



From *Echo maxima* to *Archineura maxima* – a slow taxonomic process (Odonata: Calopterygidae)

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Abstract. The treatment of *Echo maxima* Martin, 1904 in the taxonomic literature, a species known only from a single female specimen from northern Vietnam, is briefly reported. Photographs of the holotype are provided and the species' morphological characters are compared with those of the two known *Archineura* species: *incarnata* and *hetaerinoidea*. A new generic combination *Archineura maxima* is introduced.

Key words. Dragonfly, damselfly, new combination, Vietnam

Introduction

In a contribution to the knowledge of the Indochinese Odonata fauna in the book series *Mission Pavie Indo-china*, René Martin described a new, large damselfly species *Echo maxima* from Tonkin (MARTIN 1904). The description was based on a single female specimen (Fig. 1), which Hans Fruhstorfer had collected during his stay at Than Moi (presently known as Dong Mo; in the Lang Son province in the northern part of Vietnam) in June–July 1901. The holotype still remains the only known specimen of this enigmatic Demoiselle species, the 'rarest' representative of its family.

In his description MARTIN (1904) did not compare *E. maxima* with the other known calopterygid giant *Archineura incarnata* (Karsch, 1892), which also was originally described as a species of *Echo*, but he did state that his new species seemed to belong to *Echo*, and that in the colour of the body and pterostigma it resembled an enormous *Echo uniformis* Selys, 1879.

LAIDLAW (1917), who treated the genera *Climacobasis* Laidlaw, 1902 and *Archineura* Kirby, 1894 as synonyms of *Echo* Selys, 1853, appears to be the first subsequent author to comment on *E. maxima*: »I do not know the female of this species [*Archineura incarnata*], nor have I seen an example of Martin's *E. maximia* (sic), but I am now of the opinion that all these species may properly be referred to the Selysian genus [*Echo*].«

FRASER (1929) opined that Laidlaw's synonymization of the genus *Climacobasis* with *Echo* was based on two erroneous interpretations, and he treated *Climacobasis* Laidlaw, 1902 as a distinct genus. Fraser also wrote: »Dr. Laidlaw also suggests that Kirby's *Archineura* and Martin's *Echo maxima* belong to genus *Echo*. As regards the former, the basal neuration is so different that one cannot reconcile it with *Echo*; and in regard to the latter [*E. maxima*], I have since made an examination of the

type and find important differences in the venation; thus *Rii* [RP₁] is not confluent with the radius [RA] at its origin, being similar to the condition found in the genus *Matrona*; the pterostigma is elongate in both (*sic*) sexes and situated in the usual place, *viz.* moderately far back from the apex, the wings are longer, the apices nearer the pterostigma than base of wings as in *Climacobasis*. Thus the genus [*Echo*] contains but two species and one subspecies or race, – *E. margarita margarita* Selys, *E. margarita tripartita* Selys, and *E. uniformis* Krug. (*sic*),...«. The reference to »both sexes« (of *E. maxima*) was based on a misidentified male specimen in Museum Paris, see below.

FRASER (1933) described another calopterygid giant '*Leucopteryx hetaerinoides* gen. et sp. nov.' based on one female and three male specimens from Laos. The genus *Leucopteryx* (which was a preoccupied name) was poorly defined. In his discussion Fraser noted the existence of a single male specimen of *L. hetaerinoides* in



Fig. 1. Holotype of *Archineura maxima*, habitus and attached labels. Photos: Jean Legrand (insect), MH (labels).



the Museum nationale d'Histoire naturelle in Paris, which René Martin had incorrectly labelled as the male of *Echo maxima*. In this paper Fraser provided an unclear photo of the wings of *E. maxima* and wrote that the wings of that species are »totally different« from those of *hetaerinoïdes*. In his second Odonata volume in the *Fauna of British India* series, FRASER (1934: 134 ff.) repeated the generic discussion (presented in 1929) almost *verbatim*, including the incorrect reference to »both sexes« of *E. maxima*. However, soon after FRASER (1935) transferred the species *hetaerinoïdes* to the genus *Archineura* and therefore no new name for the preoccupied genus group-name *Leucopteryx* was needed. Fraser wrote: »Both *incarnata* and *hetaerinoïdes* have little in common with the characters of the genus *Echo* and undoubtedly deserve generic rank.« However, in none of his papers did Fraser suggest a new generic combination for *Echo maxima*, although even in his 1929 paper Fraser made it clear that he did not consider *maxima* to belong to the genus *Echo*. Consequently, *maxima* was placed in the genus *Echo* in all subsequent published catalogues of the World Odonata from DAVIES & TOBIN (1984) onwards, a listing followed in all catalogues available on the internet. *Echo maxima* was also listed from Vietnam without taxonomic discussion in the publications by VAN TOL & ROZENDAAL (1995) and DO & DANG (2007).

The first published expression of doubt of this species' generic placement since FRASER (1934) may have been the inverted commas used in the binomial "*Echo*" *maxima* in a brief and informal article by HÄMÄLÄINEN (2005). Later, casual remarks on the need to change the generic assignment of the species were included in PHAN & HÄMÄLÄINEN (2011) and Yu & HÄMÄLÄINEN (2012). Then in the chapter 'Giants of the east' and in the species list of the book *Demoiselle damselflies* (KARJALAINEN & HÄMÄLÄINEN 2013: 133 ff., 206 f.), I provisionally placed *maxima* in the genus *Archineura*, with a question mark.

After the publication of KARJALAINEN & HÄMÄLÄINEN (2013), René Martin's unpublished manuscript for a monograph on the calopterygoid damselflies of the world ('*Famille des Calopterygidae*') was unexpectedly found in October 2013 in an archive at the University of Florida. In 1912 Martin had submitted this manuscript to the series 'Collections Zoologiques du Baron Edm. de Selys Longchamps – Catalogue Systématique et Descriptif', but it remained unpublished during the turmoil of World War I. The manuscript had already been considered lost (cf. WASSCHER & DUMONT 2013). In this manuscript Martin treats *maxima* as a 'subspecies' of *Echo incarnata* Karsch: 'Forme *maxima* Martin, 1904 – *E. incarnata maxima* Mart.' (see Fig. 2). Martin wrote: »Cette forme que j'ai décrite comme espèce appartient très probablement à *incarnata*. Elle en diffère par sa taille un peu plus grande, le nombre moindre des anténodales, et par la bande brune qui traverse les ailes, et par la proportion différente entre la longueur de l'abdomen et celle des ailes.« [This form, which I described as a species, very probably belongs to *incarnata*. It differs by its slightly larger size, the smaller number of antenodals, by the brown band crossing

the wings, and by the different relative proportions in length of the abdomen and of the wings.] The description of *Echo incarnata maxima* given in the manuscript was similar, but not identical, to that of *E. maxima* presented in MARTIN (1904).

In October 2008, during a 3-week visit at the Natural History Museum in London, I was able to examine an unpublished manuscript by John Cowley, titled 'The classification of the Agriidae, with descriptions of new genera (Odonata)'. Obviously Cowley had written this manuscript, which appeared to be in an advanced state, shortly before his death in 1967. Concerning the genus *Archineura* Cowley wrote: »*Echo maxima* Martin, 1904, perhaps belongs to this genus, but unfortunately in the wing-photograph by FRASER (1933: 128) the important basal and anal veins are not at all clear«.

Correspondingly there has been longstanding doubt whether *maxima* was correctly placed in *Echo*. In this paper the species *maxima* is formally transferred to the genus *Archineura*.

Study of the holotype of *Echo maxima*

During a visit to Muséum national d'Histoire naturelle in Paris in October 2012, I was able to study and photograph the holotype of *E. maxima*. I had previously seen a few photographs of this specimen, kindly sent to me by Dr Jean Legrand in September 2002.

