *P. cingulatus alpinus* Tobias 1994, which was described from the Alps, and *P. cingulatus depilis* Szczesny 1994 from the Carpathian Mountains. The latter was confirmed also for the Balkan Peninsula (Kumanski & Malicky 1999, Urbanič unpublished data). During the determination of the specimens from the light traps at the Poltarica stream both subspecies were recognised. Moreover, intermediary specimens, with spines present only on one of both paramera, were also found.

Most abundant species collected at the Poltarica stream are characteristic of unpolluted stream reaches. However, *Hydropsyche contubernalis* was the only species, which has a higher saprobic value and occurs mainly in large medium polluted rivers at elevations under 500 m (Botosaneanu & Malicky 1978, Pitsch 1993b, Waringer & Graf 1997). Larvae are common in the River Sava, but were not collected in the Poltarica stream or in the River Krka (Urbanič unpublished data). It seems that this species is capable of flying far away from emerging places. This could confirm also the only published finding of the species in Slovenia, i.e. from Pohorje, where few specimens were collected at altitudes between 700 and 800 m (Krušnik 1987).

All collected species are included in the Preliminary list of Slovenian Trichoptera (Krušnik & Urbanič 2002). However, for many of them, very little is known about their distribution. *Hydropsyche dinarica* was previously known only from one location in northwest Slovenia

(Krušnik 1990), whereas *Potamophylax rotundipennis* was reported from northeast Slovenia (Urbanič et al. 2000, Urbanič 2001), but it seems that both species are much more wide distributed.

The analysis of the distribution of specimens collected with all four light traps showed that most specimens (50 %) as well as species were caught by a light trap at a distance of 10 m, followed by a light trap at the riverbed edge (29 %) and those 50 m away (20 % and 1 %). The least efficient light traps showed great differences in the number of caught specimens. The light trap containing blacklight tube proved to be much more efficient than that with bluelight. Differences in the number of caught specimens were observed also between males and females of the most abundant species *P. cingulatus*. Male specimens showed almost no difference in attraction to blacklight tubes up to the distance of 50 m. In contrast, the majority of females, and almost one half of all specimens (94) of this species, were caught by light-trap 2 followed by light trap 1 and light-trap 3 with 35 and 16 specimens, respectively. This indicated that females were mainly concentrated at the stream bank, but the most efficient light-trap, which was placed at a distance of 10 m, was probably more visible from distant locations and therefore attracted more specimens.

Table 2. Caddisfly species caught by light traps at the Poltarica stream.
Tabela 2. Vrste mladoletnic, ujetih s svetlobnimi pastmi ob vodotoku Poltarica.

Light trap	**1**		**2**		**3**		**4**	
Taxa	**Number of specimens**							
	♂	♀	♂	♀	♂	♀	♂	♀
RHYACOPHILIDAE								
Rhyacophila fasciata Hagen 1859	5		4		2			
Rhyacophila vulgaris Pictet 1834		3		1	1			
HYDROPTILIDAE								
Hydroptila forcipata (Eaton 1873)				1		1		
Hydroptila sparsa (Curtis 1834)		1		4		1		
HYDROPSYCHIDAE								
Hydropsyche contubernalis McLachlan 1865	4		5		2			
Hydropsyche dinarica Marinković-Gospodnetić 1979	1		1					
Hydropsyche instabilis (Curtis 1834)			1					
Hydropsyche spp. (♀♀)		1		10		7		
POLYCENTROPODIDAE								
Plectrocnemia conspersa (Curtis 1834)	1							
Polycentropus flavomaculatus (Pictet 1834)								1
PSYCHOMYIIDAE								
Tinodes dives Pictet 1834	6			2				
LIMNEPHILIDAE								
Glyphotaelius pellucidus (Retzius 1783)	1				1			
Limnephilus flavicornis (Fabricius 1787)				1				
Potamophylax cingulatus (Stephens 1837)	18	35	20	94	22	16	2	
Potamophylax rotundipennis (Brauer 1857)			1					

