J. Entomol. Res. Soc., 15(3): 85-94, 2013 *ISSN:1302-0250*

On the identity of *Habroleptoides carpatica* Bogoescu and Crăsnaru, 1930 and *H. confusa* Sartori and Jacob, 1986 (Insecta: Ephemeroptera: Leptophlebiidae: Habrophlebiinae)

Éva VÁNCSA[1, 2*] László RÁKOSY[1] Michel SARTORI[3]

[1]Babeş-Bolyai University, Department of Taxonomy and Ecology, Clinicilor 5-7, 400006 Cluj-Napoca, ROMANIA, e-mail: laszlorakosy@hasdeu.ubbcluj.ro

[2]National Administration of Romanian Waters, Olt River Directorate, Water Management System of Covasna, Lunca Oltului 41, 520036 Sfântu Gheorghe, ROMANIA

[3]Museum of Zoology, Palais de Rumine, CH-1014 Lausanne, SWITZERLAND

e-mail: michel.sartori@vd.ch

*Corresponding author's: e-mail: vancsaeva@gmail.com

ABSTRACT

Based upon a morphological study on topotypical larvae and reared imagines *Habroleptoides carpatica* Bogoescu and Crăsnaru, 1930 is considered as identical to *H. confusa* Sartori and Jacob, 1986. Diagnostic characters previously suggested for *H. carpatica* are shown to be unreliable and fall into the intraspecific variation of *H. confusa*. A proposal to consider *H. carpatica* as a senior subjective synonym of *H. confusa* is pending at the ICZN.

Key words: Ephemeroptera, *Habroleptoides carpatica*, *H. confusa*, synonyms, morphological characters, intraspecific variability, ICZN.

INTRODUCTION

The genus *Habroleptoides* Schönemund, 1929 encompasses 17 species, all of them restricted to the Western Palaearctic (Bauernfeind and Soldán, 2012; Kazanci and Türkmen, 2011). Although major revision of the genus was undertaken by Sartori (1986), Sartori and Jacob (1986), Sartori and Thomas (1986) and new species are described (Kluge, 1994; Kazanci and Türkmen, 2011), the status of *Habroleptoides carpatica* Bogoescu and Crăsnaru, 1930 is still not clear. The species was described at imaginal and larval stages from Valea Căşăriei brook close to the Zoological Research Station of Sinaia (Romanian Carpathians) (Bogoescu and Crăsnaru, 1930). Since then, *H. carpatica* was reported mainly from Romanian watercourses, like the Valea Babei brook and Tufa brook (Sinaia, Bucegi Mountains) (Bogoescu, 1932), River Bistriţa (Bacău county) (Bogoescu, 1958), Izvorul-Alb creek (Bacău county) (Miron, 1959), River Someş (Szállassy, 1999), but also from the Serbian Carpathians (Filipovic, 1979) and Serbian and Eastern Bosnian-Herzegovinan Dinaric Alps (Filipovic 1975,

Tanasijevic, 1970, 1973). Diagnostic characters mentioned by Bogoescu and Crăsnaru (1930) for *H. carpatica* included the two segmented labial palps and maxillary palps, the venation of the hind wings of the imagines and the shape of the last abdominal sternum of the female imago. Later on Bogoescu (1958) completed the description with further characteristics of the male genitalia (the third segment of the forceps visibly shorter than the second one and the diameter of the internal process nearly equal to the diameter of the basal segment of the forceps right above the process). When Sartori and Jacob (1986) established the new name *Habroleptoides confusa* for the widespread but misidentified taxon *H. modesta* sensu Schönemund et auct. sequ. (nec *Potamanthus modestus* Hagen, 1864) they supposed that the discriminating characters observed by Bogoescu and Crăsnaru (1930) in imagines might fall into the natural variation of *H. confusa*. However, in absence of the type material (or topotypic material) of *H. carpatica* the authors refrained from any decision about the status of *H. carpatica*. Based on the same rationale Bauernfeind and Soldán (2012) subsequently considered *H. carpatica* to represent an insufficiently described taxon (*species inquirenda*), most probably conspecific with *H. confusa*.