In its general habitus and size (Fig. 1), *maxima* resembles females of the two accepted *Archineura* species. The wing span of the pinned holotype is 107 mm and the total length 84 mm. Hind wing length is 53 mm, length of abdomen (incl. appendages) is 68 mm. In size *maxima* is intermediate between an average female specimen of *hetaerinoïdes* (the largest species) and of *incarnata*. The thorax (Fig. 3a) is as robust as in both *Archineura* species. Abdominal segments S8 and S9 (Fig. 3b) are proportionally less robust than in *hetaerinoïdes*, but are similar to *incarnata*.

The wings are proportionally slightly shorter than in *hetaerinoïdes* and *incarnata*. Females of the latter two species have uniformly clear wings (Figs 5a–d), but in *maxima* both wing pairs have a brownish transverse band just before the nodus (Figs 1, 4). In oblique view the basal area bordered by the bands has a distinct yellowish whitish sheen (Fig. 4), making it a much more colourful insect than females of the other two *Archineura* species.

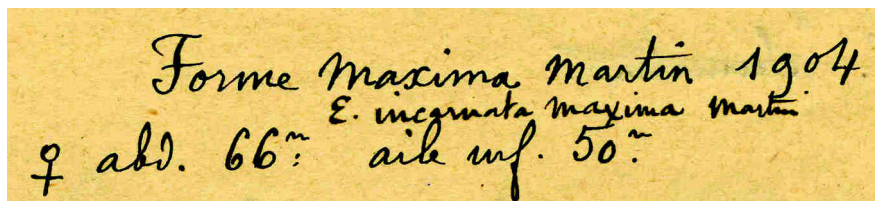


Fig. 2. Extract of René Martin's unpublished manuscript submitted in 1912.

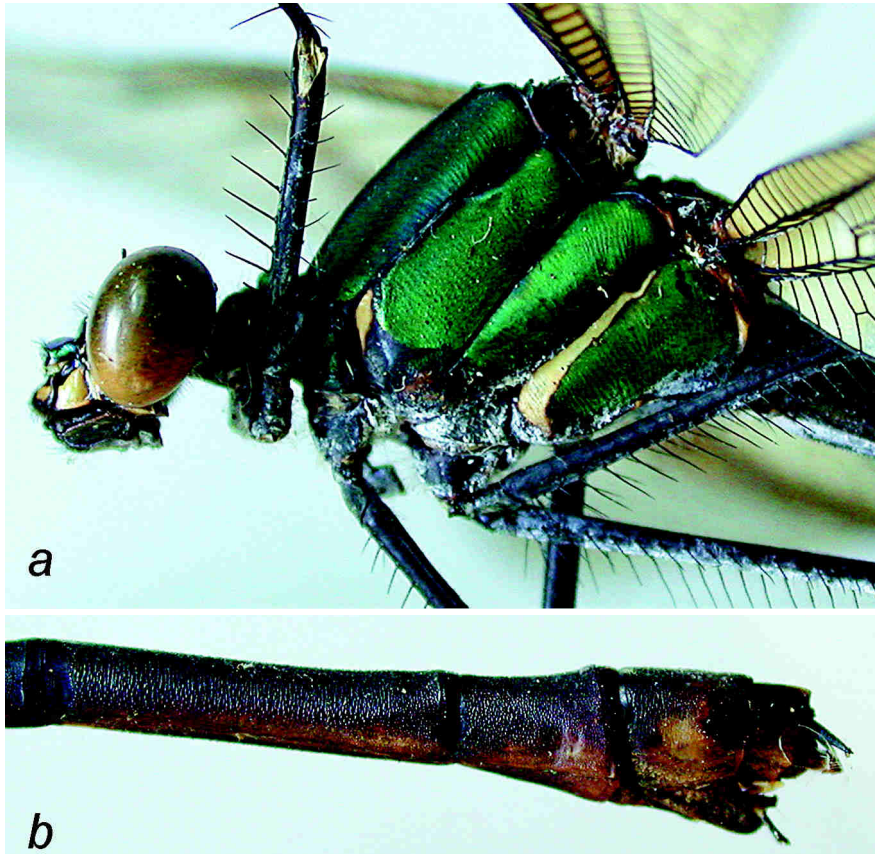


Fig. 3. Holotype of *Archineura maxima*. **a)** head and thorax; **b)** apical segments of abdomen. Mirror images, not in scale. Photos: Jean Legrand

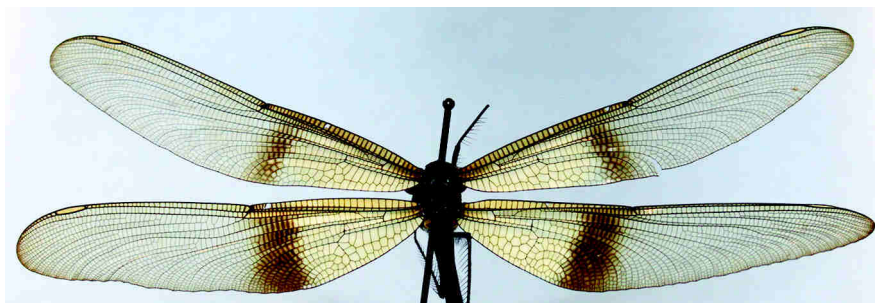


Fig. 4. Holotype of *Archineura maxima*, wings photographed from oblique view. Photo: MH

