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COMMUNICATION

SOME RARE DAMSELFLIES AND DRAGONFLIES (ODONATA: ZYGOPTERA AND ANISOPTERA) IN UKRAINE: NEW RECORDS, NOTES ON DISTRIBUTION, AND HABITAT PREFERENCES

Alexander V. Martynov

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COMMUNICATION

Some rare damselflies and dragonflies (Odonata: Zygoptera and Anisoptera) in Ukraine: new records, notes on distribution, and habitat preferences

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Abstract: New records of 11 rare species of damselflies and dragonflies (*Calopteryx virgo*, *Lestes macrostigma*, *Nehalennia speciosa*, *Coenagrion scitulum*, *Ophiogomphus cecilia*, *Lindenia tetraphylla*, *Cordulegaster boltonii*, *Somatochlora arctica*, *Leucorrhinia albifrons*, *Leucorrhinia caudalis*, and *Selysiothemis nigra*) within Ukraine are given. Habitats and distribution of species within the country are briefly discussed. Breeding sites of *C. boltonii* within Ukraine is found for the first time and confirmed with larval material. *Somatochlora arctica* is recommended for inclusion in the next edition of the Red Data Book of Ukraine.

Keywords: Odonates, Red Data Book of Ukraine, stenobiotic species

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INTRODUCTION

Damselflies and dragonflies (Odonata: Zygoptera & Anisoptera) belong to a small order in the fauna of Ukraine; it comprises only 78 species (Gorb et al. 2000; Tytar 2007; Savchuk & Karolinskiy 2013; Bernard & Daraż 2015). Despite the rather scarce fauna, distribution of many species is poorly and unevenly studied. Some regions have a lot of information published on Odonata, while in other regions even the data on species compositions are fragmented. Consequently, the distribution and habitat preferences of rare species within Ukraine are still understudied and cannot be used for analysis of species' vulnerability.

This paper is aimed to publish new records of some rare Odonata in Ukraine; some of these species are included in the third edition of the Red Data Book of Ukraine (2009) or recommended to be included in the next edition of this book by other colleagues or by me.

MATERIAL AND METHODS

Collected material (imagoes, exuviae and larvae) is deposited in author's collection in the National Museum of Natural History of the National Academy of Sciences of Ukraine (further NMNH NASU). The larvae, exuviae, and imagoes are deposited in 85–95 % EtOH and pinned. Photographs of specimens were taken by author using Canon SX30SI (Images 1A, 1B, 6A, 7A, 10H) and Leica Z16 APO equipped with Leica DFC450 Digital Camera (Images 1C–E, 2A–D, 3A–C, 4A–C, 5A–F, 6B, 6C, 7B–F, 8A, 8B, 9A–D, 10A–D, I–K) in the I.I. Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine, and subsequently processed with LAS Core 3.8 and Adobe Photoshop™ CS5 software. Photographs of some specimens and/or their distinguishing characters are given to confirm identification.

RESULTS AND DISCUSSION

Calopteryx virgo (Linnaeus, 1758)

This species is included in the Red Data Book of Ukraine (2009) and is relatively common in western regions of the country, but significantly rarer in Left-Bank Ukraine. Within Left-Bank Ukraine the species was registered only in a few locations in Kyiv, Chernihiv, Sumy, Luhansk, and Donetsk Regions (Zograf 1909; Sheshurak & Padalko 1996; Khrokalo 2000, 2004; Gorb et al. 2000; Matushkina 2006; Martynov 2010a). *Calopteryx virgo* is very rare in Donetsk and Luhansk Regions, and was previously known only by a few imagoes from two sites; stream in vicinity of Avdiivka town (48.136111N & 37.789722E) and Verhne Provallia River in vicinity of Provallia village (48.126389N & 39.809167E) (Zograf 1909; Martynov 2010a).

I registered new populations of the species within the highest part of Donetsk elevated area (Donetsk Ridge) (Image 1A–G) at the upper parts of Bulavina, Ol'hova and Khrustal'na Rivers. The rivers in these sections are covered with forest and represent rhithral or epipotamal zones with current velocity up to 0.7m/s (in some places absent, on rapids – up to 1.5m/s). The detailed description of the investigated section of Bulavina River, change of water temperature during the year and photos of habitats are given in previous articles (Martynov & Godunko 2013; Martynov 2013, 2014a).

