

**URBAN DRAGONFLIES: DATA ON THE ODONATA FAUNA OF THE DANUBE AT BUDAPEST****A. FARKAS<sup>1\*</sup> – T.O. MÉRŐ<sup>2</sup> – A. MÓRA<sup>3</sup> – GY. DÉVAI<sup>1</sup>**<sup>1</sup>University of Debrecen, Centre of Arts, Humanities and Sciences, Faculty of Science and Technology, Department of Hydrobiology, Egyetem tér 1, H-4032 Debrecen, Hungary<sup>2</sup>University of Debrecen, Centre of Arts, Humanities and Sciences, Faculty of Science and Technology, Department of Ecology, Egyetem tér 1, H-4032 Debrecen, Hungary<sup>3</sup>MTA Centre for Ecological Research, Balaton Limnological Institute, Klebelsberg Kuno 3, H-8237 Tihany, Hungary

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**NAGYVÁROSI SZITAKÖTŐK: ADATOK A DUNA BUDAPESTI SZAKASZÁNAK SZITAKÖTŐ-FAUNÁJÁHOZ (ODONATA)****FARKAS ANNA<sup>1</sup> – MÉRŐ THOMAS OLIVER<sup>2</sup> – MÓRA ARNOLD<sup>3</sup> – DÉVAI GYÖRGY<sup>1</sup>**<sup>1</sup>Debreceni Egyetem, Természettudományi és Technológiai Kar, Hidrobiológiai Tanszék, 4032 Debrecen, Egyetem tér 1.<sup>2</sup>Debreceni Egyetem, Természettudományi és Technológiai Kar, Ökológiai Tanszék, 4032 Debrecen, Egyetem tér 1.<sup>3</sup>Magyar Tudományos Akadémia, Ökológiai Kutatóközpont, Balatoni Limnológiai Intézet, 8237 Tihany, Klebelsberg Kuno út 3.

**ABSTRACT:** Although the Danube is the largest river in Hungary, its Odonata fauna is scarcely known, especially that of the river section in Budapest. In this paper new data on the Odonata fauna of the latter Danube section are presented. In 2013 the collections of exuviae and observations on adults were made at five sites along the Danube in Budapest. During this work 414 exuviae (including dead larvae found in early phases of emergence) were collected and 36 mature adults were observed. Altogether seven species were recorded, among them the rare and vulnerable *Ophiogomphus cecilia* and *Onychogomphus forcipatus*. Except for *Gomphus vulgatissimus*, all species found are new for the fauna of the main branch of the Danube in Budapest. The composition of Odonata assemblage may indicate the improving water quality state of the river.

**Key words:** faunistics; larvae; exuviae; adults; Gomphidae

**KIVONAT:** Annak ellenére, hogy a Duna hazánk legnagyobb folyója, szitakötő-faunája kevésbé ismert. Különösen igaz ez a folyó fővárosi szakaszára, amelynek szitakötő-faunájához közlünk új adatokat. 2013-ban

exuviumgyűjtéseket és imágómegfigyeléseket végeztünk a Duna budapesti szakaszán, összesen öt mintavételi helyen. A felmérés során 414 exuviumot (beleértve a vedlés közben elpusztult lárvákat is) gyűjtöttünk, valamint 36 kifejlett egyedet figyeltünk meg. Összesen hét faj előfordulását bizonyítottuk, közöttük a hazánkban ritka és sérülékeny *Ophiogomphus cecilia* és *Onychogomphus forcipatus* fajokkal. A *Gomphus vulgatissimus* kivételével mindegyik megtalált faj új a Duna-főág budapesti szakaszának faunájára. A szitakötő-fajegyűttes összetétele a folyó javuló vízminőségi állapotára utal.