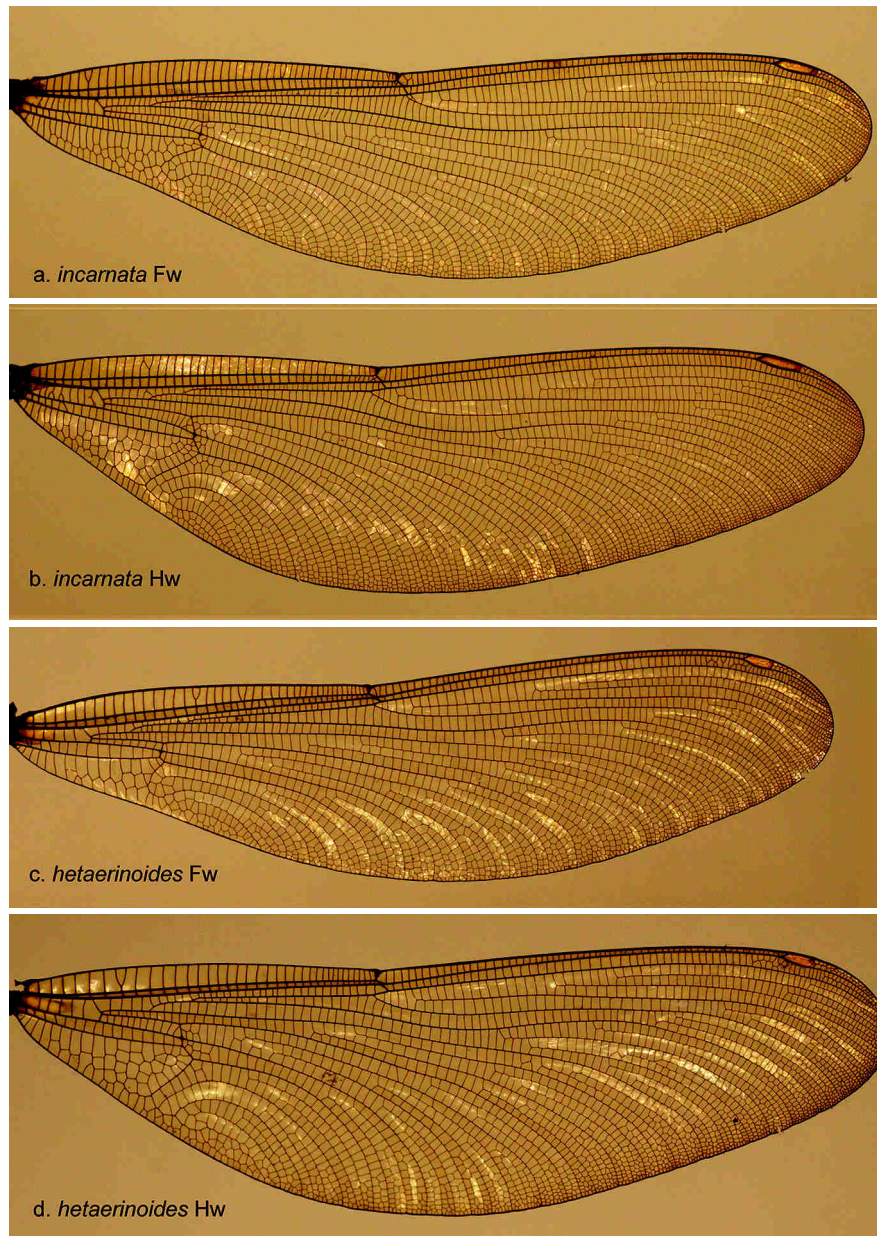


Fig. 5. Wings of *Archineura incarnata* female from Chebaling, Guangdong, China (a, b) and *A. hetaerinoides* female from Sapa, Lao Cai, Vietnam (c, d). Photos: MH



As in *incarnata* and *hetaerinoides*, the nodus is situated a little closer to the base than the apex. The pterostigma is pale ochre and elongate, especially in the hind wing. It covers 8–9 underlying cells. The pterostigma is a little longer than in *incarnata* and considerably much longer and narrower than in *hetaerinoides* (cf. Figs 1, 4, 5a–d).

Also as in the other two species, the upper antenodal space of *maxima* is much broader than the lower space (best seen in the forewing in Fig. 1). In *Echo margarita* (the type species of the genus *Echo* Selys, 1853), the upper antenodal space is only slightly broader than the lower. In *maxima* the arculus is not distinctly angulated, resembling more that in *incarnata* than in *hetaerinoides*. The sectors of the arculus are well separated at origin, as in *incarnata*.

In *maxima* vein RP (principal sector) arises from RP₃ four cells from its origin (at arculus) in both wings, vein IR₂ (subnodal sector) arises from RP₁₊₂ (principal sector) five cells apicad in Fw and correspondingly four cells in Hw (Fig. 6a). In *incarnata* (Fig. 6b) and *hetaerinoides* (Fig. 6c) RP does not merge with RA (radius; median nervure), but in *maxima* it is almost adjacent to it. In *incarnata* RP (principal sector) arises from RP₃ about 6–8 cells from its origin (at arculus), RP₁₊₂ (principal sector) arises from IR₂ 5–7 cells further on. The corresponding figures in *hetaerinoides* are 5–6 cells and 4–7 cells, respectively. Another difference is that in *maxima*, RP₁₊₂ appears linear with IR₂ arching postero-distally; in both *incarnata* and *hetaerinoides*, IR₂ appears linear with RP₁₊₂ arching antero-distally.

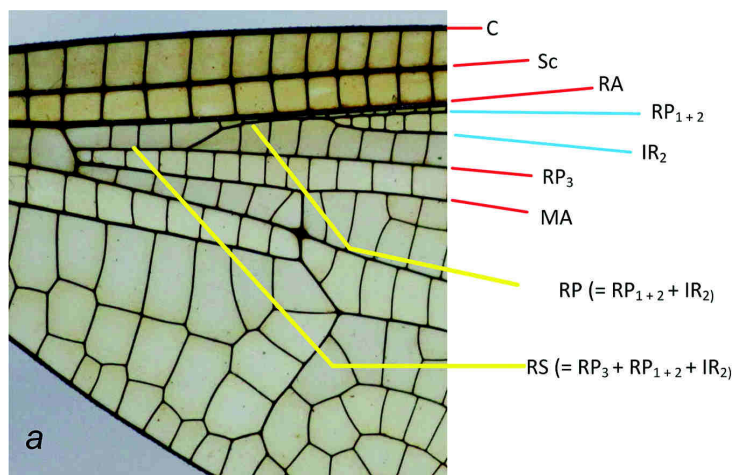
In the fore wing of *maxima* (Fig. 6a) the anal vein descends vertically below the medio-anal link, in the hind wing it is slightly directed basad. Near the wing border the anal vein gives off a basal and an apical branch, as in the other two species. In *hetaerinoides* (Fig. 6c) the anal vein below the medio-anal link is more distinctly directed basad, in *incarnata* (Fig. 6b) it is conspicuously directed basad. In *maxima* the reticulation of wings is distinctly sparser than in females of *incarnata* and *hetaerinoides*. In Table 1 some details of the reticulation of the wing base of these species is presented.

Although no male specimen of *E. maxima* is known, the resemblance of the holotype female to the females of the two known *Archineura* species, both in terms of the size, general habitus and venational details, suggests that *maxima* is best treated as a species of that genus rather than as an *Echo* species. Therefore a new combination is presented here:

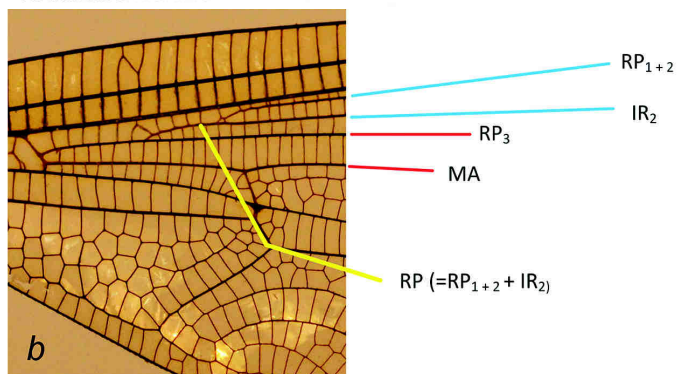
***Archineura maxima* (Martin, 1904), comb. nov.**

Discussion

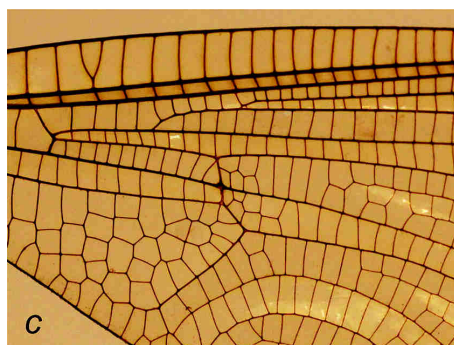
Earlier Odonata genera were usually defined mainly by venational characters. Recently other information, especially that provided by molecular studies and studies on larval stages, has shown that venational details are often unreliable in determin-



Archineura maxima female



Archineura incarnata female



Archineura hetaerinoides female

Fig. 6. Base of hind wing in *Archineura* species. **a)** *A. maxima*; **b)** *A. incarnata*; **c)** *A. hetaerinoides*. The wing venation terminology is according to RIEK & KUKALOVA-PECK (1984). Photos: MH

Table 1. Details in venation in *Archineura* species. Data of *A. incarnata* are based on six randomly selected female specimens from China and in *A. hetaerinoidea*, correspondingly on three female specimens from Laos and three from Vietnam.

