

First record of *Leucorrhinia caudalis* for Bosnia and Herzegovina (Odonata: Libellulidae)

Dejan Kulijer¹ & Iva Miljević²

¹ National Museum of Bosnia and Herzegovina, Zmaja od Bosne 3, 71000 Sarajevo, Bosnia and Herzegovina; dejan.kulijer@gmail.com

² Center for Environment, Cara Lazara 24, 78 000 Banja Luka, Bosnia and Herzegovina; ms.iva.miljevic@gmail.com

Abstract. On 30-iv-2013, a single young male of *Leucorrhinia caudalis* (Charpentier, 1840) was collected at a gravel pond near Banja Luka, Bosnia and Herzegovina. This is the first record of the species for the country and its southernmost occurrence in southeastern Europe, where it is an extremely rare species, restricted to the floodplains of the Sava and Danube Rivers. Recent surveys suggest further decline of the species in the region. Habitat characteristics at the capture site correspond with the previously described preferred habitats of the species. Floating and submerged vegetation was well developed and dominated by *Potamogeton* spp. and *Myriophyllum* spp., while sedges and reeds grew along the margins. The distribution, habitats and status of the species in the Balkans and central Europe are outlined and discussed (western Balkans, Hungary and Slovakia). Data on the species' distribution in western Europe are also provided.

Key words. Dragonfly, Anisoptera, distribution, expansion, habitat, Banja Luka, Balkans

Introduction

Leucorrhinia caudalis (Charpentier, 1840) is a Euro-Siberian species distributed mainly in northeastern Europe. Its range extends from the French Atlantic coast in the southwest to western Siberia in the northeast, and from southern Fennoscandia in the north to Croatia in the south. However, throughout most of this area, the species occurs as small and scattered populations (SCHORR 1996; SAHLÉN 2006; BOUDOT et al. 2009; MERLET & HOUARD 2012; WILDERMUTH & MARTENS 2014). In southeastern Europe, the species is rare and found only along large rivers (FRANKOVIĆ 1991; JOVIĆ et al. 2008; BOUDOT et al. 2009).

In the second half of the 20th century the species declined, particularly in Western and Central Europe, where it became locally or regionally extinct (KELLER et al. 2010; MERLET & HOUARD 2012). However, an expansion has recently been observed in France (MERLET & HOUARD 2012), Germany (MAUERSBERGER 2009; DEUBELIUS & JÖDICKE 2010), Switzerland (WILDERMUTH et al. 2005; WILDERMUTH & MARTENS 2014), as well as a northern range shift in Sweden (FLENNER & SAHLÉN 2008). The species was also discovered in Luxemburg (PROESS 1998), Slovakia (KUDELA et al. 2004) and rediscovered in Belgium (VANTIEGHEM et al. 2011) and the Netherlands (MUUSSE & VEURINK 2011), where it was regarded as extinct.

In this paper, we present the first observation of *L. caudalis* in Bosnia and Herzegovina, beyond its hitherto known distribution range in southeastern Europe, and discuss the current status of the species in the region and Europe.

Study area and methods

Collecting was carried out on 30-iv-2013 in the valley of the Vrbas River at the southern edge of Posavina, the northern, lowland region of Bosnia and Herzegovina (Western Balkans; Fig. 1). The region encompasses the area between the Sava River in the north and the Dinaric Alps mountain range in the south. It is characterized by lowland landscape intersected by several large rivers at an altitude below 200 m a.s.l.. Posavina can be regarded as the southwestern extension of the Pannonian basin. The Pannonian climate that dominates north of the Sava River extends also to the south into this area (SCHNEIDER-JACOBY 1990; ISRBC 2009).