**Kulcsszavak:** faunisztika; lárvák; exuvium; imágó; Gomphidae

## Introduction

During an earlier study carried out along the Danube upstream Budapest all four gomphid species (Gomphidae: *Gomphus flavipes*, *G. vulgatissimus*, *Onychogomphus forcipatus*, *Ophiogomphus cecilia*) were found, each of them protected in Hungary [100/2012. (IX. 28.) VM regulation]. Among these species *O. forcipatus* was new for the fauna of the Danube in Hungary, while *O. cecilia* was previously recorded from only one locality along the main branch. Moreover, *G. flavipes*, a species of community interest in need of strict protection (listed on Annex IV of the Habitats Directive of the European Union; COUNCIL OF THE EUROPEAN UNION 2006), was fairly abundant (FARKAS et al. 2013). Based on this knowledge, we aimed to study the nearby Danube section in Budapest, where dragonflies face several unfavorable factors, such as water pollution, modification of the river-bed and the river-bank and shipping. Our main aims were to find out whether species composition and abundances are affected by urbanization and what is the ratio of mortality caused by anthropogenic factors during emergence. In this paper faunistical data of this study is given, since all new records for the Danube are of great importance: although the Danube is the largest river in Hungary, its Odonata fauna is rather understudied and mostly sporadic data are available (AMBRUS et al. 1996, 1998a, 1998b; ANDRIKOVICS et al. 2006; BÁNKUTI 2009; KOVÁCS, K. et al. 2010; KOVÁCS, T. and AMBRUS 2003, 2010; KOVÁCS, T. et al. 2004, 2006; MÜLLER et al. 2006; OERTEL et al. 2005, 2010; ROZNER 2011; SZEKERES et al. 2009; TÓTH 1992, 2011; UJHELYI 1993; VIZSLÁN and PINGITZER 1997, 1998–99, 2001). Furthermore, the Odonata fauna of the Danube in the capital is even more scarcely known (AMBRUS et al. 1998a), such as that of other streams or rivers in urban areas of Hungary.

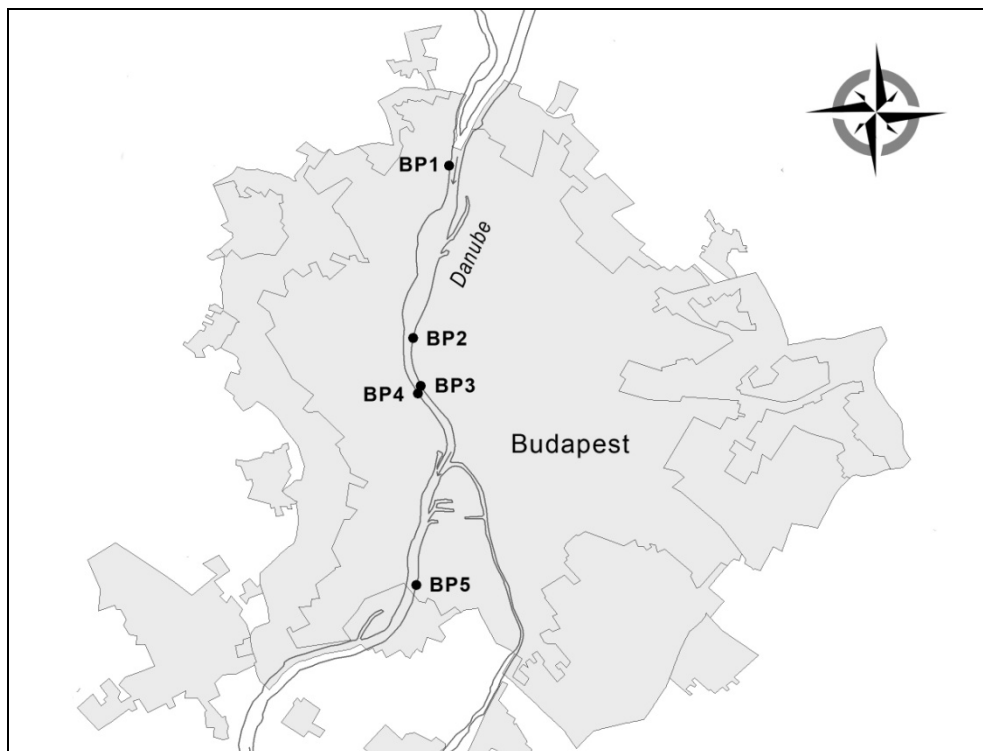
## Materials and methods

Our study was largely based on the systematic and frequent collections of gomphid exuviae. In addition, collections of exuviae of other species and observations on adults were also made to complete our knowledge on the Odonata fauna of the studied river section. Collections and observations were carried out at altogether five sites along the main branch of the Danube in Budapest (Table 1, Fig. 1) between 3 July and 3 August in 2013 on 28 days. During collections the ground, the vegetation and other artificial objects were searched intensively for the exuviae in an area of the bank up to 15 meters in width. Mortality events during emergence were also recorded. Data based on larvae include those specimens that died or damaged in early phases of emergence (in larval stage or still in the exuviae). Data

based on adults include only observations on mature, fully colored individuals (which indicate that maturation was successfully completed), while teneral were not taken into account due to that their exuviae should have been collected and therefore indicate no new records. Larvae, exuviae and adults were identified using keys and descriptions by ASKEW (2004), GERKEN and STERNBERG (1999).

