Lauterbornia 44: 65-73, D-86424 Dinkelscherben, 2002-04-25

The caddisfly (Insecta: Trichoptera) fauna of the Börzsöny Mountains (Northern Hungary) with reference to the effect of air temperature on the succes of light trapping

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With 1 figure and 2 tables

Schlagwörter: Trichoptera, Insecta, Börzsöny, Ungarn, Fanistik, Lichtfang, Temperatur, Methodik
Keywords: Trichoptera, Insecta, Börzsöny Mountains, Hungary, faunistics, light trapping, temperature, methodics

Ninety Trichoptera species were collected from the Börzsöny Mountains (Northern Hungary) up to now. *Oecetis testacea, Crunoecia irrorata, Grammotaulius nitidus, Lype reducta, Stenophylax vibex, Wormaldia occipitalis* and *Ironoquia dubia* are rare species of the area. In 1998 the relation between minimum night temperature and catching succes by light trap was observed; caddisflies still were collected at the minimum of 0.2 °C.

1 Introduction

The investigation of the Trichoptera of the Börzsöny Mountains started with the works of UJHELYI (1971, 1981 and 1982). His papers include some data of the Börzsöny Mountains with reference to the distribution of the *Leptoceridae*, *Rhyacophila* and *Hydropsyche* species in Hungary. CHANTARAMONGKOL (1983) published many data from the foot of the Börzsöny Mountains. Detailed investigations started with the works of Nógrádi and Uherkovich (NÓGRÁDI 1989a, 1989b, 1995, NÓGRÁDI & UHERKOVICH 1988, UHERKOVICH & NÓGRÁDI 1994), and KISS & SCHMERA (1999) contributed some data, too.

UHERKOVICH & NÓGRÁDI (1994) gave the first summary of the caddisfly fauna of the Börzsöny Mountains. Their list contained 82 species. KISS (2000) gave the second summary of the caddisfly fauna of the Börzsöny Mountains. His list contained 83 species, but five caddisfly species (*Rhyacophila polonica, Lype reducta, Grammotaulicus nitidus, Micropterna lateralis* and *Silo pallipes*) were not mentioned as elements of the caddisfly fauna of the Börzsöny Mountains. A revision (NÓGRÁDI & al. 1999) and new data changed the caddisfly list of the mountains. Here, I present an updated overlook of the Trichoptera fauna of the Börzsöny Mountains.

The correlations between the minimum air temperature and the catching success of Trichoptera in light trap were shown by ANDERSEN (1978). Principal

component analysis was used by USSEGLIGO-POLATERA & AUDA (1987) to define the influence of meteorological parameters on light trapping. WARINGER (1991) recommended using the maximum night air temperature for estimating the catch of caddisflies, because about 50 % of light-trapped caddisflies were caught in the first third of the night at the River Danube (WARINGER 1989). The only data on the relationship between the minimum night air temperatures and flight activity pattern of Trichoptera in Hungary are given by KISS (1991), who states that flights ceased when the temperature was below 0 °C. An aim of the present study is to clarify this relationship between minimum night air temperature and catching succes in Trichoptera.

2 Material and method

2.1 Geography of the Börzsöny Mountains

The Börzsöny Mountains are a series of separate mountain peaks created, which was created in the Tertiary by volcanic activity. The subridges starting from the main peaks and the V shaped valleys combine different landscape features. Though there are no natural lakes, 300-350 springs feed streams and rivers, most of them at 600 m above sea level.

2.2 The sampling sites

The first study area at Bernecebaráti, at 215 m above sea-level, lies in the northern part of the Börzsöny Mountains, consisting of andesite and andesite-tuff (KISS & SCHMERA 1999). The Bernecei stream runs through the sampling site. The water discharge is very variable. The depth of the water in early spring varies between 15-32 cm, in August 5-11 cm. The second sampling site is located at Királyrét (281 m a.s.l). in the Central Börzsöny Mountains. The Morgó stream runs at this sampling site. The depth of this stream was extremely variable in 1999 (between 5 and 70 cm).

2.3 Sampling method

Caddisflies were caught by light traps. One light trap with a 160 W-mixed-light-bulb, positioned 2 m above ground level, was placed near the Bernecei stream (Bernecebaráti), in 1998. The other light trap was operated with a 100 W wight-light bulb, positioned 2 m above ground level at Királyrét near the Morgó stream, in 1999. Both traps were operated from May to the end of October. The minimum night air temperature was measured in the proximity of the light trap at Bernecebaváti with a minimax-thermometer to the nearest 0.1 °C in nightly intervals.

3 Results and discussion

3.1 Faunistic results

The total number of individuals caught was 8065 and the number of species was 53 in Bernecebaráti, whereas the total number of individuals and species caught at Királyrét was 1395 and 34 respectively.

