Murányi, D., J.M. Tierno de Figueroa, & M.J. López-Rodríguez. 2012. On the trophic role of *Leuctra* cf. *signifera* (Plecoptera, Leuctridae) in a small stream in Mara valley (East Carpathians, Romania).
Illiesia, 8(15):147-151. Available online: http://www2.pms-lj.si/illiesia/Illiesia08-15.pdf

urn:lsid:zoobank.org:pub:7C3A2A5C-AEDD-4CA0-9B66-6E22796BA17A

ON THE TROPHIC ROLE OF *LEUCTRA* CF. *SIGNIFERA* (PLECOPTERA, LEUCTRIDAE) IN A SMALL STREAM IN MARA VALLEY (EAST CARPATHIANS, ROMANIA)

Dávid Murányi[1], José Manuel Tierno de Figueroa[2] & Manuel Jesús López-Rodríguez[3]

[1] Department of Zoology, Hungarian Natural History Museum, H-1088 Baross u. 13, Budapest, Hungary
E-mail : muranyi@zool.nhmus.hu

[2] Department of Zoology, University of Granada, Campus Fuentenueva s/n, 18071, Granada, Spain.
E-mail: jmtdef@ugr.es

[3] Department of Ecology, University of Granada, Campus Fuentenueva s/n, 18071, Granada, Spain.
E-mail: manujlr@ugr.es

ABSTRACT

A study of the gut contents of nymphs of *Leuctra* cf. *signifera* Kempny 1899 from the Mara valley (Romania) was carried out on the basis of three samples taken in different seasons, as well as a study of the feeding habits of the 24 coexisting taxa. The diet of *L.* cf. *signifera* was composed mainly by coarse particulate organic matter (CPOM) and detritus, this species is both shredder and collector-gatherer. The macroinvertebrate community was dominated by collector-gatherers and scrapers, followed by shredders, while predators were scarce and filterers were absent. The studied community would coincide with that typical for a mid- to low-order stream.

Keywords: Plecoptera, *Leuctra* cf. *signifera,* trophic ecology, CPOM, Carpathians

INTRODUCTION

A peculiar population of *Leuctra signifera* Kempny 1899, whose larval head characters include horn-shaped lateral protrusions rich of mechanoreceptors lack ommatidia (Fig. 1), has been recently recorded in Mara valley (Eastern Carpathians, Romania) (Rebora et al. 2010). With the aim to document the trophic ecology of this particular population, a study of the gut contents of the nymphs of this species was carried out. Moreover, to better understand their role in the whole macroinvertebrate community, a study of the feeding habits of the 24 taxa that coexist with this species in this stream was made.

The Mara valley is a northward directed, 40 km long system between the Igniş and Gutâi Mts. These mountains are part of a ridge that diverges from the main chain of the Carpathians, gradually sloped to the Pannonian Plain westwards. This peculiar *Leuctra* seems to be restricted to the springbrooks of the Mara River, separated by the Pannonian Plain of about 500 km from the *L. signifera* populations known only from the Eastern Alps and its foothills. Other stoneflies found in the Mara springbrooks also differ from the typical forms and probably need to be described as new taxa (Murányi 2006); these are reported herein as *Gen.* cf. *sp.* Among them, the most interesting is the *Taeniopteryx* cf. *nebulosa* population, as *T. nebulosa* inhabits rivers and large streams while in the Mara valley we found it in small brooks in common with typical crenal and upper rhitral species. In addition to the stoneflies, the Igniş plateau has other microendemic water invertebrates like the

Fig. 1. Larval habitus of *Leuctra* cf. *signifera* from Mara valley.

snail *Bythinella molcsanyi* Wagner 1941 or the caddisfly *Chaetopteryx aproka* Oláh 2011.

MATERIAL AND METHODS

The studied brook is a first order unnamed tributary of the Mara, locality data: Romania, Maramureş county, Igniş Mts, Deseşti-Staţiunea Izvoare, on the Valhani Plateau, 1020m a.s.l., N 47°43.015′ E 23°44.547′. The brook flows through an open wet meadow with *Eriophorum* and seeps with *Sphagnum* (Fig. 2). The width is approximately 0.5 m with steep banks, and depth is between 10 and 20 cm. The velocity is moderately fast, and acidic typical of the whole volcanic plateau. Despite the low elevation, climate of the plateau is rather cold and wet. The streambed consists of volcanic stones, pebbles, gravel patches and *Fontinalis* (Fig. 3). Semiquantitative samples were collected on 03.05.2009, 07.10.2010 and 31.03.2011: a collecting net was submerged into narrow brook sections, and an upstream area of approximately 0.5 m^2 was disturbed by hand. The semiquantitative samples were enhanced by collecting single specimens of rare taxa missing from the samples but present in the stream section.