**Table 1.** Sampling sites along the Danube at Budapest (listed downstream) with their administrative units, the exact geographical co-ordinates and the 10×10 km UTM-grid codes (in case of geographical terms the original Hungarian form is given: part = bank, híd = bridge; abbreviations: rb = right bank; lb = left bank).

Code	Sampling site	Co-ordinate		UTM code
		N	E	
BP1	Danube, rb, Római part (Budapest)	47°34'45.00"	19°03'59.90"	CT57
BP2	Danube, lb, Margit híd (Budapest)	47°30'40.45"	19°02'44.92"	CT56
BP3	Danube, lb, Erzsébet híd (Budapest)	47°29'32.66"	19°03'00.56"	CT56
BP4	Danube, rb, Erzsébet híd (Budapest)	47°29'21.83"	19°02'54.45"	CT56
BP5	Danube, lb, Csepel (Budapest)	47°24'50.57"	19°02'51.51"	CT55



**Figure 1.** Location of sampling sites (BP1–BP5) along the Danube at Budapest (for codes see Table 1).

In the species list new records contain the following information: locality (as the code of the sampling site according to Table 1), date of collection, total number of individuals, in brackets the numbers of males and females as well (a third number indicates the number of individuals with undetermined sex) and names of collectors in alphabetic order. The dates of collection follow Hungarian order (YYYY.MM.DD). The names of collectors are given by abbreviations: FA = Anna Farkas, MA = Arnold Móra, MTO = Thomas Oliver Méré.

## Results

Collections resulted in the occurrence of 414 larvae and exuviae belonging to five species (*Calopteryx splendens*, *G. vulgatissimus*, *G. flavipes*, *O. cecilia*, *O. forcipatus*). Moreover, 36 adult specimens belonging to four species (*C. splendens*, *Ischnura elegans*, *G. flavipes*, *Orthetrum albistylum*) were observed. Among them *G. flavipes* and *C. splendens* were found at all studied sites, while the other species were collected or observed only at one (*I. elegans*, *G. vulgatissimus*, *O. forcipatus*, *O. albistylum*) or two (*O. cecilia*) localities. Based on abundances of exuviae, *G. flavipes* proved to be the most dominant gomphid species, whereas *G. vulgatissimus*, *O. forcipatus* and *O. cecilia* were found in rather few (1 or 2 exuviae) numbers.

### New records

#### Data based on larvae

***Gomphus flavipes*** (Charpentier, 1825) – BP1: 2013.07.13., 1(0+0+1), FA-MA – BP2: 2013.07.04., 1(0+0+1), FA; 2013.08.01., 1(1+0), FA-MTO – BP3: 2013.07.11., 1(0+0+1), FA; 2013.07.19., 2(1+1), FA-MTO; 2013.07.27., 1(0+1), FA-MA.  
***Ophiogomphus cecilia*** (Fourcroy, 1758) – BP5: 2013.07.19., 1(1+0), FA-MTO.