A summary of faunistic data of the Börzsöny Mountains is given in Table 1. The total number of species captured by light trapping in the Börzsöny Mountains runs to 90. This is 43 %. of the total Hungarian fauna (NÓGRÁDI & UHERKOVICH 1999), and 58 %. of the caddisfly fauna of the Northern Mountains (UHERKOVICH & NÓGRÁDI 1994). *Athripsodes bilineatus, Halesus digitatus, Hydropsyche saxonica, Micropterna nycterobia, Plectrocnemia conspersa* and *Polycentropus flavomaculatus* are the widely distributed caddisfly species in the Börzsöny Mountains. These species are widely distributed in the Northern Mountains (UHERKOVICH & NÓGRÁDI 1994, NÓGRÁDI & al. 1999).

The most interesting member of the Trichoptera fauna of the Börzsöny Mountains is *Oecetis testacea*. It is probable that Börzsöny Mountains are the only habitat of this species in Hungary today (NÓGRÁDI & UHERKOVICH 1995, KISS & SCHMERA 1999). At Királyrét it was the first time that *Ironoquia dubia* was caught in the Börzsöny Mountains. Until now this species was caught in other parts of the Northern Mountains only (UHERKOVICH & NÓGRÁDI 1994, KISS 1987, NÓGRÁDI & al. 1999). *Leptocerus interruptus* was found in 1929 and 1948 in the Börzsöny Mountains (NÓGRÁDI 1989a, 1989b, 1995) and one individual in the Bükk Mountains (KISS & al. 1999). Other rare species of the mountains are *Crunoecia irrorata, Grammotaulius nitidus, Lype reducta, Stenophylax vibex* and *Wormaldia occipitalis*.

Tab. 1: The Trichoptera species of the Börzsöny Mountains based on literature data and the present investigationreferences. a = Ujhelyi 1971, b = Ujhelyi 1981, c = Ujhelyi 1982, d = Chantaramongkol 1983, e = Nógrádi & Uherkovich 1988, f = Nógrádi 1989a, g = Nógrádi 1989b, h = Uherkovich & Nógrádi 1994, i = Nógrádi 1995, j = Kiss & Schmera 1999, k = at Bernecebaráti in 1998, l = at Királyrét in 1999, m = number of records

Species	References a	b	c	d	e	f	g	h	i	j	k	l	m
RHYACOPHILIDAE													
1 *Rhyacophila fasciata* HAGEN 1859									+	+	+	+	8
2 *Rhyacophila nubila* ZETTERSTEDT 1840										+	+	+	3
3 *Rhyacophila pascoei* MCLACHLAN 1879													2
4 *Rhyacophila polonica* MCLACHLAN 1879												+	4
5 *Rhyacophila tristris* PICTET 1834													2

	Species	References a	b	c	d	e	f	g	h	i	j	k	l	m
	GLOSSOSOMATIDAE													
6	*Agapetus delicatulus* McLachlan 1884													4
7	*Synagapetus moselyi* Ulmer 1938												+	2
	HYDROPTILIDAE													
8	*Hydroptila lotensis* McLachlan 1930													2
9	*Agraylea sexmaculata* Curtis 1834													2
	PHILOPOTAMIDAE													
10	*Philopotamus montanus* Donovan 1813													2
11	*Philopotamus variegatus* Scopoli 1763													3
12	*Wormaldia occipitalis* Pictet 1984													1
	HYDROPSYCHIDAE													
13	*Hydropsyche angustipennis* Curtis 1834											+	+	4
14	*Hydropsyche bulbifera* McLachlan 1878													7
15	*Hydropsyche bulgaromanorum* Malicky 1977													4
16	*Hydropsyche contubernalis* McLachlan 1865										+	+	+	8
17	*Hydropsyche fulvipes* Curtis 1834													5
18	*Hydropsyche instabilis* Curtis 1834										+	+	+	5
19	*Hydropsyche modesta* Navás 1925											+	+	4
20	*Hydropsyche pellucidula* Curtis 1834										+	+		4
21	*Hydropsyche saxonica* McLachlan 1884					+	+	+	+	+	+	+	+	9
22	*Hydropsyche* sp indet. females										+	+	+	3
	POLYCENTROPODIDAE													
23	*Neureclipsis bimaculata* Linnaeus 1758													4
24	*Plectrocnemia brevis* McLachlan 1871								+	+	+			3
25	*Plectrocnemia conspersa* Curtis 1834			+	+	+	+	+	+	+	+	+	+	9
26	*Polycentropus flavomaculatus* Pictet 1834			+	+	+	+	+	+	+	+	+	+	9
27	*Polycentropus irroratus* Curtis 1934					+	+							2
28	*Holocentropus stagnalis* Albarda 1874					+	+							2
29	*Cymus trimaculatus* Curtis 1834					+	+	+	+	+	+			6
	PSYCHOMYIDAE													
30	*Psychomyia pusilla* Fabricius 1786													3
31	*Lype phaeopa* Stephens 1868												+	3
32	*Lype reducta* Hagen 1868													1
33	*Tinodes pallidulus* McLachlan 1878										+	+	+	5
34	*Tinodes rostocki* McLachlan 1878													3
	ECNOMIDAE													
35	*Ecnomus tenellus* Rambur 1842													3