The aim of the present study is to assess the variation of morphological characters of *H. confusa* sampled from a wide range of habitats and to ascertain the taxonomic position of *H. carpatica* based on reared material from the type locality (Valea Căşăriei brook, Sinaia, Bucegi Mountains, Southern Carpathians, Romania).

MATERIAL AND METHODS

Despite numerous efforts, the type material of *H. carpatica* was not found, the collection of Bogoescu being declared lost by Romanian researchers and staff of museums and research stations. Therefore on the 17th of April 2009 a total of five *Habroleptoides* larvae were sampled from the type locality of *H. carpatica*, Valea Căşăriei brook (Fig. 1.). As the collection of imagines failed, larvae were transported to the laboratory in a refrigerator bag and reared. Two nymphs died during rearing process and three specimens developed to imagines. All the material, including the nymphal skins, was preserved in 70% ethanol.

Additionally *H. confusa* specimens were sampled from different locations. Larvae were also reared.

Specimens were analyzed under a Hund Wetzlar stereomicroscope and Olympus microscope. Slides were realized: mouthparts, legs, genitalia were fixed with Liquid de Faure (Adam and Czihak, 1964), gills, terga, sterna, eggs and the entire exuvia were mounted in PVA (Heinze 1952). Photographs were taken and measurements were realized digitally with the help of the Cell^A software. The chorionic structure of the eggs of *H. carpatica* was investigated with a Jeol JSM-7401F scanning electron microscope at 4kV.

The analysis of the diagnostic characters mentioned by Bogoescu and Crăsnaru (1930) and Bogoescu (1958) for *H. carpatica* formed the basis of our investigation.

Other characters such as groups of bristles and spines were identified on the mouthparts, legs and pronotum of the larvae or nymphal exuviae and were counted. Number of teeth on the claws was also registered (Fig. 3.). In imaginal stage (Fig. 4.) the study was completed with measurements of the distance between eyes (compound eyes and ocelli), length of fore legs (femur, tibia, tarsal segments), length of wings (Fig. 5.).

Fig. 1. Type locality of *H. carpatica:* Valea Căşăriei brook, Sinaia.

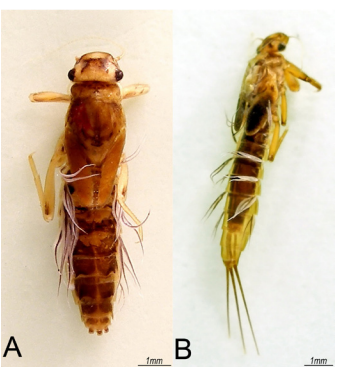

Fig. 2. A, B: Larvae of *H. carpatica.*

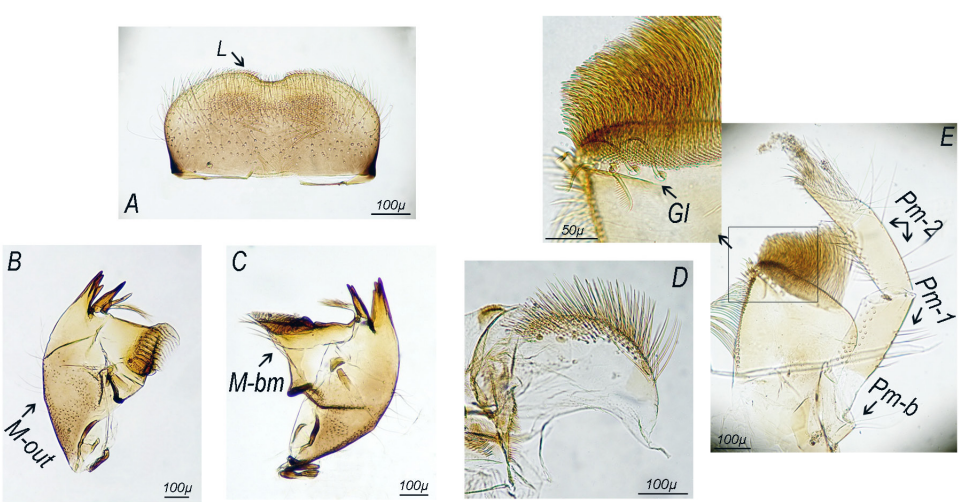

Fig. 3. *H. carpatica*: A: labrum, L - row of bristles along the anterior margin of the labrum, B: left mandible, M-out – row of bristles along the outer margin of the mandible, C: right mandible, M-bm – row of bristles on the right mandible, below the mola, D: hypopharingeal superlingua, E: maxilla, Gl – row of comb-shaped bristles on lacinia, Pm-b – group of bristles at the base of the maxillary palp, Pm-1 – row of bristles along the 1st segment of the maxillary palp, Pm-2 – row of bristles along the 2nd segment of the maxillary palp.