	<i>maxima</i> Fw	<i>maxima</i> Hw	<i>incarnata</i> Fw	<i>incarnata</i> Hw	<i>hetaeri- noides</i> Fw	<i>hetaeri- noides</i> Hw
Antenodals	34–35	30–30	39–50	35–43	43–50	33–40
Cross-veins in median field	7–8	6–6	8–13	7–11	5–9	5–7
Cross-veins in quadrangle	8–8	6–6	14–17	12–15	8–12	8–10
Cross-veins in cubital field	14–14	13–13	21–27	18–22	14–19	13–18

ing close relationships. KIRBY (1894) based his definition of the genus *Archineura* almost solely on venational characters. Obviously, no later definitions of the genus have been published, although FRASER's (1935) transferring of *Leucopteryx hetaerinoidea* to this genus broadened the extent of venational variability from that given in the original definition. Although the inclusion of *maxima* in this genus further broadens the variability of the venational characters of the genus, in this paper I do not attempt to revise the genus definition, as this should be done in a connection with a thorough generic classification of the whole family.

Molecular studies by DUMONT et al. (2007) and GUAN et al. (2012a) suggest that *Archineura* is a sister group of a cluster containing the genera *Mnais* Selys, 1853, *Psolodesmus* McLachlan, 1870, and *Echo*; therefore the status of *Archineura* as a separate genus is well grounded. On the other hand *Psolodesmus* clusters closely with *Echo modesta*. However, since the DNA of the type species of *Echo*, *E. margarita* Selys, 1853, has not yet been analysed, it would be unwise at present to draw conclusions on the mutual taxonomic status of the genera *Echo* and *Psolodesmus*. Especially since *E. margarita* seems to differ from *E. modesta* (the type species of the genus *Climacobasis*) in the structure of the genital ligula (Yu & HÄMÄLÄINEN 2012) and in certain venational details. Based on the venational differences, some earlier authors, such as FRASER (1934, 1957) and COWLEY (unpublished manuscript, around 1967) ranked *Climacobasis* as a separate genus. Since LIEFTINCK (1954) placed *Climacobasis* as a synonym of *Echo* (without explanation), this practice has been uncritically followed. Six years previously, LIEFTINCK (1948) had also used the combination *Climacobasis modesta*.

The probable type locality of *A. maxima* is a moderately flowing 10–15 m wide lowland stream, which passes Dong Mo town (21°39'22"N, 106°34'49"E, 65 m a.s.l.). Presently this stream is badly polluted and all forests in the area disappeared decades ago (Fig. 7). In 2008–2010 I made three excursions to Huu Lien Nature

Reserve, some 30 km west of Dong Mo. At Huu Lien there is still some forest left in an area of limestone karst formation with many clear streams. During the last three years (2013–2015) Tom Kompier and Sebastien Delonglée (both based in Hanoi) have made numerous visits to Huu Lien. Although several new or rare odonate species have been recorded there, *A. maxima* has not been found. So, it is unlikely that it still exists in that area. It would presumably be difficult to overlook such a large and conspicuous damselfly.

Unlike the other two *Archineura* species which live in less disturbed forested montane areas in Indochina and in southern China, *A. maxima* may have been restricted to forested lowland streams within a rather restricted range in northern Vietnam and in adjacent areas in Guangxi in China. Since nearly all lowland forests within the suspected range of the species have been completely denuded, the stream-beds scoured and the water polluted, it is possible that this species is either near to extinction or already extinct.

Archineura incarnata is still a locally uncommon species within its large range in southern China (GUAN et al. 2012b). *Archineura hetaerinioides* is a considerably rarer insect and it is known from Laos, northern Vietnam and Yunnan. For further information of the species of this genus, see HÄMÄLÄINEN in KARJALAINEN & HÄMÄLÄINEN 2013: 133–141.



Fig. 7. The possible type locality of *A. maxima*, a lowland stream passing Dong Mo town in northern Vietnam. Photo (29-vi-2005): MH

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First records of *Erythromma lindenii* (Selys, 1840) from Hungary (Odonata: Coenagrionidae)

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Abstract. The first records of *Erythromma lindenii* from Hungary are presented. In 2014 larvae, exuviae, and adults of *E. lindenii* were collected along running waters in the Kis-Sárrét area, located in the southeastern part of the country. The current knowledge of *E. lindenii* in Hungary is summarized and notes on the habitat of the species are provided.

Key words. Dragonfly, damselfly, Zygoptera, distribution, expansion, habitat, Kis-Sárrét region

Introduction

Erythromma lindenii has a holomediterranean distribution (GRAND & BOUDOT 2006: 84; cf. BOUDOT et al. 2009: 61) and during recent decades has expanded its range northwards (e.g., DIJKSTRA 2006; DE KNIJF & ANSELIN 2010; GOFFART 2010; TERMAAT et al. 2010). The species generally can be found in various types of natural and artificial running and standing waters usually characterized by a slow current or ground water influence, and typically with dense aquatic vegetation (HUNGER 1998; DIJKSTRA 2006; KOCH 2010).

The Odonata fauna of Hungary is rather well known. However, nearly four decades have elapsed since the last checklist was compiled (DÉVAI 1978). This checklist, which contained 65 species, needs revision due to taxonomical and nomenclatural changes; for example, clarification of the taxonomical status of certain species, e.g., *Lestes parvidens* (OLIAS 2005; GYULAVÁRI et al. 2011), or *Somatochlora meridionalis* (e.g., WILDERMUTH 2006). Despite intensive nationwide surveys (e.g., KOVÁCS et al. 2004, 2006; MÜLLER et al. 2006; KOVÁCS & AMBRUS 2010), no dragonfly species new for the Hungarian fauna has been found for many years. Apart from Slovakia during recent decades, *E. lindenii* has been recorded from all adjacent countries, however, which is why the species was certainly to be expected to also occur in Hungary.

Study area and methods

In 2014 collections were carried out to reveal the scarcely known Odonata fauna of the Kis-Sárrét area (Békés county, southeastern Hungary). This area is located in the eastern part of the Hungarian Lowlands ecoregion according to ILLIES (1978). The Kis-Sárrét is fairly rich in various types of aquatic habitats, such as marshes, lakes, rivers, small watercourses, and channels, providing a heterogeneous landscape of odonate habitats. Collections were made at slow-flowing waters, typically

with dense riparian/emergent (*Glyceria* sp., *Phragmites australis*, *Sparganium* sp.) and/or submerged (*Potamogeton* sp., *Myriophyllum* sp., *Ceratophyllum* sp.) vegetation (Fig. 1).

Adults were captured by hand net and exuviae were searched for along the bank. Larvae were collected with a standard pond net (mesh size 0.5 mm) in the submerged or emergent vegetation. The field guide by DIJKSTRA & LEWINGTON (2006) was used to identify adults, while larvae and exuviae were identified using keys and descriptions by ASKEW (2004) and GERKEN & STERNBERG (1999).

List of collecting sites

(1) Sebes-Körös, Körösnagyharsány (47°00'53"N, 21°38'00"E, 93 m a.s.l.) 14-vi-2014. (2) Sebes-Körös, Biharugra (47°00'01"N, 21°34'10"E, 91 m a.s.l.), 14-vi-2014. (3) Sebes-Körös, Körösújfalú (46°58'36"N, 21°24'28"E, 88 m a.s.l.), 14-vi-2014. (4) Sebes-Körös, Vésztő (46°58'43"N, 21°16'58"E, 84 m a.s.l.) 14-vi-2014. (5) Holt-Sebes-Körös, Körösnagyharsány (47°00'41"N, 21°37'41"E, 91 m a.s.l.), 17-iv-2014, 23-vi-2014. (6) Holt-Sebes-Körös, Komádi (46°57'06"N, 21°29'58"E, 89 m a.s.l.), 17-iv-2014. (7) Köles-ér, Sarkadkeresztúr (46°49'31"N, 21°25'03"E, 85 m a.s.l.), 24-vi-2014.