Calopteryx virgo is relatively common only at Bulavina River. Imagoes were mainly recorded on small glades, up to 5–8 specimens at the same time; solitary specimens were regularly observed in shady forests and on water surface; larvae were registered at places with moderate current velocity, mainly near the banks on roots of black alder. Recorded population of *C. virgo* is the biggest known within southeastern Ukraine. Material from Ol'hova and Khrustal'na Rivers were sampled several times, and only some specimens of the species were registered. Moreover, many similar waterbodies of Donetsk Ridge can be considered as potential habitats for the species; they should be investigated in future.

Material and observations: Seven imagoes and one larva, Ukraine, Donetsk Region, vicinity of Debaltsevo urban settlement, border of Donetsk and Luhansk Regions, Bulavyna River in the forest, 48.315286N & 38.436253E, Martynov A.V., 18.vii.2010; more than 15 imagoes, ibid, Martynov A.V., 19.vii.2011; five imagoes and two larvae, ibid, Martynov A.V., 20.08.2010; four imagoes and one larva, ibid, Martynov A.V., 11.vi.2010; six imagoes and one larva, ibid, Martynov A.V., 1.viii.2010; one larva, ibid, Martynov A.V., 13.iii.2010; one larva, ibid, Martynov A.V., 17.iv.2010; one larva, ibid, Martynov A.V., 1.viii.2010; one larva, ibid, Martynov A.V., 19.ix.2010; one larva, ibid, Martynov A.V., 17.x.2010; two larvae, ibid, Martynov A.V., 13.xi.2010; one larva, ibid, Martynov A.V., 20.xi.2011.

Two larvae, Ukraine, Luhansk Region, vicinity of Ivanivka urban settlement, 2km toward NE from urban settlement, Ol'hova River, 48.252879N & 38.974304E, Martynov A.V., 30.iv.2012.

One larva, Ukraine, Luhansk Region, vicinity of Khrustalnyi village, Khrustal'na River, 48.183883 &