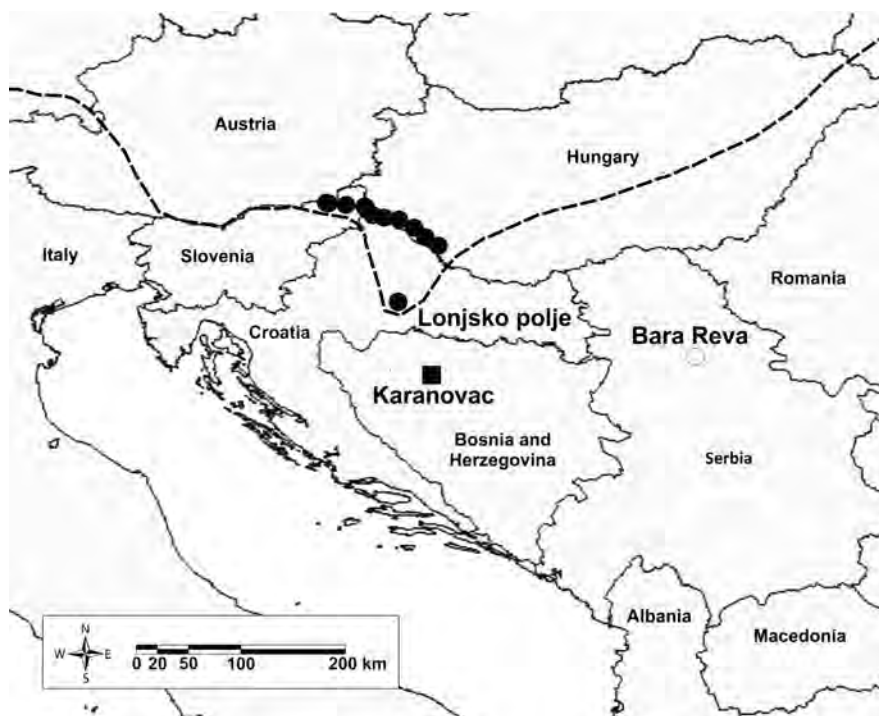


Fig. 1. The distribution of *Leucorrhinia caudalis* in southeastern Europe (RAAB et al. 2007; JOVIĆ et al. 2008; BEDJANIĆ 2014) and the location of the new record from Bosnia and Herzegovina (dashed line – southeastern distribution border; black dots – closest known sites of *L. caudalis* in Croatia, Hungary and Slovenia; black square – new record from Bosnia and Herzegovina; white dot – extinct population in Serbia).

The Vrbas River is one of the Sava's main tributaries and one of the largest rivers in Bosnia and Herzegovina. South of the city of Banja Luka, in its upper section, the Vrbas River is torrential, flowing through gorges and the mountain region of the Dinaric Alps. After it reaches Banja Luka, it slows down and in its lower course meanders through the flatland area to its mouth to the Sava River (ISRBC 2009). In its lower section are places where in the past the Vrbas River changed its course leaving ponds and oxbows known as "starača". In addition, along the river, on both sides, numerous old gravel pits were also transformed into ponds.

The collecting locality (Fig. 3) consists of two large and several smaller ponds formed as a result of gravel extraction. It is situated at the southern outskirts of Banja Luka, between Karanovac village and the Vrbas River (44°41'44.82"N, 17°12'10.46"E) at 175 m a.s.l.. The diameter of the two larger ponds is between 150 m and 200 m, both covering between 2 ha and 3 ha. The vegetation at the ponds is rich and well-structured, with trees and bushes along the shore line. The water vegetation consists of floating *Potamogeton* spp. that covers a significant part of the water surface, dense underwater vegetation with *Myriophyllum* spp., and a narrow strip of sedges and reeds at the margins. Apart from *L. caudalis*, the following odonate species were observed syntopically: *Sympecma fusca*, *Calopteryx virgo*, *Coenagrion puella*, *Ischnura elegans*, *Pyrrhosoma nymphula*, *Cordulia aenea*, and *Libellula depressa*. At both ponds, fishermen were present, suggesting that the ponds are well stocked with fish, but there is no data on fish species present at the site.

Results

On 30-iv-2013, a sunny day with the temperature above 25°C and without noticeable wind, a young male of *L. caudalis* (Fig. 2) was caught at Karanovac gravel ponds by IM. It was observed flying together with several *C. aenea* at approximately 80 cm above the water surface along the water margin of the west side of southern pond.

Discussion

The discovery of *Leucorrhinia caudalis* in Bosnia and Herzegovina was expected. The possibility of the occurrence of the species in the northern region was already anticipated by KULIJER et al. (2013). JOVIĆ et al. (2008) previously suggested that, in the past, northern Bosnia, along with northern Croatia and Serbia, represented the former southern border of the species distribution in the western Balkans.

The distribution of *L. caudalis* in Southeastern Europe (Fig. 1) is presented and discussed by FRANKOVIĆ (1991) and JOVIĆ et al. (2008). All hitherto known localities are located in the floodplains of its largest rivers: Sava, Drava, and Danube. This is the first record of the species on the Balkan Peninsula, out of the Pannonian basin. The collection site is located further south of the Sava and Danube Rivers, at the border between the Dinaric Alps and the Posavina lowland region. The present



Fig. 2. Young male of *Leucorrhinia caudalis* found at the Karanovac ponds, south of Banja Luka, Bosnia and Herzegovina (30-iv-2013). Photo: IM



Fig. 3. Karanovac ponds, south of Banja Luka, the collection site of *Leucorrhinia caudalis* in Bosnia and Herzegovina (22-vi-2012). Photo: DK

observation of *L. caudalis* is also one of the southernmost in Europe, with only populations in southwestern France situated further south (BOUDOT et al. 2009). Karanovac ponds are situated approximately 70 km south of Lonjsko polje (Croatia), as well as 160 km from the closest locality in Hungary. The Slovenian populations are approximately 210 km to the northwest, while the historical site Bara Reva in Belgrade, Serbia is 265 km to the east. Lonjsko polje in Croatia is the only other known locality in the Sava river catchment (SCHNEIDER-JACOBY 1990).