Fig. 1. Habitats of *Erythromma lindenii* in the Kis-Sárrét area, southeastern Hungary. A: Sebes-Körös (loc. 2), B: Köles-ér (loc. 7), C: Holt-Sebes-Körös (loc. 5), D: Holt-Sebes-Körös (loc. 6). Photos: AM



Results

Adults (cf. Fig. 2), larvae and exuviae of *E. lindenii* were found at seven sites in the Kis-Sárrét region, representing the first records of the species for Hungary. Besides the collected specimens listed below, on 23-vi-2014 at loc. 5 *ca* 40 additional adults were observed, some of which exhibited reproductive activity including tandem linkage and oviposition. Data were collected by the authors if not indicated otherwise.

(1) 24 exuviae. (2) 1♂ adult, 2 exuviae. (3) 1 exuvia. (4) 1 exuvia. (5) 2♂ 1♀ adults, 3 larvae. Leg. AM, AF, Pál Boda, Zoltán Csabai, Tibor Danyik. (6) 1 larva. Leg. AM, AF, Zoltán Csabai, Tibor Danyik. (7) 1♂ adult. Leg. AM, AF, Pál Boda, Zoltán Csabai.

Discussion

Discoveries of *E. lindenii* in Hungary fill a gap in its European distribution with sites situated approximately 190 km north-west from the nearest known locality at the foothills of the Romanian Retezat Mountains (MANCI 2012). In view of the records of this species close to the Hungarian border from the Austrian side of the Lake Neusiedl/Fertő (HÜBNER 1984), from the north-east of Slovenia (BOUDOT et al. 2009) and from the Croatian Turopolje region (VILENICA et al. 2011), the species



Fig. 2. Male of *Erythromma lindenii*. Holt-Sebes-Körös, Hungary (23-vi-2014). Photo: Tamás Deli

might have been expected to be first discovered in western Hungary. Its first national occurrence in eastern Hungary appears to be thus rather surprising. According to our results which included evidence of reproduction at almost all sites, *E. lindenii* seems to be well established in the area, suggesting that it has already been present in the region for some time. Interestingly, it had not been found in the course of collecting activities carried out in the same area in the 1990s (e.g., AMBRUS et al. 1998; JUHÁSZ et al. 1998; OLAJOS et al. 1998).

Erythromma lindenii is well known for its ability to quickly colonise artificial water bodies such as gravel pits and channels (cf. HUNGER 1998; MÜLLER 2004; DIJKSTRA 2006; JOVIĆ 2009; JOVIĆ et al. 2009). Typically, loc. 5, where *E. lindenii* was found in especially high abundance, was a channel with very slow-flowing, periodically almost standing water with a completely concreted channel-bed. Aquatic vegetation was absent but patches of *Phragmites australis* and some terrestrial plant species formed riparian vegetation along the banks (Fig. 1D).

As in the case of several other species with similar ability, which in recent decades showed positive population trends and range expansions in Europe, it therefore can be assumed that our Hungarian findings were also mainly due to a combination of increasing research activity on the one hand and an increasing number of suitable man-made water bodies on the other (cf. OBREGÓN-ROMERO et al. 2013; BOUDOT 2014; STILLE et al. 2014; UBONI et al. 2015). Moreover, the influence of climate change on the range expansion of *E. lindenii* cannot be excluded (cf. CONZE et al. 2010; DE KNIJF & ANSELIN 2010; GOFFART 2010; ROSSET & OERTLI 2011).

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

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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).

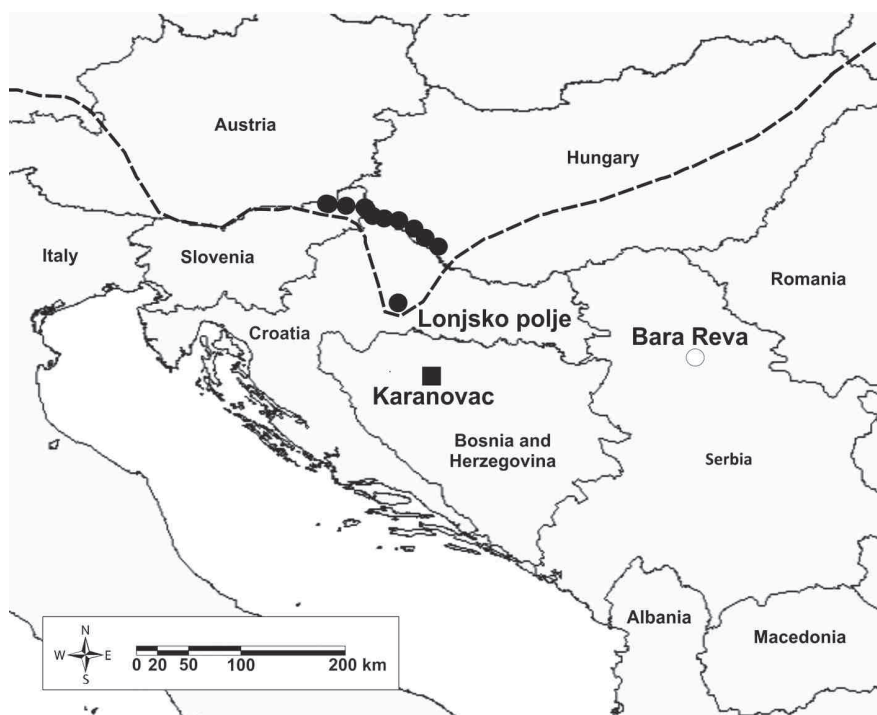


Fig. 1. The distribution of *Leucorrhinia caudalis* in southeastern Europe (RAAB et al. 2007; Jović et al. 2008; BEDJANIĆ 2014) and the location of the new record from Bosnia and Herzegovina (dashed line – southeastern distribution border; black dots – closest known sites of *L. caudalis* in Croatia, 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 & HOUDARD 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.

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Further additions to the knowledge of the odonate fauna of Armenia, with first record of *Pantala flavescens* (Odonata: Libellulidae)

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Abstract. As result of two targeted surveys of the Armenian odonate fauna in August 2010 and June 2014 a male *Pantala flavescens* was recorded photographically on the shore of Lake Sevan in the Gegharkunik district, representing the first record for Armenia. *Leucorrhinia pectoralis* was rediscovered at Javakheti-Shirak volcanic plateau (Armenian highland) 75 years after the species was first reported for Armenia. Data on the first evidenced reproduction of *Coenagrion armatum* were also collected.

Key words. Dragonfly, damselfly, Anisoptera, Zygoptera, *Coenagrion armatum*, *Leucorrhinia pectoralis*, southern Caucasus ecoregion, new records

Introduction

During the Soviet period the odonate fauna of Armenia was studied and described by AKRAMOWSKI (1948, 1958, 1964, 1975). Decades later, after gaining national independence, significant additions to the knowledge of the Armenian dragonfly fauna were made in the course of a second period of systematic odonatological exploration (TAILLY et al. 2004; ANANIAN 2012; ANANIAN & TAILLY 2012, ANANIAN & TAILLY 2013). Nevertheless, large parts of the country are still rather poorly known and some species mentioned by AKRAMOWSKI (1948) and others more recently discovered in the country are still lacking published records.

Material and methods

Data were collected during two field trips on 04–17-viii-2010 and 02–20-vi-2014 at six localities within the districts of Shirak, Lori, and Gegharkunik. Data were obtained either by taking photos of living individuals in the field or by netting them. Specimens were identified in hand and released afterwards.

List of collecting sites

(1) Between Karmravan and Vardaghbyur (40°59'45"N, 43°53'21"E, 2 013 m a.s.l.), 05-vi-2014. (2) Artanish peninsula, Lake Sevan (40°28'18"N, 45°16'38"E, 1 912 m a.s.l.), 11-viii-2010. (3) Katnarat forest (41°02'57"N, 44°10'20"E, 1 604 m a.s.l.), 08-vi-2014. (4) Lori marshes (41°03'04"N, 44°18'40"E, 1 482 m a.s.l.), 08-vi-2014. (5) Urasar marsh (41°01'22"N, 44°18'13"E, 1 562 m a.s.l.), 10-vi-2014. (6) 1.5 km east of Urasar (41°00'54"N, 44°18'18"E, 1 564 m a.s.l.), 10-vi-2014.