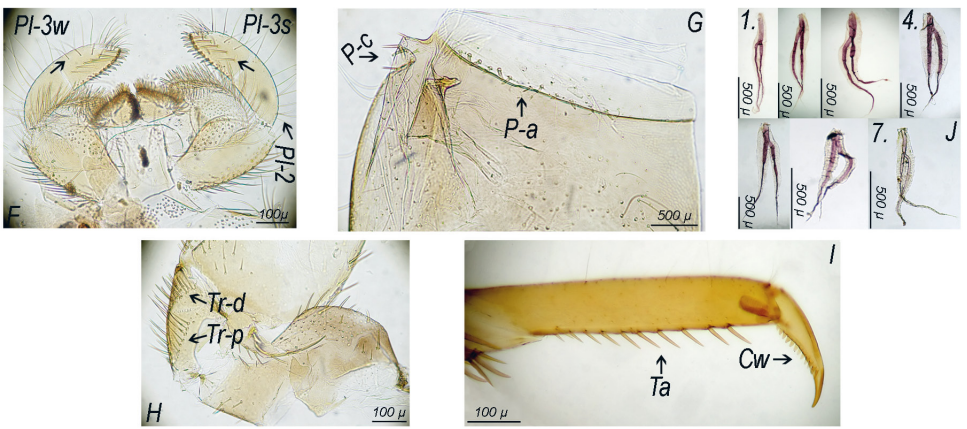

Fig. 3. (Continue) *H. carpatica*: F: labium, Pl-2 – row of bristles along the margin of the 2nd segment of the labial palp, Pl-3w – row of thick bristles on the 3rd segment of labial palps, Pl-3s - row of thin bristles on the 3rd segment of labial palps, G: pronotum, P-a – row of bristles along the anterior margin of the pronotum, P-c – group of bristles in the antero-lateral part of the pronotum, , H: coxa and trochanter (1. leg), Tr-d – row of bristles on the distal part of the trochanter, Tr-p – row of bristles on the proximal part of the trochanter, I: tarsus (3. leg), Ta – spines along the inner margin of the tarsus, Cw – teeth on the claw, J: gills.

Fig. 4. *H. carpatica*: ♂ imago.

RESULTS

Habroleptoides carpatica Bogoescu and Crăsnaru, 1930

Material examined: 2 nymphs, 1 ♂ and 1 ♀ (reared) with their nymphal exuviae: Valea Căşăriei brook, 45.366944 N 25.556389 E, 928 m a.s.l., 17. IV. 2009 (leg. et det. É. Váncsa)

Habroleptoides confusa Sartori and Jacob, 1986

Material examined: Switzerland: 1 ♂, holotype, Vaud canton, Orbe, River Vallorbe, 46.700278 N 6.346389 E, 790 m a.s.l., 12.8.1983; 1 larva, Vaud canton, Promenthouse, road Duillier-Genolier, 46.416389 N 6.224444 E, 460 m a.s.l., 5. 6. 1984; 1 larva Ticino canton, Verzasca, Lavertezzo, 46.259167 N 8.837778 E, 530 m a.s.l., 18. 4. 1984 (leg. et det. M. Sartori);

Austria: 1 larva Rabenstein, River Pielach, 47.868611 N 13.701944 E, 344 m a.s.l., 10. 5. 1986; 1 larva Frankenfels, R. Natters, 48.112222 N 15.408333 E, 27. 4. 1986; 1 larva Baden, R. Schwechat, 47.994167 N 16.216944 E, 245 m a.s.l., 9. 9. 1987; 1 larva Brauhaus, Brook Große Krems, 48.466944 N 15.378611 E, 529 m a.s.l., 17. 8. 1985; 1 larva Wilhelmsburg, R. Traisen, 48.087222 N 15.641111 E, 326 m a.s.l., 17. 4. 1990 (leg. et det. E. Bauernfeind);

