New data on dragonflies (Odonata) of northeasternmost Bulgaria

Nowe dane o ważkach (Odonata) północno-wschodniej Bułgarii

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Introduction

Bulgaria is situated in the Balkan Peninsula which is well known for its rich and specific odonate fauna partially related to that of adjacent areas of southwestern Asia (cf. Dijkstra, Lewington 2006). Additionally, the country offers dragonflies diverse habitat conditions which are a consequence of the diversity of Bulgarian geographic and climatic conditions. Studies of Bulgarian dragonflies have recently been significantly intensified (cf. Beschovski, Marinov 2007, Boudot et al. 2009). While visiting eastern Bulgaria, the author carried out studies in selected habitats – in small and medium-sized flowing waters and in standing water bodies in the areas along the coast of the Black Sea. The search was directed especially at *Lestes macrostigma* and species of the genus *Cordulegaster*. The aim of this paper is to present the results of these studies with special attention being paid to data that broadens the knowledge of the extents of some dragonfly species in this part of the Balkans.

Study area and localities

During the summer trip to northeastern Bulgaria, the odonate fauna was studied at several localities between the 2nd and 12th July 2008. The selected localities are situated between the Romanian border and the Kamchia River, mostly in the environs of Shabla, Kavarna, Balchik and Dobrich. In the northern part, i.e. to the north and east of Dobrich and Kavarna, temporary flowing waters prevail. Hence, studies were concentrated in a narrow zone along the coast of the Black Sea where permanent waters occur, both flowing and standing: streams with flooded surroundings, pools and lakes. In the southern part of the studied area, the network of flowing permanent waters is much more dense and also covers deep inland areas.

Dragonflies were observed and collected at the following 12 localities:

1. "Balota" Beach 2 km N of the Kaliakra Cape, (43°23' N, 28°28' E). The beach is situated at the foot of a cliff. Three several-acre-large inundated areas, with cloudy water overgrown with *Phragmites australis* (Cav.)Trin. ex Steudel are situated on the run of a small stream. 2nd and 12th July.

2. Balchik, the Botanical Garden, (43°24' N, 28°08' E). A small (2–3 m wide), mostly shaded, fast-flowing stream with stony-gravely bottom deposits and clear cold water (Phot. 1). 3rd July.

3. Balchik, next to the road to Albena, (43°24' N, 28°08' E), under the flyover. A deeply incised, two-metre-wide fast-flowing stream with stony-gravely bottom deposits and clear cold water. 6th July.

4. Shablenska Tuzla, 5 km NE of Shabla, 2 km SE of the Shabla Lake, (43°33' N, 28°36' E). A small (0,3 km^2) brackish lake separated from the seashore by 200–300-metre-wide dunes (Phot. 2, 3). Astatic, partly dried out in the first decade of July. Shallow, mostly to 20 cm deep, with clear very warm water and a muddy bottom (muddy deposits used by local people for

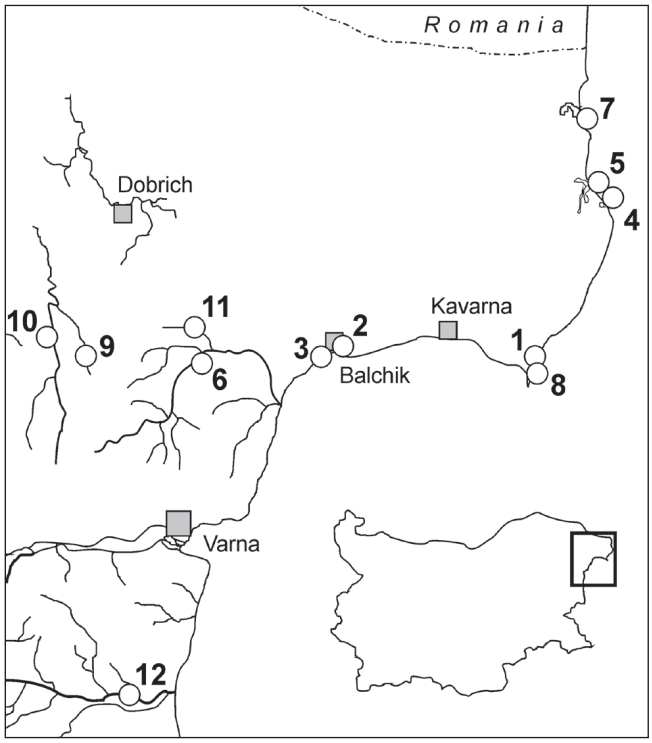

Fig. 1. Study area.
Rys. 1. Teren badań.

healing compresses). The lake bordered with the belt of *Phragmites australis* and partly overgrown with *Bolboschoenus maritimus* (L.) Palla and *Scirpus* sp. 4th and 10th July.