The analysis of the feeding habits was carried out using the methods of Bello & Cabrera (1999) adapted to the study of the digestive tract, as has been done in other works studying stonefly and other macroinvertebrate feeding (Tierno de Figueroa et al. 2006; López-Rodríguez et al. 2009). Each individual was placed into a vial with Hertwig´s liquid and heated in an oven at 65°C for approximately 24 hours, which provided a clear view of the gut contents. Afterwards, the specimens were mounted on slides for study under an Olympus CX21LED binocular optical microscope. Absolute gut content, calculated as a percentage of the gut occupied by food, was determined at 40x, and the percentage of the relative contribution of each food item to the total gut content was determined at 400x. All specimens were studied using this method except *Dina* sp., and due to its fluidophagous habits, did not allow a clear identification of the gut content. The diet of *Dina* sp. was obtained from Tachet et al. (2010). Taxa were assigned to Functional Feeding Groups (FFG; Merritt & Cummins 2006) according to the main gut contents.

Figs. 2-3. The study site: springbrook of Mara River, East Carpathians, Romania. 2: habitat; 3. substrate.

RESULTS AND DISCUSSION

The diet of *Leuctra* cf. *signifera* was composed of mainly coarse particulate organic matter (CPOM) and detritus (Table 1). Other minority components were fungi hyphae, spores and diatoms, but their low density in the guts would indicate that they were ingested incidentally with CPOM or detritus. Thus, this species is both shredder and collector-gatherer. This classification is consistent for the genus *Leuctra* (mainly collector-gatherer but also shredder and grazer; Graf et al. 2009).

The macroinvertebrate community was composed of 24 taxa (sometimes identified only to generic level) belonging to eight Orders (Table 1). The most abundant taxon in the samples was *Gammarus* sp., followed by *L.* cf. *signifera*. Regarding their trophic role, collector-gatherers and scrapers were the dominant groups, followed by shredders. The great presence of scrapers in the community may be related to the massive growth of diatoms due to the absence of canopy and, especially, to the acidic water that outflows from the *Sphagnum* bogs. Predators were very scarce, only represented by *Isoperla* cf. *sudetica* and *Dina* sp. Nevertheless, some taxa that in this work have been recorded as non-predators because they were collected in their early developmental stages, could act as predators when older (e.g. *Isoperla* sp. and *Rhyacophila* sp.). Filterers were absent in the community. In accordance with the trophic structure, the studied community would coincide with that typical for a mid- to low-order stream (Vannote et al. 1980). Furthermore, many taxa feed on very different resources at any particular point in time, and even from different trophic levels, e.g. *Isoperla* cf. *sudetica* or *Rhyacophila* sp. acting as predators and collector-gatherers.

REFERENCES

Bello, C.L. & M.I. Cabrera. 1999. Uso de la técnica microhistológica de Cavender y Hansen en la identificación de insectos acuáticos. Boletín Entomológico Venezolano, 14:77-79.

Table 1. Gut content composition and FFG of the macroinvertebrate taxa in Mara valley. Values are Mean±SD (minimum-maximum); C-g= collector-gatherer; Sh= shredder; Sc= scrapper; P= predator; * Data from Tachet et al. (2010).