Bulgaria: 1 ♂, 1 ♀ Stara Planina, Karlovo, Karlovo, 42.672583 N 24.752944 E, 700 m a.s.l., 06. 6. 2008; 2 larvae Pirin, Razlog, Bansko, 41.811611 N 23.471194 E, 1170 m a.s.l., 09. 6. 2008; 1 larva Pirin, Goce Delcev, 41.631556 N 23.496278 E, 1620 m a.s.l., 10. 6. 2008; 1 larva Rila, Belovo, Jundola, 42.083556 N 23.890139 E, 1320 m a.s.l., 07. 6. 2008 (leg. M. Bálint and P. Neu, det. É. Váncsa);

Czech Republik: 2 larva potok Hodonice, 49.270278 N 14.480556 E, 407 m a.s.l. , 3 ♂♂ Záhořanský potok, Libřice, 49.896111 N 14.4225 E, 229 m a.s.l., 5. 5. 1975 (leg. et det. T. Soldán);

Germany: 3 ♂♂ (reared) Elmbach, downstream Elm, 50.357625 N 9.548053 E, 225 m a.s.l., 27. 4. 2011 (leg. et det. É. Váncsa);

Hungary: 2 larvae Bükkös creek, upstream Szentendre, 47.694397 N 19.0023 E, 256 m a.s.l., 07. 5. 2010 (leg. et det. B. Cser);

Spain: 5 ♂♂ Sant Nicolau stream, Aigüestortes National Park (PNA), Pyrenees, 42.566611 N 0.931306 E, 1893 m a.s.l., 1. 7. 2009 (leg. et det. M.-A. Puig);

Romania: Western Carpathians: 5 larvae, 1 ♀ Drăgan creek, 46.845022 N 22.801447 E, 609 m a.s.l., 08. 5. 2010; Eastern Carpathians: 1 ♂ (reared) and its nymphal exuvia, 1♂ (reared) and 1 ♀ nymphal exuvia, Ozunca creek, upstream Băţanii Mari village, 46.093814 N 25.722458 E, 533 m a.s.l, 11. 4. 2009; 1 ♂ and 1 ♂ (reared) and their nymphal exuvia, 1 nymphal skin, Aita creek, upstream Aita Medie village, 45.974581 N 25.626739 E, 530 m a.s.l , 11. 4. 2009; 1 ♂, 1 ♀(reared) and their nymphal exuvia, 1 ♂ (reared), Cormoş creek, upstream Filia village, 46.175967 N 25.627689 E, 554 m a.s.l., 11. 4. 09 (leg. et det. É. Váncsa), Transylvanian Alps: 1 larva Cibin river, downstream Gura Râului lake, 45.717461 N 23.954344 E, 602 m a.s.l., 21. 4. 2010 (leg. E. Popescu, det. É. Váncsa).

The analyzed material collected from the type locality of *H. carpatica* is preserved in the Zoological Museum from Cluj-Napoca, Romania.

The specimens collected in Valea Căşăriei brook resemble *H. confusa* both in larval and imaginal stage in all respects. Thus among the characteristics of *H. carpatica* relevant for our study we highlight the three-segmented maxillary and labial palps of the larvae (Fig. 3. E, F) and the relatively similar length of the first pair of gills with the following ones (Fig. 2., Fig. 3. J). For imagines the variation of the hind wing venation, observed even in a single individual (right and left wings), seems to be one of the most conspicuous trait. This is well marked by the disparate number and location of the transversal veins between R-M and Cu-M (Table 2., Fig. 5. D, E). Additionally for the ♂ genitalia the well-developed internal projection of the basal segment of the forceps, the shorter third segment of the forceps comparing to the middle one and the relatively broad, apically slightly rounded penes are determinative (Fig. 5. A). Finally for the ♀ imago we emphasize the bluntly ending lobes of the last sternum (Fig. 5 B),

and the constitution of the egg chorion from ridges arranged in parallel, longitudinal rows (Fig. 5. F, G).