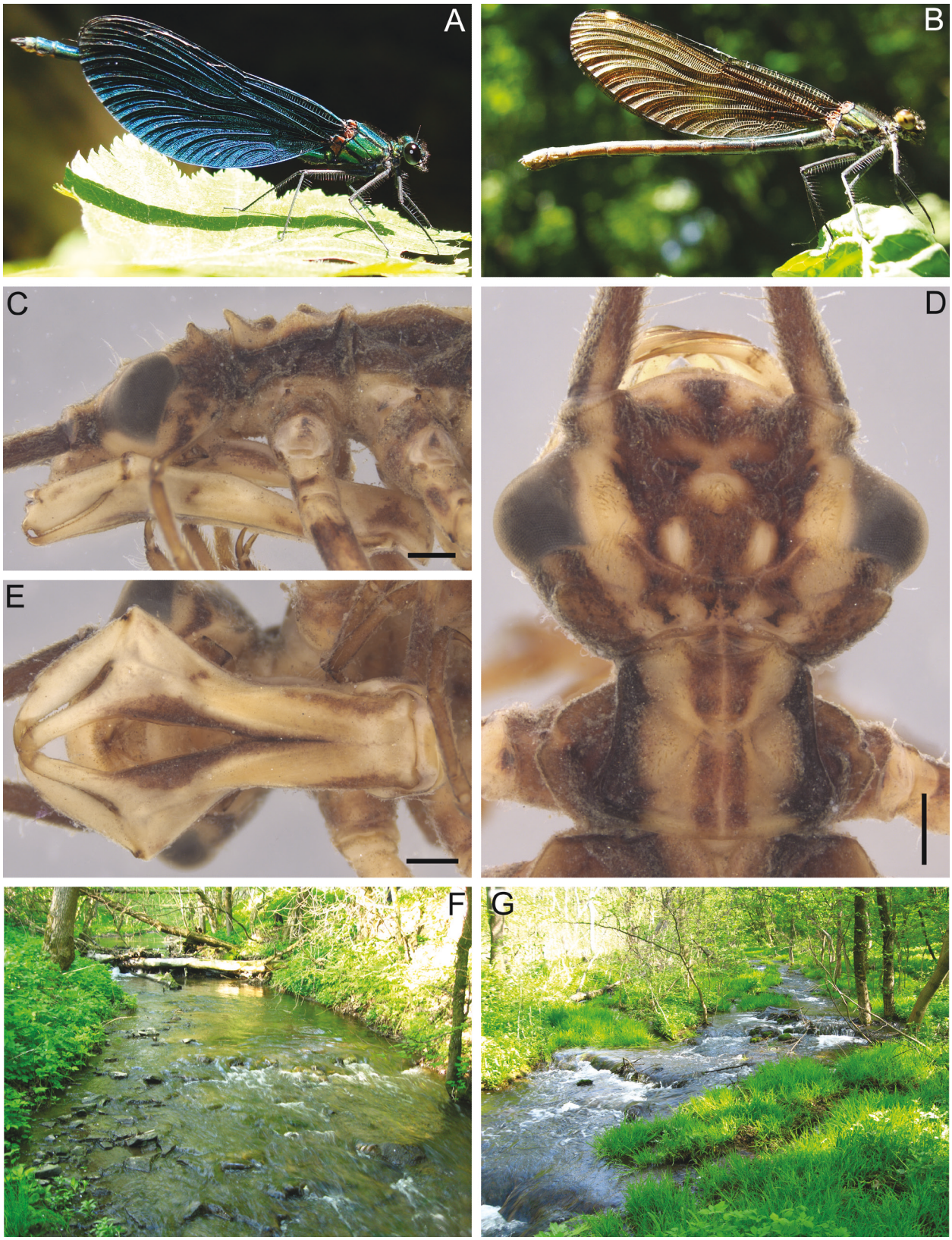

Image 1. ***Calopteryx virgo*** **(Linnaeus, 1758), imago (A, B), larva (C–E), habitats (F, G): A—male | B—female | C—head and pronotum, lateral view, scale 0.5mm | D—head and pronotum, dorsal view, scale 0.5mm | E—mask, ventral view, scale 0.5mm | F—Ol'hova River, vicinity of Ivanivka urban settlement, Luhansk Region (30.iv.2012) | G—Khrustal'na River, vicinity of Khrustalnyi village, Luhansk Region (30.iv.2012). © Alexander V. Martynov.**

38.878600, Martynov A.V., 30.iv.2012.

***Lestes macrostigma* (Eversmann, 1836)**

This locally distributed species inhabits mainly brackish continental and seaside waterbodies. Distribution of *L. macrostigma* is poorly studied in Ukraine; it is known from a few places in Odesa, Mykolaiv, Kherson, Vinnutsya, Kirovohrad, Khmelnytskyi, Chernihiv, Kharkiv, Donetsk Regions, and Crimea (Rodzyanko 1895; Gorb et al. 2000; Dyatlova 2006; Matushkina 2006; Martynov & Martynov 2007(2008); Martynov 2010a; Savchuk & Karolinskiy 2013; Smirnov & Tarasenko 2017). Presence of the species in some regions needs confirmation because of old and/or doubtful records. On the other hand, the southern regions of Ukraine have numerous waterbodies suitable for breeding of the species, therefore I am sure that *L. macrostigma* is more widely distributed in Ukraine than expected.

I recorded several new breeding locations of *L. macrostigma* in Zaporizhzhya, Dnipropetrovsk, and Kherson Regions (Image 2A–H) at Tashchenak River, Malyi Utluk River, Lyman Lake and unnamed pound near Syvash Lake. Most of these waterbodies are brackish. Species prefer dry riparian areas. At Tashchenak River the species was most numerous, with thousands of specimens recorded; females oviposited eggs in trunks of *Bolboschoenus maritimus* (L.) Palla.

Material and observations: Six imagoes, Ukraine, Dnipropetrovsk Region, vicinity of Bulahovka village, dried part of salt Lyman Lake, 48.630584N & 35.657207E, Martynov A.V., 20.vi.2012.

Few imagoes, Ukraine, Zaporizhzhya Region, vicinity of Mala Ternivka village, pond on Malyi Utluk River, 46.582887N & 35.201294E, Martynov A.V., 24.vi.2019.