#### Data based on exuviae

***Calopteryx splendens*** (Harris, 1782) – BP2: 2013.07.08., 1(0+0+1), FA – BP3: 2013.07.18., 1(0+1), FA-MTO – BP5: 2013.07.31., 1(1+0), FA-MTO.  
***Gomphus vulgatissimus*** (Linnaeus, 1758) – BP5: 2013.07.03., 1(1+0), FA-MTO.  
***Gomphus flavipes*** (Charpentier, 1825) – BP1: 2013.07.05., 6(2+4), FA; 2013.07.09., 18(9+9), FA; 2013.07.13., 11(3+8), FA-MA; 2013.07.17., 5(2+2+1), FA-MTO; 2013.07.21., 10(3+7), FA; 2013.07.29., 3(1+2), FA; 2013.08.02., 6(4+1+1), FA-MTO – BP2: 2013.07.04., 4(2+2), FA; 2013.07.08., 5(2+3), FA; 2013.07.12., 8(1+7), FA; 2013.07.16., 22(12+10), FA-MTO; 2013.07.20., 24(9+15), FA-MTO; 2013.07.28., 21(7+13+1), FA-MA; 2013.08.01., 13(7+5+1), FA-MTO – BP3: 2013.07.10., 1(1+0), FA; 2013.07.18., 7(1+6), FA-MTO; 2013.07.22., 2(1+1), FA-MA; 2013.07.30., 1(1+0), FA-MTO – BP4: 2013.07.18., 1(0+1), FA-MTO; 2013.07.22., 9(2+7), MA – BP5: 2013.07.03., 24(11+13), FA-MTO; 2013.07.07., 27(14+11+2), FA; 2013.07.11., 35(21+14), FA; 2013.07.15., 40(21+18+1), FA-MTO; 2013.07.19., 45(16+29), FA-MTO; 2013.07.27., 37(17+18+2), FA-MA; 2013.07.31., 15(5+10), FA-MTO.  
***Ophiogomphus cecilia*** (Fourcroy, 1758) – BP4: 2013.07.18., 1(0+1), FA-MTO.  
***Onychogomphus forcipatus*** (Linnaeus, 1758) – BP5: 2013.07.27., 1(1+0), FA-MA.

## Data based on adults

***Calopteryx splendens*** (Harris, 1782) – BP1: 2013.07.05., 1(0+1), FA; 2013.07.17., 1(1+0), FA-MTO; 2013.08.02., 1(1+0), FA-MTO – BP2: 2013.07.08., 1(1+0), FA; 2013.07.28., 1(1+0), FA-MA – BP3: 2013.07.06., 1(0+1), FA; 2013.07.18., 1(1+0), FA-MTO – BP4: 2013.08.03., 1(1+0), FA – BP5: 2013.07.03., 5(3+2), FA-MTO; 2013.07.07., 2(1+1), FA; 2013.07.11., 1(1+0), FA; 2013.07.19., 1(1+0), FA-MTO.

***Ischnura elegans*** (Vander Linden, 1820) – BP3: 2013.07.18., 1(1+0), FA-MTO.

***Gomphus flavipes*** (Charpentier, 1825) – BP1: 2013.07.13., 1(0+1), FA-MA – BP5: 2013.07.07., 1(0+1), FA; 2013.07.11., 7(6+1), FA; 2013.07.31., 8(2+6), FA-MTO.

***Orthetrum albistylum*** (Selys, 1848) – BP5: 2013.07.19., 1(1+0), FA-MTO.

## Discussion

Although urbanization may have several unfavorable effects on dragonflies, which may primarily cause the disappearance of rare species (e.g. ALIBERTI LUBERTAZZI and GINSBERG 2010; PAUL and MEYER 2001), not only the two frequent *Gomphus*-species but the much scarcer *O. forcipatus* and *O. cecilia* were also found as larvae/exuviae along the Danube in the capital. This two species were detected at few localities up to date: *O. forcipatus* was previously found only along the main and side Danube branches surrounding the island Szentendrei-sziget (FARKAS et al. 2013), while *O. cecilia*, besides the same localities (FARKAS et al. 2013), was collected from the Mosoni-Duna and from the main branch at Zebegény as well (AMBRUS et al. 1998a, 1998b; KOVÁCS, T. and AMBRUS 2003; KOVÁCS, T. et al. 2006). Dealing with the Odonata fauna of the Danube in Budapest only some sporadic data are available (AMBRUS et al. 1998a). Four species (*Platycnemis pennipes*, *I. elegans*, *Anax imperator*, *Orthetrum cancellatum*) were recorded from the Ráckevei-Soroksári-Duna, whereas from the main branch only *G. vulgatissimus* was collected as larvae at Erzsébet Bridge. Accordingly, all species found in this study are new for the fauna of the main branch of the Danube in Budapest, except for *G. vulgatissimus*. However, *O. forcipatus* has already been reported from Budapest (UJHELYI 1993), but this data was based on a single adult collected in 1963, and no exact place of sampling was given.

Although we found only one exuviae of the earliest emerging *G. vulgatissimus*, it is most likely that this species is much more frequent along the studied river section. The strikingly low number of specimens must be due that collections could have begun late in the season, after the extremely large flood in early summer had subsided.

In conclusion, more Odonata species were found along the Danube in Budapest than it had been expected. The occurrence of rare and vulnerable species (i.e. *O. cecilia*, *O. forcipatus*) may be attributed to the improving water quality state of the river (LIŠKA et al. 2008).

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