Further characteristics of *H. carpatica* larvae in comparison with *H. confusa* can be seen in Table 1. Table 2 presents details of the analyzed characters in the imaginal stage.

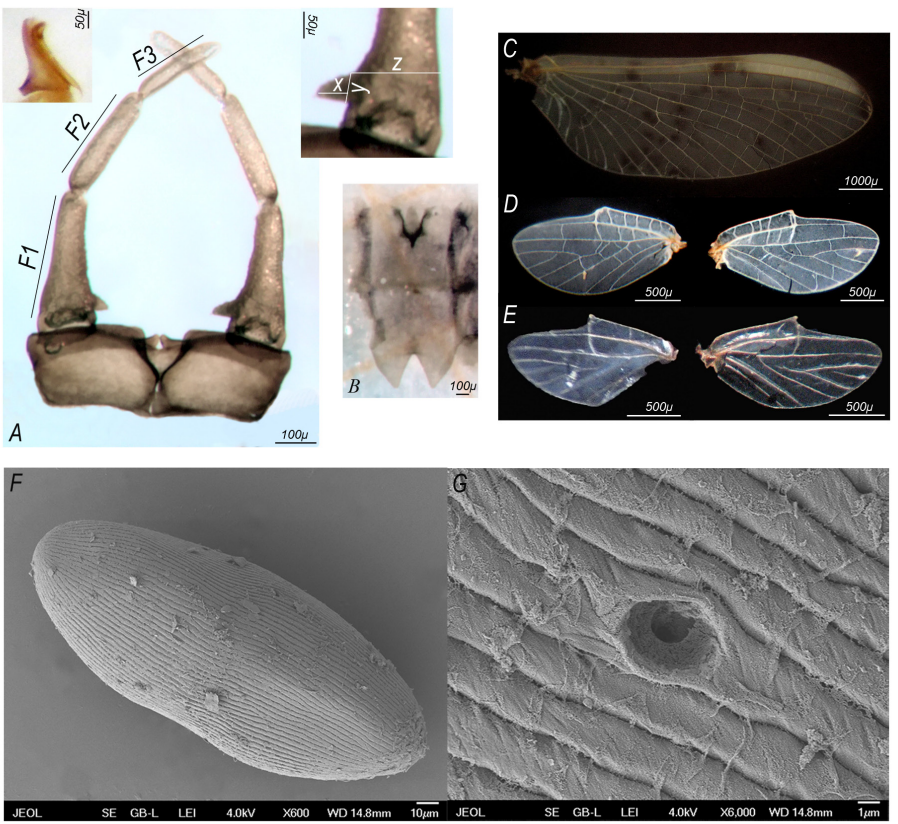

Fig. 5. *H. carpatica*: A: ♂ genitalia, F1– length of the first segment of the forceps, F2 - length of the second segment of the forceps, F3 - length of the third segment of the forceps, x – length of the internal process, y – width of the internal process, z- width of the basal segment of the forceps, B: ♀ last sternum, C: ♂ fore wing, D: ♂ hind wings, E: ♀ hind wings, F: egg, G: micropyle

DISCUSSION

The present study confirms that the *Habroleptoides* specimens collected at the type locality of *H. carpatica* cannot be separated from *H. confusa* neither in the larval nor in the imaginal stages. The morphological traits suggested by the original description of *H. carpatica* are either unreliable or non-existent. Thus the examination of the mouthparts of *Habroleptoides* larvae (larval exuviae) originating from Sinaia