Results

Pantala flavescens is a new record for Armenia. Data on *Coenagrion armatum* represent the second record only for the country and the first evidence of reproduction. An autochthonous population of *Leucorrhinia pectoralis* is the first well documented record of the species since its discovery 75 years ago.

Family Coenagrionidae

1. *Coenagrion armatum* (Charpentier, 1840)

(1) 10 mature and 12 teneral individuals.

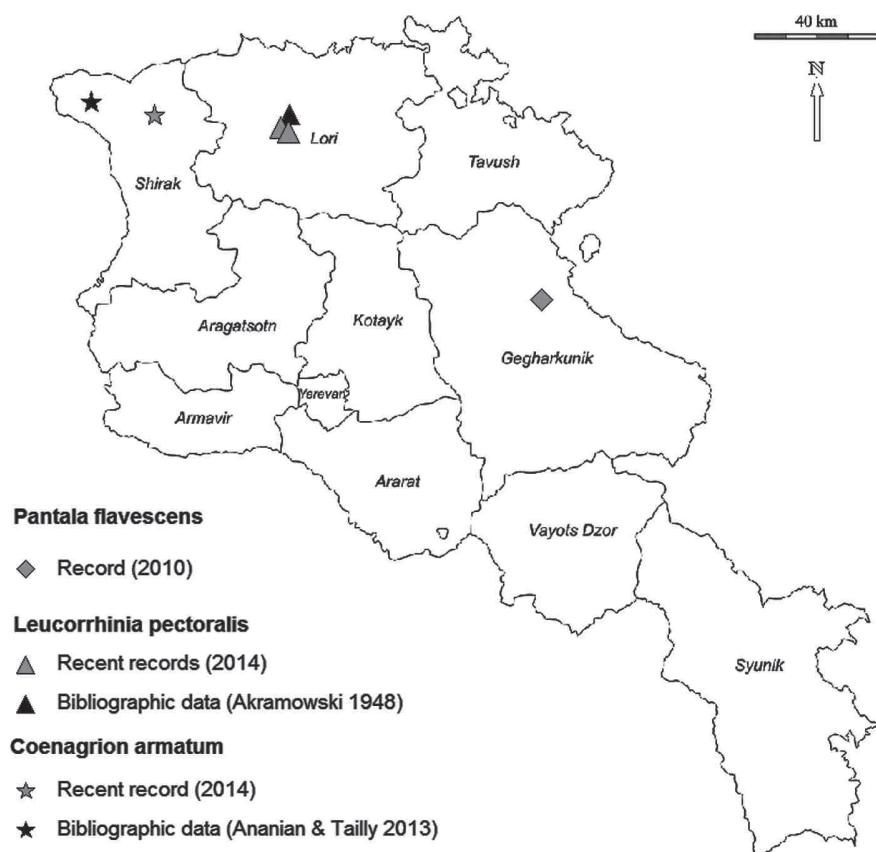


Fig. 1. Map of Armenia, with district boundaries and geographic position of collecting sites.

Family Libellulidae

2. *Leucorrhinia pectoralis* (Charpentier, 1825)

(3) 15 teneral individuals (4) 15 mature ♂ and 20 teneral individuals.

(5) Several teneral individuals (6) 1 teneral ♀.

3. *Pantala flavescens* (Fabricius, 1798)

(2) 1 ♂.

Discussion

The disjunct population of the boreal *Coenagrion armatum* on the Javakheti-Shirak volcanic plateau (Armenian highland) of the Lesser Caucasus was discovered in present day Georgia over a century ago by BARTENEV (1909). The continuous occurrence of a large population there was confirmed recently by SCHRÖTER et al. (2015). A single male of *C. armatum* was captured in 2006 on the western shore of Arpi lake on the Armenian part of the plateau (ANANIAN & TAILLY 2013) but in spite of several visits to the area this observation could not be repeated during the following summers. However, in late spring 2014 complementary investigations were undertaken in numerous pre-selected bogs of the area, resulting in the discovery of a small breeding population of *C. armatum* between Vardaghbyur and Karmravan (Figs 1, 2). The reproductive habitat was situated near an open wetland probably formed by a broken water pipe leakage. Vegetation of the habitat was consisted of species characteristic of high altitude meso-oligotrophic bogs with *Carex* sp., *Triglochin* sp., *Schoenoplectus* sp., and several mosses in dense and mixed stands



Fig. 2. Breeding habitat of *Coenagrion armatum*. Between Vardaghbyur and Karmravan villages, Javakheti-Shirak volcanic plateau, Armenia (05-vi-2014). Photo: ED



Fig. 3. Immature male of *Leucorrhinia pectoralis*. Lori marshes between Saratovka and Urasar villages, Armenia (08-vi-2014). Photo: ED



Fig. 4. Male of *Pantala flavescens*. Artanish Peninsula, Lake Sevan, Armenia (11-viii-2010). Photo: ED

(Fig. 2) surrounded by open mountain steppe vegetation and ploughed fields. Other Odonata species observed in this habitat were *Coenagrion lunulatum*, *Libellula quadrimaculata*, and *Enallagma cyathigerum*. This breeding population of *C. armatum* is the first one to be discovered in Armenia and lies only about 20 km from the large Georgian population described by BARTENEV (1909; cf. SCHRÖTER et al. 2015).

Data presented for *Leucorrhinia pectoralis* are the first documented sightings for Armenia after the species was firstly mentioned as occurring there by AKRAMOWSKI (1948) (Figs 1, 3; TAILLY et al. 2004; ANANIAN & TAILLY 2013). *Leucorrhinia pectoralis* is generally rare and local in the region and our findings are only the third record for the Transcaucasus after its discovery at the northern slopes of the Georgian part of the Javakheti-Shirak volcanic plateau (BARTENEV 1925) and a subsequent record made by SHENGELIA (1964). Together with sites in the Balkans and Turkey, these populations of the southern Caucasian ecoregion constitute the southernmost occurrences of both species (cf. BOUDOT & KALKMAN 2015). Although the Javakheti-Shirak volcanic plateau is still characterised by a rich network of wetlands considerable parts of wet peatland have already been drained and converted into pasture or ploughed fields. Ongoing degradation and destruction of aquatic habitats due to disorganised subsistence agriculture and uncontrolled livestock breeding appears to be a severe threat to newly discovered Armenian populations of both *C. armatum* and *L. pectoralis*.

Our observation of *Pantala flavescens* constitutes the first well documented record of this species in Armenia (Figs 1, 4), increasing the total number of odonate species known from this country to 59 (cf. TAILLY et al. 2004; ANANIAN & TAILLY 2013). *Pantala flavescens* is a well-known, cosmopolitan, obligate migrant with a circumtropical distribution. It has been recorded in the Western Palearctic zoogeographic region as far north as Montenegro (OBER 2008), Croatia (FINKENZELER 2010), Bulgaria (DE KNIJF 2015), Kaliningrad in the Courish Spit (BUCZYŃSKI et al. 2014), and the Azores (VIEIRA & CORDERO-RIVERA 2015). The species has been recorded in adjacent Azerbaijan (AKRAMOWSKI 1964) and Georgia (SHENGELIA 1975) where single specimens have been found rather regularly in recent years (f. ex. R. Mauersberger, A. Schröter, P. Schrijvershof, and M. Bot pers. comm.; ED unpubl.). In adjacent Turkey the species was even recorded as reproducing (ARLT 1999) which is why the first record for Armenia appeared to be overdue rather than surprising.