Taxon	N	% detritus	% MOPG	% hyphae	% spores	% diatoms	% pollen	% prey	FFG
Rhitrogena iridina (Kolenati, 1839)	6	64.3±25.9 (19-90)	24.2±27.1 (0-70)	8.5±4.1 (3-15)	2.2±2.7 (0-6)	0.7±1.6 (0-4)	0.2±0.4 (0-1)	-	C-g/Sh
Rhitrogena sp.	8	10.5±2.0 (8-15)	4.0±4.2 (0-10)	5.3±3.1 (2-10)	0.5±1.4 (0-4)	79.8±6.2 (70-90)	0.0	-	Sc
Baetis rhodani (Pictet, 1843)	1	84.0	0.0	15.0	1.0	0.0	0.0	-	C-g
Baetis sp.	2	14.0±1.4 (13-15)	2.5±3.5 (0-5)	1.0±1.4 (0-2)	0.0	82.5±3.5 (80-85)	0.0	-	Sc/C-g
Rhabdiopteryx sp.	1	5.0	1.0	8.0	0.0	86.0	0.0	-	Sc
Taeniopteryx cf. *nebulosa* (Linnaeus, 1758)	2	46.5±27.6 (27-66)	35.0±21.2 (20-50)	15.0±7.1 (10-20)	3.0±0.0 (3-3)	0.5±0.7 (0-1)	0.0	-	C-g/Sh
Protonemura sp.	1	12.0	10.0	8.0	0.0	70.0	0.0	-	Sc/C-g
Nemoura carpathica Illies, 1963	2	50.0±70.7 (0-100)	50.0±70.7 (0-100)	0.0	0.0	0.0	0.0	-	C-g/Sh
Nemoura sp.	1	12.0	60.0	8.0	0.0	20.0	0.0	-	Sh/Sc
Leuctra cf. *signifera* Kempny, 1899	16	47.3±24.6 (0-77)	47.8±25.0 (20-100)	5.2±3.1 (0-10)	0.9±1.5 (0-6)	0.1±0.3 (0-1)	0.0	-	Sh/C-g
Leuctra cf. *nigra* (Olivier, 1811)	1	82.0	10.0	8.0	0.0	0.0	0.0	-	C-g
Isoperla cf. *sudetica* (Kolenati, 1860)	3	19.7±16.7 (10-39)	3.3±5.8 (0-10)	1.0±1.0 (0-2)	0.0	0.0	0.0	76.0±22.5 (50-90)	P/C-g
Isoperla sp.	1	10.0	10.0	0.0	0.0	80.0	0.0	-	Sc
Drusus sp.	8	17.9±17.7 (5-60)	20.6±27.9 (0-80)	3.9±3.7 (0-10)	0.0	57.5±37.2 (0-94)	0.1±0.4 (0-1)	-	Sc/Sh/C-g
Other Limnephilidae	9	6.0±5.4 (0-15)	81.8±31.8 (0-100)	1.7±3.5 (0-10)	0.0	10.6±29.8 (0-90)	0.0	-	Sh
Rhyacophila sp.	1	5.0	0.0	1.0	0.0	94.0	0.0	9.0	Sc
Goeridae (pupa)	1	-	-	-	-	-	-	-	-
Elmidae (adult)	1	100.0	0.0	0.0	0.0	0.0	0.0	-	C-g
Elmidae (larva)	5	10.2±21.1 (0-48)	0.0	2.2±4.4 (0-10)	0.4±0.9 (0-2)	87.2±21.1 (50-99)	0.0	-	Sc
Chironomidae	1	85.0	10.0	5.0	0.0	0.0	0.0	-	C-g
Niphargus puteanus baloghi Dudich, 1940	4	34.3±17.1 (13-50)	54.0±10.7 (48-70)	1.3±1.5 (0-3)	1.0±1.1 (0-2)	0.3±0.5 (0-1)	0.0	-	Sh/C-g
Gammarus sp.	42	50.1±20.7 (10-94)	43.9±21.3 (4-90)	5.6±3.7 (0-15)	0.3±0.9 (0-5)	<0.1±0.3 (0-2)	0.0	-	C-g/Sh
Tubificidae	3	25.3±17.9 (15-46)	60.0±26.5 (30-80)	10.3±7.5 (3-18)	1.7±2.1 (0-4)	1.3±0.6 (1-2)	1.3±2.3 (0-4)	-	Sh/C-g
Dina sp.	8	-	-	-	-	-	-	-	P*

Graf, W., A. Lorenz, J.M. Tierno de Figueroa, S. Lücke, M.J. López-Rodríguez, & C. Davies. 2009. Distribution and Ecological Preferences of European Freshwater Organisms. Volume 2: Plecoptera. Series Editors: A. Schmidt-Kloiber & D. Hering. PENSOFT Publishers, Sofia.

Kempny, P. 1899. Zur kenntniss der Plecopteren. II. Neue und ungenügend bekannte Leuctra-Arten. III. Theile. Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien, 49:269-278.

López-Rodríguez, M.J., J.M. Tierno de Figueroa, & J. Alba-Tercedor. 2009. Life history of two burrowing aquatic insects in Southern Europe: *Leuctra geniculata* (Insecta: Plecoptera) and *Ephemera danica* (Insecta: Ephemeroptera). Aquatic Insects, 31 (2):99-110.

Merritt, R.W. & K.W. Cummins. 2006. Trophic relationships. pp. 585-610. *In* Hauer, F.R. & G.A. Lamberti [eds.]. Methods in Stream Ecology. 2nd ed. Academic Press, Inc., San Diego, CA, 877 pp.

Murányi, D. 2006. Review and contribution to the Plecoptera fauna of Maramureş, Romania. Studia Universitatis Vasile Goldiş Arad, 17:85-94.

Oláh, J. 2011. A new species of *Chaetopteryx* (Trichoptera, Limnephilidae) from the Northeast Carpathians. Braueria, 38:9-10.

Rebora, M., D. Murányi, S. Piersanti & E. Gaino. 2010. The lateral protrusions of the head of the stonefly larva *Leuctra* cf. *signifera* (Plecoptera: Leuctridae). Aquatic Insects, 32 (4):259-264.

Tachet, H., P. Richoux, M. Bournaud & P. Usseglio-Polatera. 2010. Invertébrés d'eau douce.

Systématique, biologie, écologie. CNRS Editions, Paris.

Tierno de Figueroa, J.M., A. Vera, & M.J. López-Rodríguez. 2006. Adult and nymphal feeding in the stonefly species *Antarctoperla michaelseni* and *Limnoperla jaffueli* from Central Chile (Plecoptera: Gripopterygidae). Entomologia Generalis, 29 (1):39-45.

Vannote, R.L., G.W. Minshall, K.W. Cummins, J.R. Sedell, & C.E. Cushing. 1980. The river continuum concept. Canadian Journal of Fisheries and Aquatic Science, 37:130-137.

Wagner, J. 1941. A Gutin-hegység Mollusca faunájának alapvetése. Állattani Közlemények, 38:197-210.

Received 9 August 2012, Accepted 11 September 2012, Published 1 October 2012