clearly indicated that the maxillary and labial palps are composed of three segments each, instead of the two described, which is obviously based on a misinterpretation by Bogoescu and Crăsnaru (1930). The measurements made on the male genitalia also disagree with the findings of Bogoescu (1958). Even though the third segment of the forceps turned to be shorter than the middle one in all the analyzed specimens, including *H. confusa*, the difference between the segments of the two species was not as pronounced as it was suggested. Likewise the internal projection of the forceps was about half the width of the basal segment right above the process in all measured males, instead of being about the same width in *H. carpatica* and 3 times thinner in *H. confusa*. Slight deflections from the vertical position of the process during the measurements could explain the differences recorded by Bogoescu (1958). Both species are also supposed to differ by the number of intercalary veins present in the hind wings, but our results clearly deny the reliability of this diagnostic character (Fig. 5. D, E). The variation of hind wing venation in *H. confusa* had been previously documented by Biancheri (1956 [sub *H. modesta*]) and Sartori and Jacob (1986). The SEM study of the eggs of *H. carpatica* revealed the same chorionic structure with the eggs of *H. confusa*, previously studied by Gaino *et al*. (1993). The present analysis, including the study of additional larval and imaginal structures as well (Tables 1, 2), did not reveal the existence of any species-specific morphological trait.

Table 1. Numerical characters of *H. carpatica* and *H. confusa* larvae (for abbreviations of the analyzed characters see Fig. 3)

Analyzed characters		*H. carpatica*		*H. confusa*	
		variation	N ind	variation	N ind
1 leg	Cw	9-13	4	11-15	28
	Tr-p	9-14	4	8-20	25
	Tr-d	14-19	4	15-30	20
2 leg	Cw	9-13	4	10-15	28
	Ta	10-11	4	8-14	27
	Tr-p	2-4	3	0-9	22
	Tr-d	4-8	4	3-13	23
3 leg	Cw	12-13	3	10-16	24
	Ta	10-11	3	8-14	24
	Tr-p	1	3	1-3	18
	Tr-d	4	3	1-9	20
Mouthparts	L (half)	10-12	4	8-16	27
	L (entire)	21-23	4	17-31	27
	M(left)-bm	8-11	4	7-14	21
Mouthparts	M(left)-out	11-14	3	8-28	20
	M(right)-out	12-14	3	6-28	19
	Pm-b	4-5	3	4-6	26
	Pm-1	6-8	4	3-11	27
	Pm-2	3-5	3	2-5	27
	Gl	4-5	4	4-6	26
	Pl-2	8-11	3	7-13	27
	Pl-3s	4-6	3	4-8 (12)	26
	Pl-3w	4	3	2-7	26
Pronotum	P(left part)-a	12-14	4	7-17	22
	P(right part)-a	11-13	4	9-23	22
	P(left part)-c	6-11	4	4-15	23
	P(right part)-c	4-11	4	4-13	23

In conclusion the morphological analysis clearly revealed that the diagnostic characters suggested by Bogoescu and Crăsnaru (1930) and Bogoescu (1958) for *H. carpatica* fit into the natural variation of *H. confusa*. Therefore both taxa should be considered as synonyms.

Following the principle of priority article 23.1 (ICZN, 1999), the valid name should be *H. carpatica*. But in order to stabilize the nomenclature, we propose that prevailing usage should be maintained. *H. confusa* is a widespread species and its name has been commonly used in taxonomic, faunistic and ecological works ever since its description in 1986. Thus conditions requested for article 23.9.1.2 are met, but obviously not those of article 23.9.1.1 , i.e. the senior synonym has not been used as a valid name after 1899. Therefore, the case has been referred to the Commission (Váncsa and Sartori, 2013). Meanwhile, prevailing usage will be maintained (article 82) and the name *H. confusa* used until the ruling of the Commission is published.

Table 2. Numerical characters of *H. carpatica* and *H. confusa* imagines (for abbreviations of the analyzed characters see Fig. 5.)