Hundreds of imagoes, Ukraine, Zaporizhzhya Region, vicinity of Radionivka village, temporary drying up area near the banks of Tashchenak River, 46.673468N & 35.239565E, Martynov A.V., 20.vi.2019.

Thousands of imagoes, Ukraine, Zaporizhzhya Region, vicinity of Radionivka village, temporary drying up area near the banks of Tashchenak River, 46.668631N & 35.25462E, Martynov A.V., 20.vi.2019.

Few imagoes, Ukraine, Zaporizhzhya Region, vicinity of Davydivka village, upper part of Utlyukskyi Estuary, temporary drying up areas near the bank, 46.511196N & 35.192460E, Martynov A.V., 26.vi.2019.

Few imagoes, Ukraine, Zaporizhzhya Region, vicinity of Kyrylivka village, channel and small temporary waterbody, 46.437174N & 35.441674E, Martynov A.V., 30.vi.2019.

Three imagoes, Ukraine, Kherson Region, vicinity of Strohanivka village, unnamed pound near Syvash Lake, 46.234207N & 33.874605E, Martynov A.V., 19.vii.2019.

***Coenagrion scitulum* (Rambur, 1842)**

This is a rare species in Ukraine; known from a few sites within Crimea, Odesa, Mykolaiv, Kherson, Chernihiv and Donetsk Regions (Polischuk 1964, 1974; Sheshurak & Padalko 1996; Dyatlova 2006; Khrokalo et al. 2009; Khrokalo & Prokopov 2009; Martynov & Martynov 2009; Stepoviy 2018). According to Pavlyuk (1973), the record of *C. scitulum* larvae from Kherson Region is doubtful; record of the species from Chernihiv Region should also be considered as doubtful. Here, I present a new record of the species within Donetsk Region; one imago was recorded on the bank of small lentic seasonal waterbody at Belosarayskaya spit (Image 3A–D). This record without information on concrete locality coordinates and data of collecting was mentioned in Martynov (2010b).

Material: One imago, Ukraine, Donetsk Region, vicinity of Yalta village, Belosarayskaya spit, small lentic periodically drying waterbody, 46.920647N & 37.312413E, Martynov A.V., 7.vii.2008.

***Nehalennia speciosa* (Charpentier, 1840)**

This species is the smallest odonate among European taxa. *Nehalennia speciosa* is locally distributed within all Europe and locally extirpated in many locations previously recorded as habitats (Bernard & Wildermuth 2005; Dijkstra 2006). Known few habitats of the species in Ukraine are situated within northern, western and eastern regions mainly; in most southern locations of the country (Crimea, Odesa, and Kherson Regions) the species is considered as locally extirpated (Polischuk 1974, Gorb et al. 2000; Khrokalo & Nazarov 2008; Khrokalo & Prokopov 2009; Tytar 2009, 2019; Dyatlova & Kalkman 2008; Karolinskiy 2013; etc.). *Nehalennia speciosa* was recommended for being included to the Red Data Book of Ukraine by Khrokalo (2005).

New breeding sites of *N. speciosa* were found in Rivne Region within Rivnenskyi Nature Reserve (Image 4A–E). The species inhabits waterbodies on sphagnum bogs (marshes) in all locations, except for two places where species inhabits deep lakes (Bile Lake and Black Lake) with banks overgrown with wide dense cushions of floating sphagnum. Depth of the lakes near the floating banks is about 2–3 m. Also, species was registered at small, relatively shallow natural waterbodies (area up to 20m^2; depth – about 0.5m) on sphagnum bog and at old artificial waterbodies (area – up to 150m^2; depth – up to 1.2m) on the same kind of bog. Moreover, the biggest number of specimens was recorded at the old