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***Pantala flavescens* – a new species for the fauna of Bulgaria (Odonata: Libellulidae)**

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Abstract. A male of *Pantala flavescens* was observed on 30 July 2012 in the Western Rhodope Mountains in the southwest of Bulgaria. This species is new for the Bulgarian fauna. The observation was made along a stream, away from suitable breeding habitat. Therefore, we consider our observation to be of a vagrant individual.

Key words. Dragonfly, Anisoptera, first record

Introduction

The Globe Skimmer (*Pantala flavescens*) (Fabricius, 1798), as its vernacular name suggests, is a well-known migrant (CORBET 1999). It can disperse enormous distances from its breeding areas and is able to cross oceans (ANDERSON 2009; HOBSON et al. 2012) or to fly over high altitudinal passes (WOJTUSIAK 1974; BORISOV 2012). It even migrates at night, crossing seas at altitudes of up to 1,000 m, with higher densities at about 200 to 500 m during mass migrations (FENG et al. 2006). *Pantala flavescens* has an overall circumtropical distribution and is a common species in most of Africa, South and Central America, Oceania and Asia (REICHHOLF 1973; CORBET 1979; LARSEN 1987; HAWKING & INGRAM 1994; SILSBY 2001; MAY 2013). In the Northern Hemisphere the species is known to occur regularly up to 52–53°N in the USA or Canada, and sometimes also to the same latitude in eastern Asia (GORB & FURSOV 1990; CORBET 1999). In the Western Palaearctic however, it is less widespread and the number of records from Europe remains surprising low and mostly confined to the Eastern Mediterranean (LAISTER 2005; OBER 2008; BOUDOT et al. 2009).

The Bulgarian dragonfly fauna has been relatively well studied (BOUDOT et al. 2009; KUTSAROV et al. 2012). Nevertheless, several regions are still under-surveyed, or the regional inventory is based on rather old records (< 1980), so that even in the well investigated regions several new additions to the regional fauna list may still be made.

Study area

Field investigations were carried out along the River Pirinska Bistritza (41°27'59"N, 23°26'55"E) near the hamlet of Chereshnitsa, less than 3 km northeast of Katuntsi in the Western Rhodope Mountains, Bulgaria. The river has here a breadth of 3–5 metres and is bordered by a narrow forest belt. The surrounding hilly landscape

is predominantly formed of forest and extensively used grasslands and to a smaller extent also by areas of crop cultivation. The water quality seems to be very good and no pollution was evident. Other Odonata species found at this location on the same date were *Calopteryx splendens* and *C. virgo*, both very abundant, together with *Onychogomphus forcipatus* in very low numbers (< 5 imagines). The days preceding and throughout our visit were extremely warm, with temperatures rising to 40°C. The typical weather pattern for that period was for the heat to build up during the day, followed by heavy thunderstorms and summer rains in the late afternoon.

Results

On 30-vii-2012, a male of *P. flavescens* was seen hovering and patrolling over an abandoned grassland with patchy thorny scrub, adjacent to the river. The male was observed for nearly 20 minutes. Most of the time it was hunting for insects, which were caught in flight. During the observation period, it alighted only once for approximately one minute, perching vertically on top of a thorny shrub. Approaching heavy winds preceding a summer thunderstorm caused the male to flyaway over the canopy of the riverine forest.

Discussion

Within the Western Palaearctic, most records of *Pantala flavescens* originate from the Middle East where (as in Turkey) it is regularly observed, although there are no established breeding populations (DUMONT 1977; SEIDENBUSCH 1995; JÖDICKE 1998; ARLT 1999; AYDIN 2006; HACET & AKTAÇ 2006; KALKMAN & VAN PELT 2006; SALUR et al. 2012) or the Levant (DUMONT 1991; MONNERAT & HOESS 2011). It is only very sporadically observed in North Africa, with records from Morocco (JÖDICKE 1995), Tunisia (JÖDICKE et al. 2000) and Egypt (BOUDOT et al. 2009; DIJKSTRA & BOUDOT 2010). In January 2013 it was for the first time observed in the Canary Islands, namely on Gran Canaria, over several days (MARTÍNEZ-DARVE SANZ & CANO-VILLEGAS 2014). Although politically belonging to Spain, the Canary Islands are biogeographically part of Africa. And as recently as November 2014 first record of the species was made for the Azores (São Miguel island) representing its northernmost record in Macaronesia (VIEIRA & CORDERO-RIVERA 2015). The rarity of occurrence of the species in North Africa might be explained by the arid Saharan belt, which divides North Africa from Sub-Saharan Africa, where *P. flavescens* is common and widespread. The Sahara also seems to be responsible for the nearly complete absence of the species in most parts of Europe (LAISTER 2005; BOUDOT et al. 2009; BUCZYŃSKI et al. 2014).

Pantala flavescens is known only from a very limited number of records from eleven European countries. Probably the highest number of records is from Cyprus (KIAUTA 1963; SPARROW et al. 2015) where the species is a very rare migrant, which might be explained by the close proximity of Cyprus to the Middle East and the



Nile valley, where *P. flavescens* is more frequently encountered. Nevertheless in some years such as 2007 several individuals were recorded (SPARROW et al. 2015). In the last decade, the species was recorded from several localities and countries in Europe. It was found for the first time on the Italian Pelagic Islands of Lampedusa and Linosa in 2010 and 2012 (CORSO et al. 2012). Furthermore, three specimens were recorded in 2013 on the island of Malta (GAUCI 2014) and FINKENZELLER (2010) observed at least three individuals patrolling above a beach on Krk Island (Croatia). Apart from the records in Cyprus, the oldest European record is that of a male from Herceg-Novi (Montenegro) which was only discovered 35 years later in the collection of the State Museum of Natural History in Stuttgart (OBER 2008). In Greece, *P. flavescens* was observed on Rhodes Island (LAISTER 2005) and in 2005 in the delta of the Evros River at the border with European Turkey. In the latter, *P. flavescens* was caught at three sites (HACET & AKTAÇ 2004) and on Gökçeada Island (HACET & AKTAÇ 2006). All these observations fall within the Mediterranean region. The most remarkable European record was a male found in an ornithological trap on the Courish Spit, Kaliningrad Oblast, western Russia in 2013 (BUCZYŃSKI et al. 2014). The number of records and countries in Europe from which *P. flavescens* has been observed has clearly been increasing since 2010. This might be caused by increased occurrence of the species in Europe but might also be explained by a greater rates of detection due to better knowledge of the species by increasing numbers of odonatologists.

Our observation of *P. flavescens* represents the first record for Bulgaria and increases the total number of Odonata species for the country to at least 70. The Bulgarian location is situated at less than 10 km from Greece and approximately at 230–300 km from the localities in the Evros delta and in European Turkey. The observation of *P. flavescens* in the western Rhodope falls within the Eastern Mediterranean and within the Eastern Balkans, the region from which most European records originate.

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Nomenclatorial fossicking – unearthing forgotten Selysian species names of Belgian Odonata

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Abstract. Five forgotten available species group names in Odonata, introduced by Edmond de Selys Longchamps in 1831, are listed and their taxonomic status is discussed. The following synonymies are presented: *Agrio[n] cyaneus* Selys, 1831 and *Agrio[n] oeneus* Selys, 1831 are junior subjective synonyms of *Calopteryx virgo* (Linnaeus, 1758); *Agrio[n] cellaris* Selys, 1831 and *Agrio[n] virescens* Selys, 1831 are junior subjective synonyms of *Calopteryx splendens* (Harris, 1780). *Agrio[n] coralinus* Selys, 1831, an obvious coenagrionid species, is ranked as a *nomen dubium*.

Key words. Dragonfly, damselfly, Zygoptera, European *Calopteryx*, synonymy

Introduction

Digitalisation of old scientific literature and placing it on the internet with open access has made life quite easy for those of us who want to consult very old or otherwise highly inaccessible publications, either out of pure curiosity, or in search of details for scholarly purposes.