In the countries of the region, the species is very rare or extinct (BELANČIĆ et al. 2008; JOVIĆ et al. 2008; BOUDOT et al. 2009) and there is no evidence of expansion, as is the case in central and western Europe. New data from Slovenia suggests that the species declined after 2006 (BEDJANIČ 2014), while in Croatia at the single known locality only one single male was observed in 2014 (M. Franković, pers. comm.). The most significant populations in the region are known from Hungary, but these are scattered and isolated (SCHORR 1996; JOVIĆ et al. 2008). In the 1980s, several of these populations became extinct (e.g., at Kis-Balaton and Tatabánya), those remaining being known along the rivers Drava and Mura in the southwest, and the middle course of the river Tisza in the east of the country (A. Ambrus pers. comm.). The current status in Hungary is not favourable (ETCBD 2009; ANONYMOUS 2013) and, according to A. Ambrus (pers. comm.), the species is still in decline. In Serbia, *L. caudalis* was not found after the 1970s (JOVIĆ et al. 2008). A new discovery was reported only from Slovakia (KUDELA et al. 2004), but the authors believe that this finding represents an overlooked population and not a recent colonization event. Destruction and degradation of known habitats and the introduction of phytophagous fish are probably the main reasons for the continuous decline of the species' populations in SE Europe (SCHORR 1996; BEDJANIČ 2014).

Although a sedentary species, *L. caudalis* has proved capable of colonizing habitats over large distances (KELLER et al. 2010, 2011; MUUSSE & VEURINK 2011; VANTIEGHEM et al. 2011). According to MUUSSE & VEURINK (2011) the possible source of the newly colonized sites in the Netherlands is 235 km away, near Cologne in Germany. Recent studies suggest that these long flights are accomplished by a very small number of individuals during the maturation phase (KELLER et al. 2010, 2011; WILDERMUTH & MARTENS 2014). Based on their results, KELLER et al. (2011) consider dispersal over 5 km distance as very rare.

Leucorrhinia caudalis inhabits still, mesotrophic to eutrophic waters, such as larger ponds, shallow lakes, gravel pits, oxbows, and backwaters of large rivers. Main habitat characteristics are clear water and richly developed emergent and particularly submerged macrophyte vegetation. In most cases, habitats are groundwater influenced (SAHLÉN 2006; RAAB et al. 2007, MUUSSE & VEURINK 2011; MERLET & HOUARD 2012; WILDERMUTH & MARTENS 2014). Old gravel ponds are known as good habitats for *L. caudalis* in Europe (e.g., WILDERMUTH & MARTENS 2014) and the region (e.g., BEDJANIČ 2014). Based on what was observed at the site, the Kara-

novac site seemed to have favourable conditions for the species. The rich floating and bank vegetation provided good resting and perching sites for adults while rich submerged vegetation provided a perfect habitat for the larvae. The water at the site seemed reasonably clear and transparent (apart from a part recently degraded by disposal of construction waste).

The discovery of *L. caudalis* at this location poses a question – could a local population exist at the site or at some other locality (-ies) in North Bosnia? We believe this is quite possible. A number of gravel pits and oxbows along the Vrbas River downstream from Banja Luka represent a network of suitable habitats and a possible connection with the closest populations in Croatia and Hungary. Given the very poor knowledge of the dragonfly distribution in the Balkans, including scarce historical data, and currently low research intensity, it is difficult to draw any conclusion from this discovery on the species' former and current status in Bosnia and Herzegovina. Taking the dispersal potential of the species into account, *L. caudalis* could have colonized the Karanovac ponds from any of the mentioned sites in Croatia, Hungary, or Slovenia. On the other hand, it is quite possible that this could be a previously overlooked local population. Further investigations should give a better insight into the potential presence of a population in the area. Based on the habitat characteristics, the fact that the specimen was very young and was captured early in the species' flight season (April 30th), we believe that it emerged at the site.

Unfortunately, these ponds are threatened and already partially degraded due to the disposal of construction waste at the site. This has already resulted in the destruction of water vegetation and turbid water at one of the ponds. Due to these threats, urgent actions for the preservation of the site are needed.

Acknowledgements. For the help with records and literature on the distribution and habitats of *L. caudalis* we would like to thank: András Ambrus, Matjaž Bedjanič, Geert De Knijff, Klaas-Douwe B. Dijkstra, Matija Franković, Vincent Kalkman, Saša Rajkov, and Tim Termaat.

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Received 7th May 2015