	Species	References a	b	c	d	e	f	g	h	i	j	k	l	m
	PHRYGANEIDAE													
36	*Phryganea grandis* LINNAEUS 1758												+	3
	LIMNEPHILIDAE													
37	*Ironoquia dubia* STEPHENS 1837												+	1
38	*Ecclisopteryx madida* MCLACHLAN 1867								+	+	+	+	+	6
39	*Limnephilus affinis* CURTIS 1834													4
40	*Limnephilus auricula* CURTIS 1834													4
41	*Limnephilus bipunctatus* CURTIS 1834													3
42	*Limnephilus decipiens* KOLENATI 1848											+	+	4
43	*Limnephilus extricatus* CURTIS 1834													2
44	*Limnephilus flavicornis* FABRICIUS 1787											+	+	5
45	*Limnephilus griseus* LINNAEUS 1758													4
46	*Limnephilus ignavus* MCLACHLAN 1865													3
47	*Limnephilus incisus* CURTIS 1834													2
48	*Limnephilus lunatus* CURTIS 1834													3
49	*Limnephilus rhombicus* LINNAEUS 1758											+	+	4
50	*Limnephilus sparsus* CURTIS 1834													2
51	*Limnephilus tauricus* SCHMID 1964													2
52	*Limnephilus vittatus* FABRICIUS 1798													2
53	*Grammotaulius nigropunctatus* RETZIUS 1783													6
54	*Grammotaulius nitidus* MÜLLER 1764													1
55	*Glyphotaelius pellucidus* RETZIUS 1783										+	+	+	5
56	*Anabolia furcata* BRAUER 1857						+	+	+	+	+	+	+	8
57	*Potamophylax cingulatus* STEPHENS 1837													2
58	*Potamophylax nigricornis* PICTET 1834													7
59	*Potamophylax rotundipennis* BRAUER 1857										+	+	+	6
60	*Halesus digitatus* SCHRANK 1781			+	+	+	+	+	+	+	+	+	+	9
61	*Halesus tesselatus* RAMBUR 1842										+	+	+	8
62	*Stenophylax permistus* MCLACHLAN 1895						+	+	+	+	+	+	+	8
63	*Stenophylax vibex* CURTIS 1834													1
64	*Micropterna lateralis* STEPHENS 1837											+	+	4
65	*Micropterna nycterobia* MCLACHLAN 1875			+	+	+	+	+	+	+	+	+	+	9
66	*Micropterna testacea* GMELIN 1798								+	+	+	+	+	6
67	*Micropterna sequax* MCLACHLAN 1875													4
68	*Chaetopteryx fusca* BRAUER 1857					+	+	+	+	+	+	+	+	8
	GOERIDAE													
69	*Goera pilosa* FABRICIUS 1775						+	+	+	+	+	+	+	8

Species	References a	b	c	d	e	f	g	h	i	j	k	l	m
70 *Lithax obscurus* HAGEN 1859						+	+	+	+		+		5
71 *Silo pallipes* FABRICIUS 1781											+	+	4
LEPIDOSTOMATIDAE													
72 *Crunoecia irrorata* Curtis 1834													1
LEPTOCERIDAE													
73 *Athripsodes bilineatus* LINNAEUS 1758						+	+	+	+	+	+	+	9
74 *Athripsodes cinereus* CURTIS 1834													2
75 *Ceraclea dissimilis* STEPHENS 1836													4
76 *Ceraclea alboguttata* HAGEN 1860													2
77 *Mystacides azurea* LINNAEUS 1761													2
78 *Mystacides longicornis* LINNAEUS 1758													3
79 *Mystacides nigra* LINNAEUS 1758													7
80 *Oecetis furva* RAMBUR 1842													2
81 *Oecetis lacustris* PICTET 1834													2
82 *Oecetis ochracea* CURTIS 1825													2
83 *Oecetis testacea* CURTIS 1834													2
84 *Oecetis tripunctata* FABRICIUS 1793													2
85 *Setodes punctatus* FABRICIUS 1793													2
86 *Leptocerus interruptus* FABRICIUS 1775													3
87 *Leptocerus tineiformis* CURTIS 1834													2
SERICOSTOMATIDAE													
88 *Notidobia ciliaris* LINNAEUS 1761													3
89 *Sericostoma personatum* KIRBY & SPENCE 1869												+	3
BERAEIDAE													
90 *Beraea pullata* CURTIS 1834								+	+				2

Note: *Potamophylax latipennis* CURTIS 1834 and *Silo piceus* BRAUER 1857 were omitted from the Trichoptera fauna of the Börzsöny Mountains as misidentifications (NÓGRÁDI & al. 1999).

