

On the occurrence of *Cordulegaster boltonii* (Donovan, 1807) (Odonata: Cordulegastridae) in the western part of the Lithuanian Lake District (Poland)

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(Received 25 September 2012; final version received 31 October 2012)

The authors analyse three sites of occurrence of *Cordulegaster boltonii* in the western part of the Lithuanian Lake District (Suwałki Region, north-east Poland). The area is situated within a distance of over 300 km between large agglomerations of the species' sites in the Tuchola Forest (north Poland) and in south-east Lithuania. Only one historical site is known so far from the study area (from 1911). A small but permanent distribution island probably exists in the study area, although *C. boltonii* is rare and develops in small populations. A research programme is required to explain the size of the distribution island, its relations to the sites in Lithuania and the status and threats to the species.

Aprašomos trys geltonžiedžio žirgelio *C. boltonii* radavietės vakarinėje Lietuvos ežeryno dalyje (Suvalkai, šiaurės rytų Lenkija). Tiriama teritorija yra tarp didelių rūšies radaviečių sankauptų Tucholos miške (šiaurės Lenkija) ir pietryčių Lietuvoje, tarp kurių atstumas siekia 300 km. Iki šiol šioje teritorijoje buvo žinoma tik viena istorinė rūšies radavietė (nuo 1911 m.). Manome, kad čia egzistuoja nedidelė, tačiau pastovi šio reto žirgelio populiacija. Tačiau populiacijos dydžio, jos ryšių su kitomis populiacijomis Lietuvoje, rūšies statuso ir grėsmių jai įvertinimui reikalinga mokslinių tyrimų programa.

Keywords: *Cordulegaster boltonii*; distribution island; Poland; Lithuania

Introduction

Cordulegaster boltonii (Donovan 1807) is a stenotope of clean, natural running waters; it is legally protected in Poland (Rozporządzenie 2011), rare in many regions of the country, and with still insufficiently studied distribution (Bernard et al. 2009). On the scale of the whole Europe and European Union the species population is stable; therefore, Kalkman et al. (2010) included it into the Least Concern category which encompasses valorised and non-threatened species. However, it was also considered in a number of national and regional Red Lists and/or Books. Among the countries and regions neighbouring Poland, *C. boltonii* is absent only from the Red Book of the Kaliningrad Region of the Russian Federation, although it is included in the list of species requiring special attention and control in the region (Dedkov and Grishanov 2010). In all other neighbouring countries, it is categorised as a species of high risk: R (Rare) in Lithuania (Budrys 2007), VU (Vulnerable) in Czech Republic (Dolný et al. 2007), Ukraine (Ermolenko 1994) and Germany (Ott and Piper 1998) or EN (Endangered) in Slovakia (David 2001) and Belarus (Gurin 2004). For these reasons, any new data on the species occurrence and ecology is valuable.

The occurrence of *C. boltonii* in north-east Poland is particularly enigmatic (Bernard et al. 2009). The area is also very interesting due to its location within the range of distribution of the species. This paper presents and discusses data from three sites of *C. boltonii* in the area. None of the three sites has been published as a site of *C. boltonii* so far, although the first of the sites (Bludzie Małe) was generally considered in the species distribution maps in the 'Polish Red Data Book of Animals' (Bernard 2004) and 'A Distribution Atlas of Dragonflies (Odonata) in Poland' (Bernard et al. 2009).

Material and methods

The study area is located in two mesoregions, Romincka Forest (sites No. 1 and No. 2) and Eastern Suwałki Lake District (site No. 3), in the western part of the Lithuanian Lake District (the belt of the Eastern Baltic Lake District). The area is distinguished by a strongly diversified, young glacial land relief and vast forest cover. The hydrographic network is also rich. Absolute heights usually amount to 150–200 m, locally reaching more than 300 m. The climate is the most severe in Poland, with strong continental features (Kondracki 2000).

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The authors of the paper have been conducting studies on the dragonflies of the Lithuanian Lake District from the mid-1990s. The studies were carried out with a varied intensity and within the framework of various projects, like the analysis of the odonatofauna of flowing waters in Poland, supplementary studies for 'A Distribution Atlas of Dragonflies (Odonata) in Poland' (Bernard et al. 2009), or faunistic valorisation of the Suwałki Landscape Park and its buffer zone. Dragonfly *imagines* were captured and observed. The following data were collected: numbers, adult emergence, occurrence of teneral or juvenile individuals and reproductive behaviour. Larvae were captured by means of a hydrobiological net (quantitative and semi-quantitative samples). Exuviae were also sporadically collected.