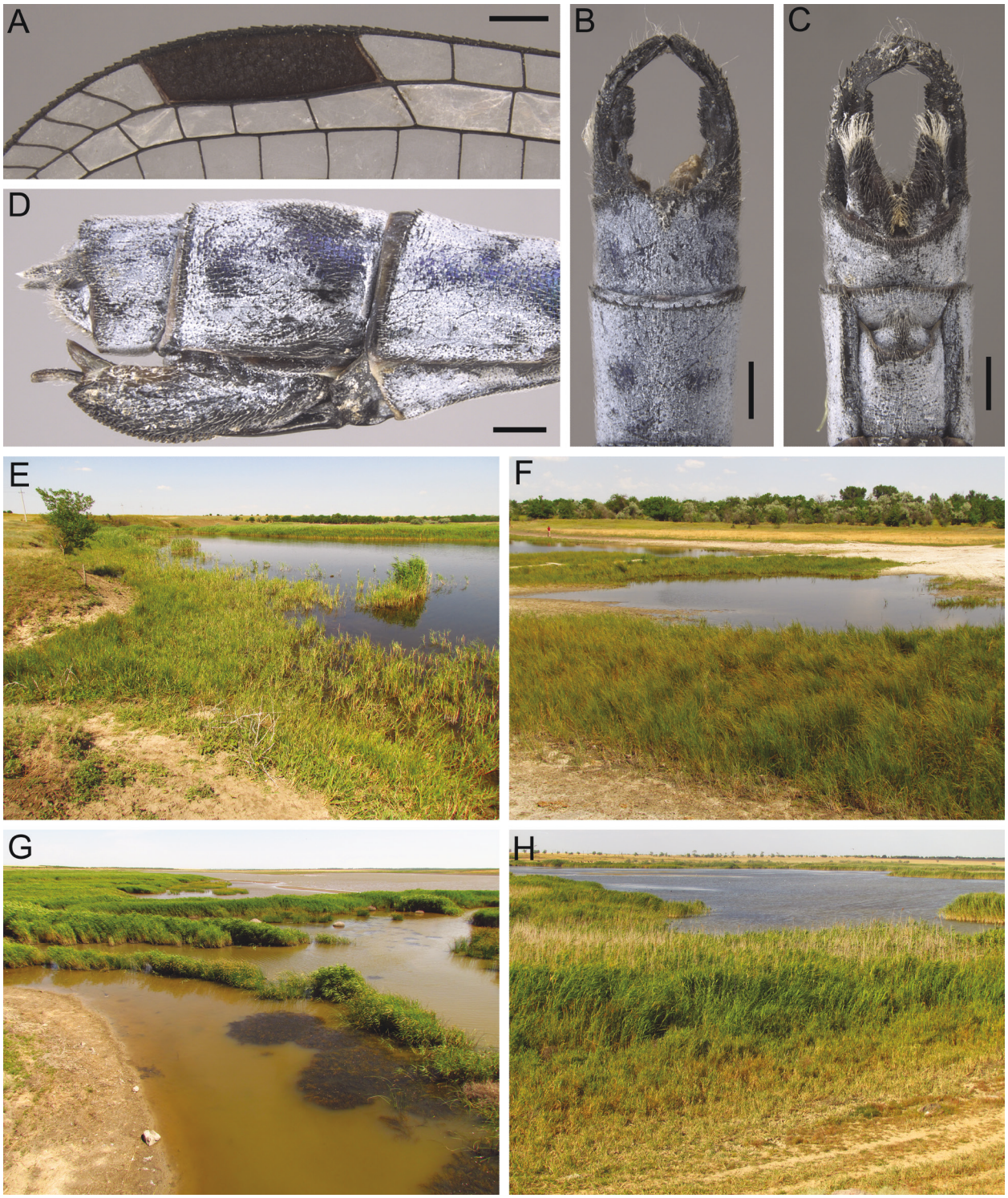

Image 2. ***Lestes macrostigma*** **(Eversmann, 1836), imago (A–D) and habitats (E–H): A—pterostigma, scale 0.5mm | B—male, apex of abdomen, dorsal view, scale 0.5mm | C—male, apex of abdomen, ventral view, scale 0.5mm | D—female, apex of abdomen, lateral view, scale 0.5mm | E, F—Tashchenak River, vicinity of Radionivka village, Zaporizhzhya Region (20.vi.2019) | G—upper part of Utlyukskyi Estuary, vicinity of Davydivka village, Zaporizhzhya Region (26.vi.2019) | H—unnamed pound near Syvash Lake, vicinity of Strohanivka village, Kherson Region (19.vii.2019). © Alexander V. Martynov.**

artificial waterbodies (up to 25–30 specimens at 10 m of a bank length); in all other points the number of specimens was much lower. It should be noted, that that due to significant age these artificial waterbodies didn't differ from the natural waterbodies in water parameters, vegetation, and appearance. Diapason of some parameters of waterbodies in collecting places was water hardness 9–16 ppm, pH 5.1–6.4.