Analyzed characters		*H. carpatica*		*H. confusa*	
		variation	N ind. gen	variation	N. ind. gen
Distance eyes (µm)	compound	175	1 ♂	154-224	12 ♂
	ocelli	222	1 ♂	222-280	12 ♂
1. leg – length (µm)	Femora	1980 / 1593	1 ♂ /1 ♀	1769-2329 / 1463	10 ♂ / 1 ♀
	Tibia	2898 / 1896	1 ♂ / 1 ♀	2482-3016 / 1949	12 ♂ / 1 ♀
	Tars 1	1063 / 205	1 ♂ / 1 ♀	919-1140	12 ♂
	Tars2	990 / 158	1 ♂ / 1 ♀	871-1200	12 ♂
	Tars3	772 / 131	1 ♂ / 1 ♀	678-908	12 ♂
	Tars4	263 / 253	1 ♂ / 1♀	119-360	12 ♂
Wing length (µm)	fore wing	7803	1 ♂	7334-8657 / 8482	14 ♂ / 1 ♀
	hind wing	1852 / 1519	1 ♂ / 1 ♀	1759-2212 / 1754-2187	9 ♂, 2 ♀
Fore wing – crossveins (N)	pterostigma	14	1 ♂	10-14	7 ♂, 2 ♀
Fore wing – intercalary veins (N)	cubital field	5	1 ♂, 1 ♀	4-5	15 ♂, 2 ♀
Hind wing – transversal veins (N)	R-M	0-3	1 ♂, 1 ♀	1-4	17 ♂, 2 ♀
	Cu-M	0-1	1 ♂, 1 ♀	0-1	17 ♂, 2 ♀
Genitalia (µm)	x	63	1 ♂	53-83	18 ♂
	y	52	1 ♂	42-67	18 ♂
	z	101	1 ♂	91-142	18 ♂
	F1	325	1 ♂	302-392	18 ♂
	F2	280	1 ♂	261-327	15 ♂
	F3	233	1 ♂	206-272	15 ♂

ACKNOWLEDGMENTS

The authors express their sincere gratitude to the following researchers for supporting the study with specimens: Ernst Bauernfeind (Naturhistorisches Museum Wien), Balázs Cser (Middle-Danube Valley Inspectorate for Environment, Nature and Water, Budapest), Tomáš Soldán (Biology Centre CAS, Institute of Entomology, České Budějovice), Elena Popescu (National Administration of Romanian Waters, Olt River Directorate, Sibiu) and Maria-Angels Puig (Centro de Estudios Avanzados

de Blanes, Blanes). The collection realized by M.-A. Puig was supported by the MAYSTONES (Spanish MMARM 10/2007) project. Thanks are also due to T. Soldán for SEM photographs, which were realized under the financial support of the Grant Agency of the Czech Republic (Project No. 206/08/1389), to Nikita Julievich Kluge (Saint-Petersburg State University, Saint-Petersburg) and to Ana-Maria Krapal ("Grigore Antipa" National Museum of Natural History, Bucharest) for literature. For his helpful advice during the study, nomenclatorial help and comments on an earlier draft of the manuscript, we are grateful to E. Bauernfeind. Thanks are due to the two anonymous reviewers, whose comments and suggestions improved the manuscript.

REFERENCES

Adam, H., Czihak, G., 1964, *Arbeitsmethoden der makroskopischen und mikroskopischen Anatomie*. Ein Laboratoriumshandbuch für Biologen, Mediziner und Hilfskräfte. Gustav Fischer Verlag Stuttgart, 583.

Bauernfeind, E., Soldán, T., 2012, *The Mayflies of Europe (Ephemeroptera)*. Apollo Books, Ollerup, 781.

Biancheri, E., 1956, Note sugli Efemerotteri Italiani. IV Sulla variabilita' delle ali posteriori di *Habrophlebia (Habroleptoides) modesta* (Hagen). *Bollettino della Società Entomologica Italiana*, 86(7-8): 122-126.

Bogoescu, C., 1932, Contributions à l'étude systématique des Éphéméroptères de Roumanie. *Publicaţiunile Societăţii Naturaliştilor din România*, 11: 134-142.

Bogoescu, C., 1958, *Ephemeroptera. Fauna Republicii Socialiste Romîne. Insecta* (I). Academia Republicii Socialiste Romîne, Bucureşti, 7(3) : 187 (in Romanian).

Bogoescu, C., Crăsnaru, C., 1930, Sur une nouvelle espèce de *Habroleptoides* Schönem. (Ephemeroptera), *Habroleptoides carpatica* n. sp. *Bulletin de la Section Scientifique de l'Académie Roumaine*, 13(2): 190-194.

Filipovic, D., 1975, Ephemeroptera of S. R., Serbia. *Recueil des Travaux sur la Faune d'Insectes de la Serbie*, 1: 211-219.