Results

C. boltonii was recorded at the following sites (Figure 1):

- (1) The Bludzia River, 1 km south of the village of Bludzie Małe (Romincka Forest Landscape Park), 54°18'58"N, 22°34'27"E, UTM: FF01. The site is

at the southern boundary of the Romincka Forest, in a belt of marshy forests and meadows along numerous river meanders. River width is 4–5 m, current moderate and bottom dominated by sandy sediments.

Material: 26 July 2005, 1♂, leg. et det. G. Tończyk.

- (2) The Błędzianka River, 1 km north of the village of Stańczyki (Romincka Forest Landscape Park), 0.5 km below the railway viaducts on the line Goldap–Żytkiejny, 54°18'05"N, 22°39'30"E, UTM: FF01. The Błędzianka is a meandering forest river surrounded by alder forests and riverside carrs and by spruce forest higher. The river current is moderate and the bottom is mainly sandy.

Material: 15 July 1997, 1♂, leg. et det. J. Szymański.

- (3) A flower meadow on a slope of the Czarna Hańcza River valley, 1 km north-west of the village of Malesowizna (Suwałki Landscape Park), 0.3 km of the river course above the dam reservoir (Turtulski Pond), 54°13'44"N, 22°48'

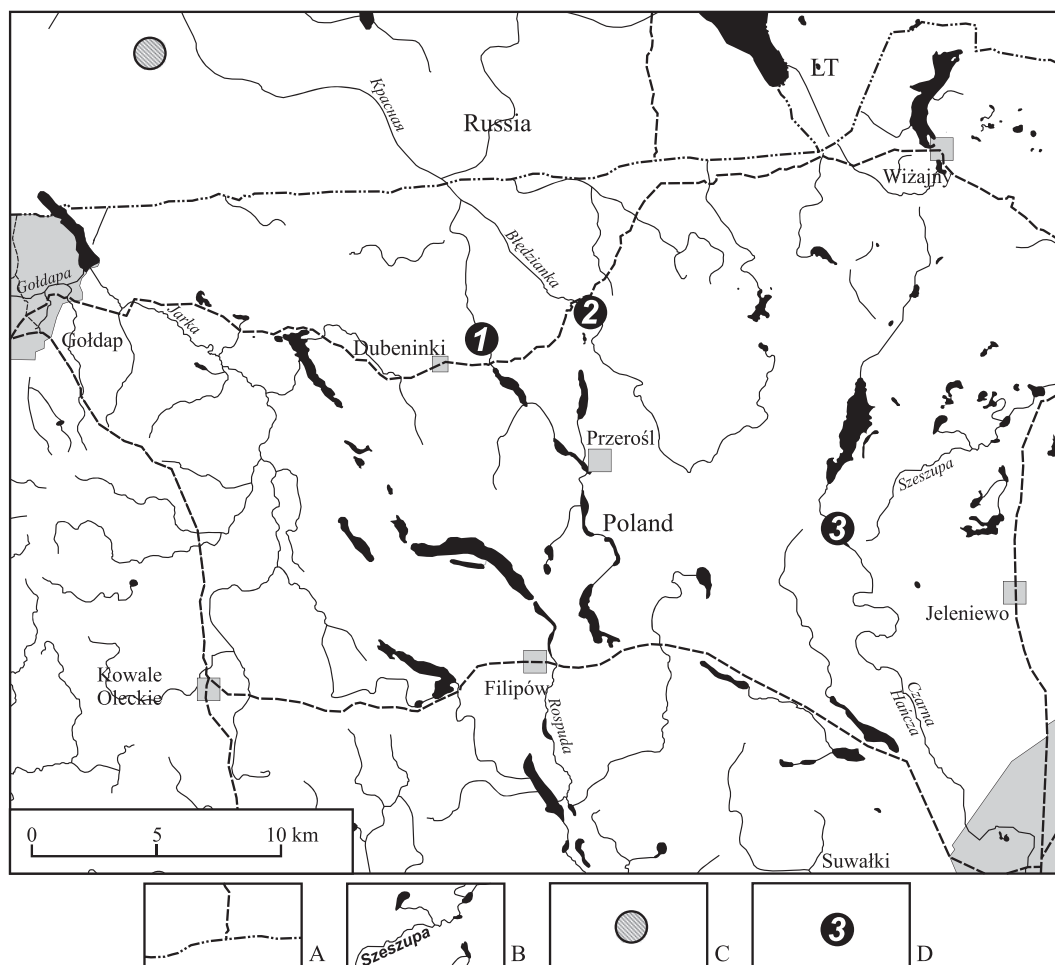


Figure 1. *C. boltonii* sites in the western part of the Lithuanian Lake District. A – state borders, B – surface waters, C – site of Le Roi (1911), and D – new data (numbering as in the text), LT – Lithuania.