Thus, while searching for the contents of the first two publications of Edmond de Selys Longchamps for a brief biographic account of him for a Finnish language article (HÄMÄLÄINEN 2015), I consulted Philippe Vander Maelen's book titled *Dictionnaire géographique de la province de Liège* (sic) (VANDER MAELEN 1831). In the appendix of this book there are several articles by separate authors. Two are by Selys, one on birds and the other on insects. His first, longer, article (SELYS 1831a) is an annotated catalogue listing a total of 205 bird species recorded in the Liège region. The catalogue includes several species names associated with the Latin '*mihi*' [meaning 'name given by me'] in brackets. Some of these species entries were provided with very brief Latin descriptions. I am not sure how many of these new names are available for zoological nomenclature, but no doubt all are synonyms.

Selys' first new dragonfly names

Selys' first entomological paper (SELYS 1831b) is much more modest and less coherent than his first ornithological paper. The last two of the four pages of this article contain mere lists of genera of Neuroptera (in the broad Linnean sense) and Lepidoptera recorded in the Liège region. Each generic name is listed with the number of species recorded. The first two pages contain more detailed text, which is largely devoted to the damselflies of the genus *Agrion* (Fig. 1). Each species is character-

ized in a few lines. In all binomial names the genus name is incorrectly spelled as *Agrio*. Since in the brief introductory text the generic name is correctly spelled as *Agrion*, and since he was familiar with this spelling of the genus via LATREILLE's (1805) *Histoire naturelle*, the incorrect spelling was undoubtedly a printer's error. Therefore *Agrio* must be ranked as an incorrect subsequent spelling. Consequently *Agrio* Selys, 1831 is not an available genus-group name, although it was listed in *Nomenclator zoologicus* by NEAVE (1939).

Seven species-group names in the genus *Agrio*[*n*] were presented. In addition to the species names *virgo* [Linnaeus, 1758] and *puella* [Linnaeus, 1758], Selys introduced five new names. Four of them (all qualified with word '*mihi*') were in the *virgo*-group and one in the *puella*-group (Fig. 1). As far as I know, these names have not subsequently appeared in any Odonata catalogues, global or regional. However, they were duly listed in SHERBORNE's (1902–1922) *Index animalium*. Since the names were associated with brief descriptions, they are available names. *Agrio*[*n*] *cyaneus* seems to be a mature male of *Calopteryx virgo*, *A. cellaris* is a mature male of *Calopteryx splendens*, *A. oeneus* is female of *C. virgo* and *A. virescens* appears to be female of *C. splendens*, although the description is somewhat confusing. *Agrio*[*n*] *coralinus* was not furnished with the word '*mihi*', although also it was a new name. This is obviously a coenagrionid species. However, its real identity remains uncertain, and it is best ranked as *nomen dubium*.

The taxonomic grouping of the European *Calopteryx* species had puzzled the early authors, starting with Linnaeus. It also took Selys quite a long time to achieve

ORDRE DES NÉYROPTÈRES.

Observations sur la famille des Libellulines (connues sous le nom de Demoiselles.). Parmi les belles espèces de cette famille que l'on trouve aux environs de Liège, je citerai la *Libellula quadrimaculata*, qui est si rare aux environs de Paris, si commune dans notre province, et l'*OEschna*, si difficile à saisir et dont les ailes dorées brillent tant aux rayons du soleil.

J'ai étudié particulièrement le genre *Agrion* dont les nombreuses variétés ont fort embarrassé les naturalistes. Voici le résultat de mes observations sur les deux espèces adoptées par les auteurs :

Agrio virgo (Lat.), *Libellula virgo* (L.). Les quatre variétés indiquées par les auteurs me paraissent être autant d'espèces distinctes dont voici les caractères :

Agrio virgo (Espèce modifiée). Ailes sans taches, d'un brun clair, à reflets azurés; corps d'un bleu verdâtre brillant.

Agrio cyaneus (mihi), l'*Ilélène* (Geoff.). Ailes sans taches, opaques, d'un bleu verdâtre foncé ainsi que le corps.

Agrio cellaris (mihi), la Louise (Geoff.). Ailes transparentes; un espace bleuâtre arrondi sur le milieu; corps d'un bleu verdâtre brillant.

Agrio oeneus (mihi), l'*Ulrique* (Geoff.). Ailes d'un jaune roussâtre; une petite tache blanche à chacune; corps d'un vert bronzé.

Agrio virescens (mihi). Ailes transparentes, d'un vert tendre sans taches; corps d'un vert bronzé.

Je n'ai pas encore trouvé l'espèce que Geoffroy nomme la *Félicie*.

Agrio puella (Lat.), *Libellula puella* (Linn.). Deux espèces distinctes sont comprises sous ce nom :

Agrio puella, l'*Amélie* et la *Dorothée*, (Geoff.). Corps bleuâtre ou verdâtre; presque blanc immédiatement après sa transformation; ailes transparentes avec un point marginal noir. Les mâles sont bleus. les femelles vertes. Cette espèce varie beaucoup dans la position des couleurs vertes, bleues et noires.

Agrio coralinus. Corps d'un rouge assez clair. Les anneaux de l'abdomen sont légèrement entourés de verdâtre; ailes transparentes avec un point marginal noir.

Genres.	Espèces.
Libellula.	10
OEschna.	4
Agrio.	6

Fig. 1. Facsimile of the text treating dragonflies in SELYS (1831b). Extracted from pages 57–59.



a solid taxonomic grasp of the different 'forms' of the European *Calopteryx*. Later Selys himself referred to his premature 1831 paper only once, but without specifying that he had introduced new species names in it. In his major book on the European dragonflies, *Revue des Odonates ou Libellules d'Europe* (SELYS & HAGEN 1850, footnote on p. 136) Selys wrote: »En 1831, j'ai suivi sans le savoir la première manière de voir de Linné en isolant comme autant d'espèces les âges et les sexes.« Freely translated: "In 1831, without knowing the original treatment [of LINNAEUS in his *Fauna Svecica* (1746)], I followed it by isolating many species based on age and sex." For the treatment of the presently recognised *Calopteryx* species in *Fauna Svecica*, see HÄMÄLÄINEN (2008).

While H.A. Hagen prepared his *Synonymia Libellularum Europaeorum* (HAGEN 1840) he was not aware of the existence of Selys' obscure 1831 paper. Therefore Selys' new species-group names remained unlisted and were thus not analyzed in this otherwise very complete catalogue. Selys and Hagen first began corresponding in 1841 (WASSCHER & DUMONT 2013) and they soon developed a very close working relationship. Later, in his review of the world Neuroptera literature, HAGEN (1849) was rather circumspect in the wording of his comments on Selys' 1831 paper. He noted that the author was only 17 years old when this 'inadequate' (»unzulänglich«) article was submitted, and failed to reveal that the paper included several synonymic names. In his long obituary of Selys, PLATEAU (1902) describes this paper as "a modest enumeration with only historical value". In the recent detailed review of the life and work of Selys, WASSCHER & DUMONT (2013) commented on the paper thus: »virtually all names used in this article, including the 'new species', are wrong, and thus Selys still had a lot to learn«. However, the authors did not list the names of these 'new species' or comment on their status. The names were briefly listed in HÄMÄLÄINEN (2015).

In the references to Selys' 1831 paper, both HAGEN (1863) and PLATEAU (1902) give its title as *Liste des genres d'insectes aptères, névroptères et lépidoptères de la province de Liège*. I do not know if there is a reprint of this publication with this title (which describes well its content, apart from the misspelling of Liège). However, in the original book by Vander Maelen (Appendice, p. 57) the title of Selys' entomological contribution contains only the single word *Insectologie*.

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