5. Shablenska Tuzla, 5 km NE of Shabla, (43°34' N, 28°36' E), a beach. 10th July.

6. Batovo, (43°24' N, 27°56' E), the Batova River: 3–4 m wide, bordered with trees, slow-flowing, with fairly cloudy water. 6th July.

7. Durankulak Lake, (43°40' N, 28°33' E). The study area situated in its eastern part, near the seashore. 7th July.

8. Kaliacra Cape, (43°21' N, 28°27' E), without water bodies, only foraging dragonflies observed. 12th July.

9. Krumovo, several kilometers W of the Varna-Dobrich road, (43°24' N, 27°45' E). A one-metre-wide, slow-flowing stream with clear and warm water, and thick muddy bottom deposits. Low bordering slopes overgrown with herbaceous vegetation and local bushes, and the streambed by abundant *Berula erecta* (Huds.) Coville. 11th July.

10. Botevo, (43°25' N, 27°42' E). The Botevska River: 3–5 m wide, slow-flowing, winding its way, locally overflowing into small adjacent areas. The river banks partly overgrown with bushes of *Salix* sp. Cloudy water. 11th July.

11. Batovo, (43°25' N, 27°57' E). A small fast-flowing forest stream, up to 1 m wide, with clear water. A tributary of the Batova river. 11th July.

12. The Kamchia River, 4 km N of Staro Oryakhovo, (43°01' N, 27°49' E): 10–15-metre-wide, slow-flowing with cloudy water. 9th July.

Results and discussion

The distribution of recorded species is presented in Table 1.

More detailed information on some most interesting species has been provided below. The data mostly concern imagines. Numbers of localities are given in brackets [...]. The following abbreviations are used: Exx – exuviae, LL – larvae.

Lestes macrostigma (Eversmann, 1836) (Phot. 4): [4] 4 and 10 VII 2008 – very numerous, estimated at more than ten thousand individuals.

Caliaeshna microstigma (Schneider, 1845) (Phot. 5): [2] 3 VII 2008 – 20–30 ♂♂, ♀♀, teneneral individuals, emergence, LL, Exx; [3] 6 VII 2008 – a few ♂♂, ♀♀, Exx; [5] 10 VII 2008 – 1♂ juvenile; [6] 6 VII

2008 – a few ♂♂, ♀♀, breeding behaviour; [8] 12 VII 2008 – several dozens of foraging ♂♂, ♀♀,; [9] 11 VII 2008 – a few ♂♂.

Cordulegaster picta Sélys, 1854 (Phot. 6, 8): [2] 3 VII 2008 – a few patrolling ♂♂, ♀♀, breeding behaviour , LL, Exx; [3] 6 VII 2008 – a few ♂♂, ♀♀, Exx; [6] 6 VII 2008 – a few ♂♂, ♀♀, breeding behaviour; [11] 11 VII 2008 – 3 ♂♂.

Cordulegaster insignis Schneider, 1845 (Phot. 7, 8): [6] 6 VII 2008 – 2 ♂♂; [9] 11 VII 2008 – 5 patrolling ♂♂.

Tab. 1. Dragonflies recorded at particular localities. Numbers of localities follow numbers given in the text. Explanations: ● – autochthonous occurrence (larvae, exuviae, teneral individuals), ○ – probable autochthonous occurrence (breeding behaviour, at least a few territorial or patrolling males), + – record of the species (single or very rare individuals, without breeding behaviour).

Tab. 1. Ważki stwierdzone na poszczególnych stanowiskach. Numeracja stanowisk jak w tekście. Objaśnienia: ● – występowanie autochtoniczne (larwy, wylinki, osobniki terenalne), ○ – występowanie prawdopodobnie autochtoniczne (behawior rozrodczy, co najmniej kilka samców terytorialnych lub patrolujących), + – stwierdzenie gatunku (osobniki pojedyncze lub bardzo nieliczne, bez behawioru rozrodczego).