14°E, UTM: FF21. The Czarna Hańcza River in the study area is a strongly meandering stream with a width of up to 3 m, moderate current and sandy or sandy-stony bottom; it is flowing through a mosaic of marshy meadows, riverside carrs and alder forests. The slopes of the river valley are largely deforested and used as meadows and pastures. Numerous artificial pine plantations intermingle with preserved small patches of dry-ground forests.

Material: 3 July 2012, 1♂ (hunting) (Phot. Ł. Dawidowicz et W. Jarska, det. Ł. Dawidowicz et P. Buczyński). Observation was done at variable, quite warm and sunny weather with showers.

Discussion

C. boltonii is a West Palaearctic species in terms of distribution and an Atlantic-Mediterranean species in terms of chorology (Bernard et al. 2009). The area of its more or less dense occurrence stretches from Spain to north Italy and the centre of Central Europe. Large distribution islands also include a large part of Great Britain and south Scandinavia (Dijkstra 2006). Further east, *C. boltonii* occurs as far as in the Ural Mountains

(Eremina 2010; Kharitonov and Eremina 2010), but the density in this direction is decreasing, with patchy distribution, large disjunctions and many insufficiently studied areas (Belova et al. 2008; Bernard 2000; Dijkstra 2006; Khristoforova 2011; Skvortsov 2010).

A change in the character of distribution of *C. boltonii* occurs within the territory of Poland. The area of distribution of the species has a shape of a bow including lakelands and submontane regions stretching from north and north-west to south-east, with a clear centre in west Poland (Figure 2). The studies conducted in the last years revealed that in this part of the distribution area, the species is too frequent and numerous to be included in any category of endangerment in the 'Red List of Dragonflies of Poland' (Bernard et al. 2009; Kutera and Woźniak 2010; Smolis et al. 2012), although it has lately still been included in the VU category (Bernard 2004; Bernard et al. 2002). In the north of the country, the dense part of the range of occurrence ends before the line of the Vistula River: the last larger aggregation of sites is located in the Tuchola Forest (Bernard et al. 2009). A large distribution island closest to the aggregation is located at a distance of over 300 km, in the east of the Lithuanian Lake District in Lithuania (Budrys 2007; Dijkstra 2006; Kovács, Olajos, and Szilágyi 2011; Kovács et al. 2008; Švitra 2009). Our

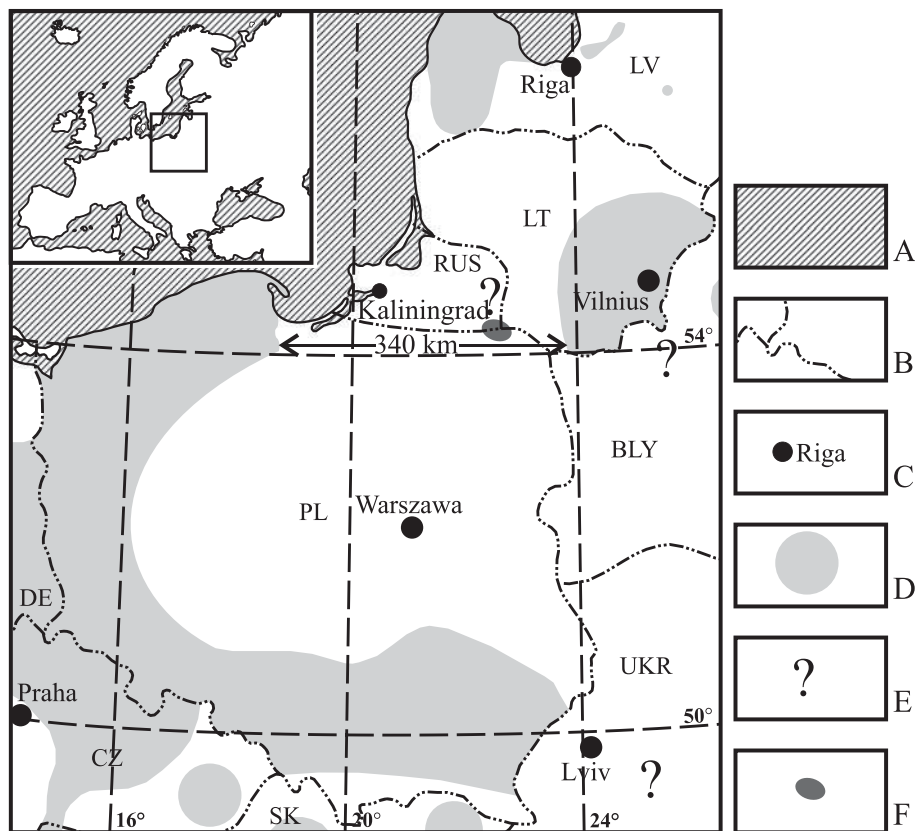


Figure 2. *C. boltonii* sites in the western part of the Lithuanian Lake District against the area of occurrence of the species (according to Dijkstra (2006) and Bernard et al. (2009), changed based on data by Kalniņš (2012), Kovács et al. (2008, 2011), Švitra (2009) and new records). A – Baltic Sea, B – state borders, C – capital cities, D – area of occurrence, E – only general data or data insufficient for determination of the area of occurrence available, and F – area with the sites discussed. Countries: DE – Germany, CZ – Czech Republic, SK – Slovakia, PL – Poland, UKR – the Ukraine, BLY – Belarus, LT – Lithuania, and LV – Latvia.