3.2 Minimum night temperature and catching success of light trapping

The minimum night air temperature observed was 0.2 °C. At this temperature Trichoptera were still caught in the light trap. This observation corresponds to the findings of WARINGER (1991), where 0.2 °C minimum night air temperature was recorded at nights with Trichoptera present in the traps. Table 2 shows the minimum night air temperature for abundant species caught by the trap, which does not necessarily correspondend to the lowest temperature when

a given species was still able to fly at the study site. Typical autumn species e.g. *Anabolia furcata, Chaetopteryx fusca* still fly at such low night air temperature. On th other hand flight activity of summer species e.g. *Goera pilosa, Polycentropus flavomaculatus* started > 4.9 °C minimum night air temperature.

The relationship between minimum night air temperature and caddisfly catching success was highly positively significant ($p < 0.001$); Spearman's rank coefficient (Fig. 1). This relationship may be useful for rough estimate of the size of light trap catches of caddisflies.

Tab. 2: Minimum night air temperature (°C) and the first date when the Trichoptera species entered the trap at the given minimum night air temperature; only abundant species with >50 specimens per year are included

Species	°C	Date
Anabolia furcata Brauer 1857	0.2	25-10-1998
Chaetopteryx fusca Brauer 1857	0.2	25-10-1998
Microptema testacea Gmelin 1798	0.2	28-10-1998
Potamophylax rotundipennis Brauer 1857	0.7	19-10-1998
Microptema nycterobia McLachlan 1875	0.7	19-10-1998
Rhyacophila fasciata Hagen 1859	1	12-10-1998
Hydropsyche saxonica McLachlan 1884	1.1	22-05-1998
Hydropsyche sp. indet females	4.8	21-09-1998
Silo pallipes Fabricius 1781	4.9	21-05-1998
Goera pilosa Fabricius 1775	4.9	21-05-1998
Polycentropus flavomaculatus Pictet 1834	4.9	21-05-1998
Hydropsyche instabilis Curtis 1834	6.4	24-08-1998
Hydropsyche contubernalis McLachlan 1865	6.4	24-08-1998
Oecetis testacea Curtis 1834	6.4	24-08-1998
Hydropsyche pellucidula Curtis 1834	6.4	24-08-1998
Agapetus delicatulus McLachlan 1884	6.8	17-08-1998
Athripsodes bilineatus Linnaeus 1758	6.8	18-06-1998

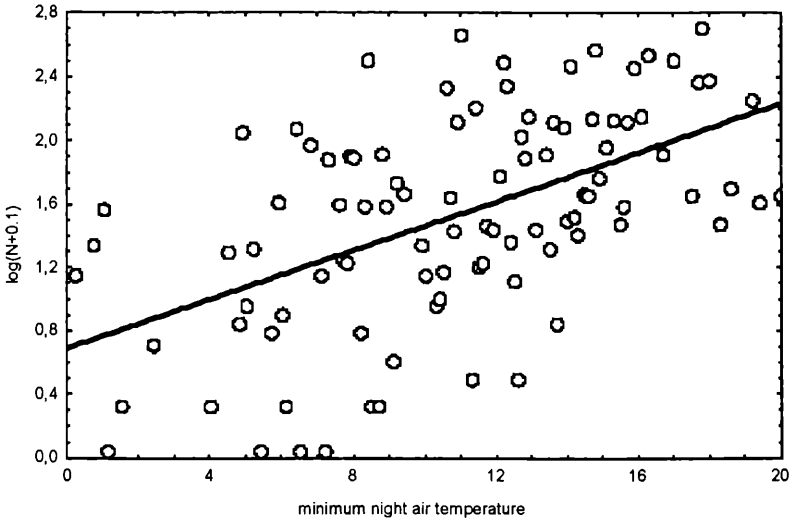

Fig. 1: Relationship between minimum night air temperature and the number of individuals caught (N). The regression is given by (log(N) = 0.69 + 0.77*MIN (r_s=0.55, p <0.001)

Acknowledgements

The author expresses his sincere thanks to Dr. Sára Nógrádi and Dr. Ákos Uherkovich for their valuable help for identification, to Árpád Bezeczky and Margit Takáts for operating the light traps. I thank Dr. Árpád Szentesi and Dr. Ákos Uherkovich for their comments on the manuscript. This research was supported by the National Scientific Research Grant (OTKA) No. F026608.

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Received: 2001-10-15