Species – Gatunek	Localities – Stanowiska											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. *Calopteryx splendens* (Harris)										○		○
2. *Calopteryx virgo* (Linnaeus)						○			+			
3. *Lestes barbarus* (Fabricius)				●								
4. *Lestes macrostigma* (Eversmann)				●								
5. *Platycnemis pennipes* (Pallas)						○			○	○		○
6. *Ischnura elegans* (Vander Linden)										○		○
7. *Ischnura pumilio* (Charpentier)							○					
8. *Coenagrion ornatum* (Sélys)									○			
9. *Coenagrion puella* (Linnaeus)									○			
10. *Coenagrion pulchellum* (Vander Linden)	+											
11. *Erythromma viridulum* (Charpentier)							○					
12. *Aeshna affinis* Vander Linden				+								
13. *Aeshna isoceles* (O.F. Müller)	○											
14. *Anax imperator* Leach	●						+					
15. *Caliaeshna microstigma* (Schneider)		●	●		+	○		+	○			
16. *Cordulegaster insignis* Schneider						+			○			
17. *Cordulegaster picta* Sélys		●	●			○					○	
18. *Libellula depressa* Linnaeus										+		
19. *Libellula fulva* O.F. Müller	○											
20. *Orthetrum albistylum* (Sélys)							+					+
21. *Orthetrum brunneum* (Fonscolombe)	●	○								○		
22. *Orthetrum cancellatum* (Linnaeus)							+					
23. *Orthetrum coerulescens anceps* (Schneider)	●								+			
24. *Crocothemis erythraea* (Brullé)	○			+			○					

24 species i.e. 35% out of 68 species known in Bulgaria (Beschovski, Marinov 2007) have been recorded in the area of the studies. Records of *Cordulegaster insignis*, *Cordulegaster picta* and *Lestes macrostigma* are especially interesting from the faunistical and zoogeographical point of view and those of *Caliaeshna microstigma* also are worth noticing.

The European part of the extent of *C. insignis* is small and restricted to the southeastern Balkans where the species is local and rare. It is only known from easternmost Greece, Turkish Thrace, eastern Bulgaria, one old locality in the West of the country and a few localities situated along the

Phot. 1. The locality of *Cordulegaster picta* and *Caliaeschna microstigma* in the Balchik Botanical Garden.
Fot. 1. Stanowisko *Cordulegaster picta* i *Caliaeschna microstigma* w ogrodzie botanicznym w Balchik.

Phot. 2. Partly dried out water body in Shablenska Tuzla inhabited by *Lestes macrostigma*.
Fot. 2. Częściowo wyschnięty zbiornik w Shablenska Tuzla, zasiedlony przez *Lestes macrostigma*.

Phot. 3. The habitat of *Lestes macrostigma* in Shablenska Tuzla. – rushes *Bolboschoenus maritimu*s and *Scirpus* sp. in the foreground.
Fot. 3. Zbiornik w Shablenska Tuzla, zasiedlony przez *Lestes macrostigma*. Na pierwszym planie wyschnięte szuwary *Bolboschoenus maritimus* i *Scirpus* sp.

Phot. 4. *Lestes macrostigma* male.
Fot. 4. *Lestes macrostigma* – samiec.

Danube River in northern Bulgaria and southernmost Romania (Boudot et al. 2009; Marinov et al. 2007; van Pelt 2006). In Bulgaria, the species had been recorded at 13 localities before the author's studies (Marinov et al. 2007), however, their number has recently increased by the addition of several unpublished records (M. Marinov pers. comm.). The two localities found by the author partly covered a gap recognizable in the northeastern part of the country. This suggests a wider and more continuous occurrence of the species in eastern Bulgaria.

C. picta occurs in Europe only in a small area in northeasternmost Greece, Turkish Thrace and southern and eastern Bulgaria; one recent record is also known from the western Balkans in Montenegro (Boudot et al. 2009). In Bulgaria, the species extent is concentrated almost exclusively in a narrow belt along the coast of the Black Sea up to Varna (van Pelt 2006). Four new localities found by the author have slightly extended this belt in its northern part, in the basin of the Batova River. These localities are presently the northernmost known localities in the whole species extent. It is highly probable that other streams in the basin of this river also are inhabited by *C. picta*. New localities are mostly small fast-flowing streams with a stony bottom. They were totally or to a large degree shaded by trees. Larvae of the species were found among stones while its exuviae – under bridges and among roots and dry vegetation adjacent to the streambeds. Above the streams, numerous males patrolled, often in a high density. Females ovipositing in shallow sandy areas along the stream banks were also observed.