Material and observations: 19 imagoes, Ukraine, Rivne Region, vicinity of Khmil' village, Bile Lake on sphagnum marsh, 51.479283N & 27.311233E, Martynov A.V., 3,6.vii.2017; 12 imagoes, emerging, copulation, ibid, Martynov A.V., 8.vi.2018; 8 imagoes, ibid, Martynov A.V., 12.vi.2019; five imagoes, emerging, ibid, Martynov A.V., 13.vi.2020.

Five imagoes, Ukraine, Rivne Region, vicinity of Khmil' village, Lysots'ke (Chorne) Lake on sphagnum marsh, 51.477505N & 27.306219E, Martynov A.V., 12.vi.2019; 3 imagoes, emerging, ibid, Martynov A.V., 13.vi.2020.

Several hundreds of imagoes, copulation, Ukraine, Rivne Region, vicinity of Khmil' village, artificial lentic waterbody on sphagnum marsh, near the forest road Bil's'k – Khmil', 51.492215N & 27.291293E, Martynov A.V., 4.vii.2017; about 50 imagoes, emerging, ibid, Martynov A.V., 13.vi.2020.

Eight imagoes, Ukraine, Rivne Region, vicinity of Hrabun' village, Rivne Nature Reserve, waterbodies on sphagnum marsh, 51.538117N & 27.189650E, Martynov A.V., 7.vi.2018.

***Ophiogomphus cecilia* (Fourcroy, 1785)**

Rare species included to the Red Data Book of Ukraine (2009). It is locally distributed within Zakarpattya, Ivano-Frankivsk, Lviv, Volyn, Ternopil, Odesa, Vinnytsia, Kyiv, Chernihiv, Sumy, and Kharkiv Regions (Polischuk 1974; Sheshurak & Padalko 1996; Gorb et al. 2000; Khrokalo 2000; Ridei et al. 2007; Tytar 2009; Khrokalo & Verves 2009; Kolozsvári et al. 2015; Zamoroka et al. 2017; Kuzemko 2017; Smirnov 2017, 2018; Novosad 2018; Sheshurak et al. 2018; Shulga 2019, etc.). Some