Light trap	**1**		**2**		**3**		**4**	
Taxa	**Number of specimens**							
	♂	♀	♂	♀	♂	♀	♂	♀
LEPIDOSTOMATIDAE								
Lepidostoma hirtum (Fabricius 1775)	1		1	10	5	3		
ODONTOCERIDAE								
Odontocerum albicorne (Scopoli 1763)	6	7		3		1		
No. of specimens	**43**	**47**	**33**	**126**	**33**	**29**	**2**	**1**
No. of species	**11**		**13**		**9**		**2**	

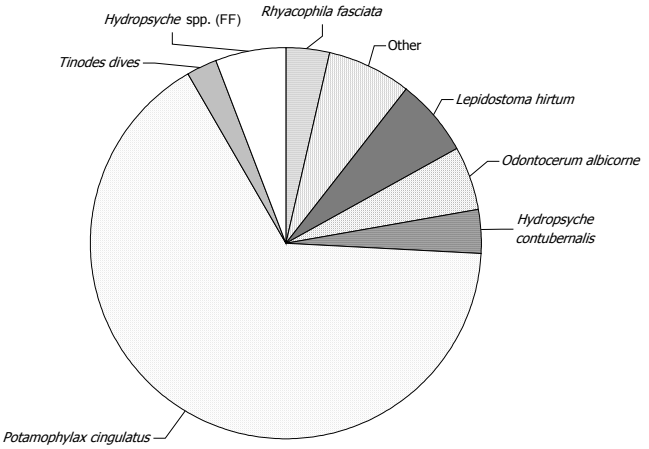

Figure 3. Percentages of more abundant taxa caught by light traps.
Slika 3. Odstotki pogostejših taksonov, ujetih s svetlobnimi pastmi.

Povzetek

Mladoletnice so skupina vodnih žuželk. Odrasle osebke mnogih vrst privlačijo svetlobni viri, zato je lov s svetlobnimi pastmi ena izmed najpogostejših metod lova. Uspešnost ulova na izbranih vzorčnih mestih je odvisna tudi od vira svetlobe in oddaljenosti svetlobne pasti od mesta izletanja oz. vodnega okolja.

Vodotok Poltarica, ob katerem je bilo izbrano vzorčno mesto, je neonesnažen, tipičen kraški izvir v povirju reke Krke. Ob robu struge ter v oddaljenosti 10 m in 50 m so bile postavljene štiri svetlobne pasti. Tri pasti so vsebovale vir ultravijolične, ena pa vir bele svetlobe. V času delovanja so bili ujeti osebki šestnajstih vrst. Najpogostejši so bili osebki vrste *Potamophylax cingulatus*, pripadali pa so dvema podvrstama. Med vrstami, ki ni značilna za neobremenjene izvirne predele, je bila relativno številčna vrsta *Hydropsyche contubernalis*, čeprav ličinke niso bile najdene v Poltarici ali v reki Krki. Avtor je to pripisal

sposobnosti vrste razširjanja na daljše razdalje, saj je vrsta v Sloveniji pogosta v večjih rekah, tudi v Savi. Med ujetimi vrstami sta zanimivi tudi najdbi vrst *Hydropsyche dinarica*, ki je bila pred tem v Sloveniji ulovljena le na eni lokaciji v severozahodni Sloveniji, in vrste *Potamophylax rotundipennis*, pred tem znane iz porečja reke Mure. Najdbi potrjujeta predvidevanja, da imata obe vrsti v Sloveniji širša areala.

Analiza razporeditve osebkov med pastmi je pokazala, da je bilo največ osebkov in vrst ujetih v pasti na oddaljenosti 10 m od struge, najmanj pa v najbolj oddaljeni pasti. Drugačen vzorec razporeditve je bil zaznan pri samcih najpogostejše vrste, ki na razdalji krajši od 50 m niso kazali vpliva oddaljenosti pasti od vodotoka na število ulovljenih osebkov. Razlike pa so se pokazale pri uspešnosti lova, saj so bile pasti z viri ultravijolične svetlobe veliko učinkovitejše kot tiste z virom bele svetlobe.

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