The range of *L. macrostigma* in Europe is extensive but it is fragmented into many small 'islands' (Dijkstra 2006b). *L. macrostigma* had been known from four published localities in Bulgaria: three with confirmed breeding of the species (Beschovski, Marinov 2007) and one where its presence was probably only accidental (Marinov 2007). The occurrence of the species at the fifth locality (Shablenska Tuzla) was recorded in 2006 and 2007 (M. Marinov pers. comm.). However, the locality has only been dotted on general maps in the Mediterranean Atlas by Boudot et al. (2009) and it has remained unpublished so far. Hence, the locality is published here for the first time. The current observations suggest the species' occupancy on a larger scale along the Black Sea coast. This may be true also for other countries bordering the Black Sea where brackish waters occur along the sea coast. The new (fifth) Bulgarian locality has a similar coastal situation to three localities adjacent to the Burgas Gulf. However, it is located much more to the north. The local population was very large which corresponds with the observations made in the environs of Burgas (M. Marinov unpubl. data). The size of the Shablenska Tuzla population is certainly a consequence of habitat conditions being optimal for *L. macrostigma*. The low depth and high temperature of brackish water, and the abundant occurrence of *Bolboschoenus-Scirpus* rushes strictly follow the species habitat preferences (Dijkstra 2006b; Jödicke 1997). The presence of withered dark brown vegetation, being a consequence of strongly astatic conditions, may also favour the species occurrence.

C. microstigma is restricted in Europe to the Balkan Peninsula, where the species extent reaches ca 43,5° at its western and eastern edges (Boudot et al. 2009; Dijkstra 2006a). In Bulgaria, *C. microstigma* was recorded in the southern, central and eastern part of the country. In the East, it occurs along the coast of the Black Sea up to the

environs of Kavarna (Marinov 2000). The species was recorded at 6 localities in the study area, including locality No. 5 situated 25 km to the north of Kavarna. This last record is presently the northernmost record of the species in the eastern Balkans. Although only a juvenile individual was observed at the northernmost locality its native occurrence is doubtless: it must have originated from streams running in the nearby surroundings.

Two recorded species – *L. macrostigma* and *C. ornatum* – have been classified among critical species in Europe (Sahlén et al. 2004). *C. insignis* was proposed by Marinov et al. (2007) to the Bulgarian Red list of dragonflies as being critically endangered (CR). What is more, M. Marinov postulates in the website on Bulgarian Odonata (Red list...) to classify other species to the Red list: *L. macrostigma* to the category CR, and *C. microstigma* and *C. picta* to the category VU. The new data combined with the literature data seem to show that the species mentioned above are not threatened in Bulgaria to such degrees.

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Phot. 5. *Caliaeschna microstigma* male.
Fot. 5. *Caliaeschna microstigma* – samiec.

Phot. 6. *Cordulegaste picta* male.
Fot. 6. *Cordulegaster picta* – samiec.

Phot. 7. *Cordulegaster insignis* male.
Fot. 7. *Cordulegaster insignis* – samiec.

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Streszczenie

Podczas letniego pobytu na północno-wschodnim wybrzeżu Bułgarii, w dniach od 2 do 12 lipca 2008 r., odwiedzono 12 stanowisk celem zapoznania się z lokalną odonatofauną. Badaniami objęto obszar pomiędzy granicą Rumunii i rzeką Kamczija, a przede wszystkim okolice miejscowości: Shabla, Kavarna, Balchik i Dobrich. W północnej części przeważają cieki okresowe. Dlatego badaniami objęto tam głównie pas przymorski z wodami stałymi, zarówno płynącymi, jak i stojącymi. W południowej części badanego obszaru sieć stałych wód płynących jest gęstsza i obecna także w głębi lądu.

Stwierdzono 24 gatunki ważek spośród 68 znanych dotąd w Bułgarii, co stanowi 35% bułgarskiej odonatofauny. Do najbardziej interesujących należą stwierdzenia: *Cordulegaster insignis*, *Cordulegaster picta* i *Lestes macrostigma*, a w drugiej kolejności: dane dotyczące *Caliaeschna microstigma*.

C. insignis znany był dotąd w Bułgarii z 13 publikowanych i kilku ostatnio znalezionych, niepublikowanych stanowisk. Jego występowanie ogranicza się praktycznie do wschodniej części kraju i jego północnego skraju wzdłuż Dunaju. Dwa nowe stanowiska częściowo wypełniły lukę w północno-wschodniej części kraju,

Phot. 8. *Cordulegaster insignis* (above) and *Cordulegaster picta* (below).
Fot. 8. *Cordulegaster insignis* (u góry), *Cordulegaster picta* (u dołu).

sugerując bardziej rozległy i bardziej ciągły zasięg gatunku we wschodniej Bułgarii.