records come from a very interesting place, namely a gap between these two areas (Figure 2).

C. boltonii was first reported from the so-called gap by Le Roi (1911): ‘Am 30. Juni 1911 fing Freiherr von Geyr ein ♀ bei Rominten, als es an einem gebirgsbachartigen Wasserlauf mit der Eiablage beschäftigt war’ (‘On 30 June 1911 near Rominten, Baron von Geyr found a female laying eggs to a stream with a character of a montane stream’). It was the first record of the species in former East Prussia (Ostpreußen) and is still the only one from the area of the today’s Kaliningrad Region. Today, Rominten is called Krasnolesye. The aforementioned stream must have been the Krasnaya River (Rominte) or one of its tributaries. For a period of almost 90 years (from 1911 to 1997), the species was not recorded and its status was unknown. To date, the occurrence of *C. boltonii* in the area is confirmed: sites No. 1 and No. 2 are located, respectively, 17 and 21 km south-east of Krasnolesye and in the Romincka Forest and site No. 3 is another 12 km further (Figure 1). Based on a series of records from an area with a length of 33 km in various time periods, the existence of a small, but permanent distribution island can be assumed (Figure 2). Moreover, three sites are located within one fluvial system (Błędzianka–Krasnaya and its tributary Bludzia). This suggests the existence of a metapopulation.

The data by Tumilovich (2009) may come from the same area or its vicinity. During the studies in the major part of the Kaliningrad Region in 2004–2007, she captured one *C. boltonii* individual. Unfortunately, the author did not specify the location of the site.

Streams and rivers in the western part of the Lithuanian Lake District seem to be favourable for *C. boltonii* in terms of features of habitats and water quality (Bernard 2000, 2004; Bernard et al. 2009; Sternberg, Buchwald, and Stephan 2000). Its optimum is also compatible with the parameters of sites described in this paper. The species, however, is very scarce in this area, and its populations are likely to be very small. This can be confirmed by the fact that *C. boltonii* was not found by Bernard (2000) who conducted a particularly oriented and intensive search in the area at the end of the last decade of the twentieth century. Moreover, during that time, he conducted investigations in the upper course of the Czarna Hańcza River, i.e. our site No. 3. The same river section was also studied several times by us (in 2000, 2007, 2009, and 2011), and no record of occurrence of *C. boltonii* was done. This may be related to a long life cycle and significant variations in the numbers of the species (Bernard 2000; Donath 1987; Ferreras-Romero, Márquez-Rodríguez, and Ruiz-García 1999; Pfuhl 1994). Earlier investigations may have been carried out in years unfavourable for the species.

According to our data, *C. boltonii* occurs in the western Lithuanian Lake District more frequently and over a larger area than Bernard et al. (2009) and Dijkstra (2006) thought based on available information. The anal-

ysis of occurrence, however, requires systematic and multi-annual studies. It is worth considering undertaking wide-scope inventory works. It seems that some gaps in the image of the distribution of *C. boltonii* east of the Vistula River valley results from lack of relevantly oriented studies. For example, it is interesting whether the distribution island at the Polish–Russian–Lithuanian border is actually strongly isolated from a large distribution island in south-east Lithuania. The site on the Czarna Hańcza River is located at a distance of less than 80 km from the distribution island. It also seems little probable that a large aggregation of *C. boltonii* sites around Vilnius should end exactly at the Lithuanian–Belarusian border, especially that similar habitats occur on the Belarusian side. The status of the species in the Kaliningrad Region requires verification whether it still occurs in the vicinity of Krasnolesye and whether the area of its distribution extends further. Finally, due to the legal status of *C. boltonii*, the size of its populations in north-east Poland, as well as their threats and the need of undertaking protection activities regarding them should also be verified.

Acknowledgements

We are very grateful to Jakub Szymański for providing us with a *C. boltonii* specimen from Bludzie Małe and to Giedrė Višinskienė for translation of the Lithuanian abstract. We thank Povilas Ivinskis and Mārtiņš Kalniņš for valuable comments to the first version of this paper.

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