Filipovic, D., 1979, *Biogeographical and faunistical notes on mayflies (Ephemeroptera) of SR Serbia*. *In*: Pasternak, K., Sowa, R. (Eds.). Proceedings of the Second International Conference on Ephemeroptera. Panstwowe Wydawnictwo Naukowe, Warszawa-Kraków, 31-37.

Gaino, E., Mazzini, M., Sartori, M., 1993, Comparative analysis of the chorionic pattern in *Habroleptoides* species (Ephemeroptera, Leptophlebiidae). *Bolletino di zoologia,* 60: 155-162.

Heinze, K., 1952, Polyvinylalkohol-Lactophenol-Gemisch als Einbettungsmittel für Blattläuse. *Die Naturwissenschaften,* 12: 285-286.

Kazanci, N., Türkmen, G., 2011, *Habroleptoides kavron* sp. n., a new species (Ephemeroptera, Leptophlebiidae) from Eastern Black See Region (Turkey) with ecological notes. *Review of Hydrobiology*, 4(2): 63-72.

Kluge, N. Ju., 1994, Habrophlebiinae subfam. n. with description of a new species of *Habroleptoides* from the Caucasus (Ephemeroptera: Leptophlebiidae). *Zoosystematica Rossica*, 3(1): 35-43.

Miron, I., 1959, Contribuţii la cunoaşterea Ephemeropterelor din bazinul mijlociu al Bistriţei. (Contribution to the knowledge of Ephemeroptera fauna of the middle course catchment of River Bistriţa) *Analele Ştiinţifice ale Universităţii "Al. I. Cuza" Iaşi*, 6: 307-312 (in Romanian).

Sartori, M., 1986, Révision taxonomique du genre *Habroleptoides* Schönemund, 1929 (Ephemeroptera; Leptophlebiidae) III. Description de *H. annae* n. sp. et de *H. thomasi* n. sp. et synthèse finale des stades ailés. *Revue Suisse de Zoologie,* 93(4): 919-949.

Sartori, M., Jacob, U., 1986, Révision taxonomique du genre *Habroleptoides* Schönemund, 1929 (Ephemeroptera, Leptophlebiidae). II. A propos du statut de *Habroleptoides modesta* (Hagen, 1864).

Revue Suisse de Zoologie, 93(3): 683-691.

Sartori, M., Thomas, A. G. B., 1986, Révision taxonomique du genre *Habroleptoides* Schönemund, 1929 (Ephemeroptera, Leptophlebiidae). I. *Habroleptoides assefae*, n. sp. du Haut-Atlas marocain. *Revue Suisse de Zoologie*, 93(2): 417-422.

Schönemund, E., 1929, *Habroleptoides*, eine neue Ephemeropteren-Gattung. *Zoologischer Anzeiger,* 80: 222-232.

Szállassy, N., 1999, *The occurrence of mayfly (Ephemeroptera) larvae along the River Someş/Szamos. In:* Sárkány-Kiss A. and Hamar J. (Eds.). The Someş/Szamos River Valley: a study of the geography, hydrobiology and ecology of the river system and its environment. Tiscia Monograph Series, Szolnok-Szeged-Târgu Mureş, Hungary-Romania, 203-206.

Tanasijevic, M., 1970, Fauna Ephemeroptera na podrucju planina Maglic, Volujak i Zelengora. (The Ephemeroptera fauna of Maglic, Volujak and Zelengora Mountains) *Glasnika Zemaljskog Muzeja, Sarajevo, N. S*., 9: 179-184 (in Serbian).

Tanasijevic, M., 1973, Die Ephemeroptera-Fauna der Gebirgen Maglic, Volujak un Zlengora. *Wissenschaftliche Mitteilungen des Bosnisch-herzegovinischen Landesmuseums*, 3(C-Naturwissenschaft): 201-206.

Váncsa, É., Sartori, M., 2013, Case 3617, *Habroleptoides confusa* Sartori and Jacob, 1986 (Insecta: Ephemeroptera: Leptophlebiidae): proposed precedence of the specific name over *Habroleptoides carpatica* Bogoescu and Crăsnaru, 1930. *Bulletin of Zoological Nomenclature,* 70(2): 82-85.

Received: April 24, 2013 *Accepted: October 21, 2013*