Zasięg *C. picta* w Bułgarii obejmuje głównie wąski pas wzdłuż wybrzeży Morza Czarnego. Cztery stwierdzone przez autora stanowiska nieco poszerzyły znany zasięg w jego północnej części, w dorzeczu rzeki Batova. Stanowiska te są obecnie najbardziej na północ wysuniętymi stanowiskami w całym zasięgu gatunku. *C. picta* znaleziony został w większości w małych, szybko płynących strumieniach o kamienistym dnie, całkowicie lub w dużej części zacienionych. Obserwowano liczne patrolujące samce (często w dużym zagęszczeniu) oraz samice znoszące jaja na piaszczystych przybrzeżnych płyciznach. Larwy znajdowano pomiędzy kamieniami, a wylinki wśród korzeni i zeschniętej roślinności na obrzeżach cieków.

Dotychczas opublikowano z Bułgarii cztery stanowiska *L. macrostigma*. Stanowisko piąte, podane w tej pracy, było wprawdzie, jak się okazało, znane od 2006 r., jednak nie zostało wcześniej opublikowane. Stanowisko to ma podobne przybrzeżne położenie jak trzy stanowiska w rejonie Zatoki Burgaskiej, leży jednak zdecydowanie dalej w kierunku północnym. Bardzo duża liczebność lokalnej populacji, szacowana na

ponad 10 tys. osobników, jest rezultatem optymalnych warunków siedliskowych: małej głębokości i wysokiej temperatury wody, jej zasolenia oraz obfitej obecności szuwarów *Bolboschoenus maritimus* i *Scirpus* sp.

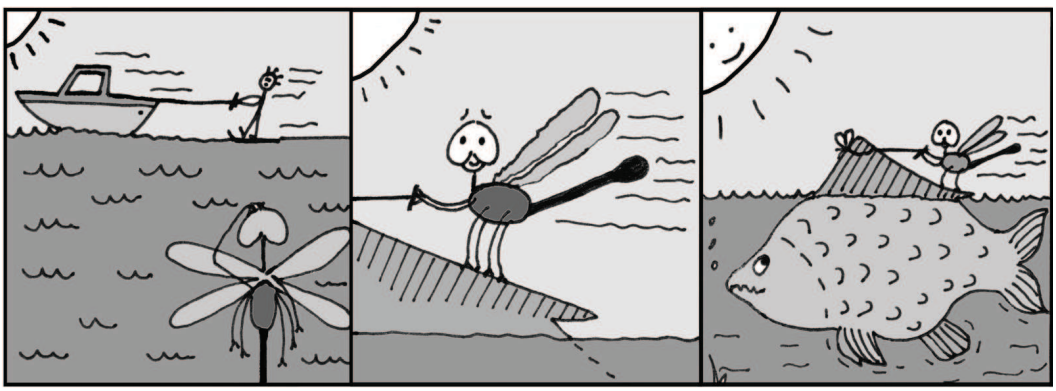
C. microstigma była stwierdzana w Bułgarii w południowej, centralnej i wschodniej części kraju. Na wschodzie znana była z wybrzeży Morza Czarnego aż do Kawarny. Badania autora przyniosły 6 stanowisk gatunku, w tym jedno zlokalizowane 25 km na północny-wschód od Kawarny. To ostatnie jest obecnie najbardziej na północ wysuniętym stanowiskiem *C. microstigma* we wschodnich Bałkanach.

Dwa spośród stwierdzonych gatunków – *L. macrostigma* i *C. ornatum* należą do gatunków krytycznych w Europie. Cztery gatunki zostały zaproponowane do Czerwonej listy ważek Bułgarii: *C. insignis* (CR), *L. macrostigma* (CR), *C. microstigma* (VU), C. picta (VU). Nowe stwierdzenia w połączeniu z danymi literaturowymi zdają się jednak wskazywać, że powyższe gatunki nie są zagrożone w Bułgarii aż w takim stopniu.

Key Words. Odonata, dragonflies, zoogeography, NE Bulgaria.

Przygody ważki z Lublina: Rybie narty

Adventures of the dragonfly from Lublin: Fish-ski



rys. Edyta Buczyńska