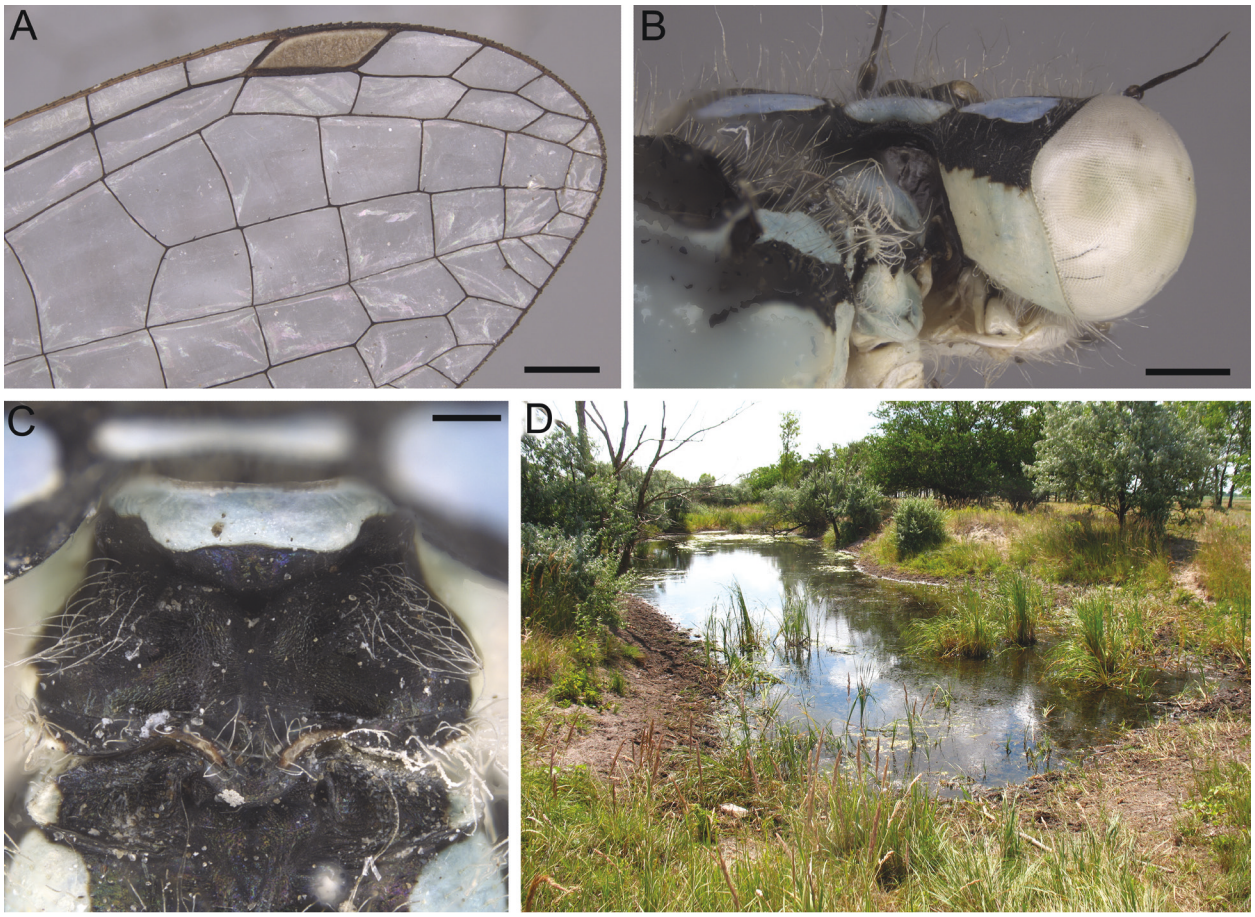

Image 3. *Coenagrion scitulum* (Rambur, 1842), female imago (A–C) and habitat (D): A—apex of wing, scale 0.5mm | B—head, back view, scale 0.5mm | C—pronotum, dorsal view, scale 0.5mm | D—small lentic periodically drying waterbody, vicinity of Yalta village, Donetsk Region (07.vii.2008). © Alexander V. Martynov.

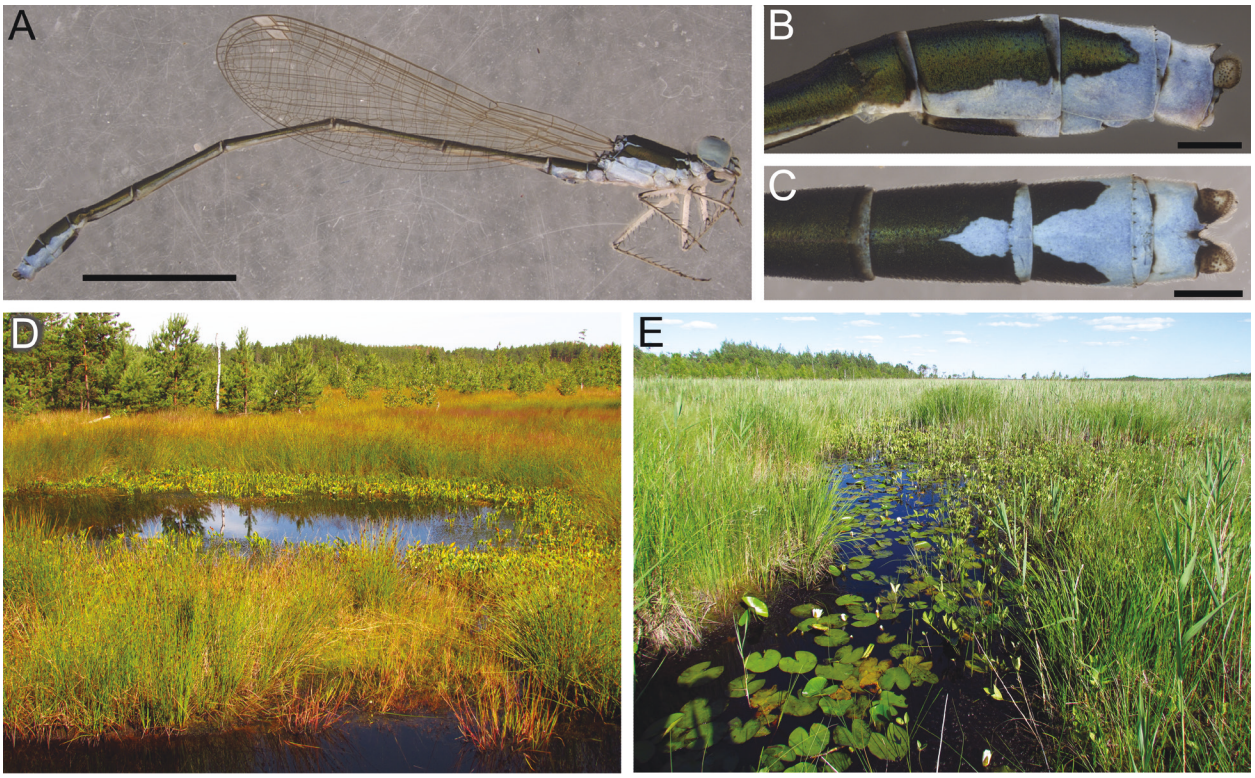

Image 4. *Nehalennia speciosa* (Charpentier, 1840), male imago (A–C) and habitats (D, E): A—total lateral view, scale 5mm | B—apex of abdomen, lateral view, scale 0.5mm | C—apex of abdomen, dorsal view, scale 0.5mm | D—artificial lentic waterbody on sphagnum marsh, vicinity of Khmil' village, Rivne Region (04.vii.2017) | E—waterbody on sphagnum marsh, vicinity of Hrabun' village, Rivne Region (07.vi.2018). © Alexander V. Martynov.

records on the species, however, are old, and need confirmation, as a result the adequate picture of species distribution within Ukraine could not be composed. All records of the species in Crimea refer to the larval stage only (Kiseleva & Vasyuta 1984), they are questionable and need confirmation (Khrokalo & Prokopov 2009).

I recorded the species in Horyn', Stvyga, Styr, and Sluch Rivers within Rivne Region, in the basin of Prypiat River (Image 5A–H). Larvae of the species were collected from bottom at microhabitats with sand in the rivers, sometimes with small stones or/and pieces of bog iron ore (in some cases bottom was just slightly silted), current velocity was about 0.2–0.3 m/s. These localities seem to be the most typical habitat for the species (Dijkstra 2006). The diapason of some parameters of waterbodies at collection sites were water hardness 43–210 ppm, pH 6.5–8.9. In my opinion, further investigations on similar rivers within northern Ukraine may reveal new habitats of *O. cecilia*.

Material and observations: One larva, Ukraine, Rivne Region, vicinity of Zbuzh village, Horyn' River, 50.990300N & 26.320683E, 154m , Martynov A.V., 07.vii.2017;

One larva, Ukraine, Rivne Region, vicinity of Poznan' village, Stvyga River, 51.591450N & 27.477868E, 139m, Martynov A.V., 05.vii.2017

One larva, Ukraine, Rivne Region, vicinity of Khmil' village, Stvyga River, 51.461417N & 27.387817E, 144m, Martynov A.V., 06.vi.2018.

One imago, Ukraine, Rivne Region, Stvyga River, between Glynne and Poznan' villages, 51.563133N & 27.428250E, 147m, Martynov A.V., 08.vi.2018; 1 imago, ibid, Martynov A.V., 12.vi.2019; 2 larvae, ibid, Martynov A.V., 15.viii.2019.

One imago, Ukraine, Rivne Region, vicinity of Poznan' village, Stvyga River, 51.60641N & 027.48431E, Martynov A.V., 12.vi.2019.

Two larvae, Ukraine, Rivne Region, vicinity of Sarny town, Sluch River, 51.317445N & 26.635826E, 148m, Martynov A.V., 02.viii.2017.

One exuvia, Ukraine, Rivne Region, vicinity of Mayunychi village, Styr River, 51.251447N & 25.946012E, Martynov A.V., 12.vi.2020.

***Lindenia tetraphylla* (Vander Linden, 1825)**

The species was recorded at Crimea in 2009. It was the first record of the species from Ukraine (Savchuk & Karolinskiy 2013). Later, *L. tetraphylla* was found

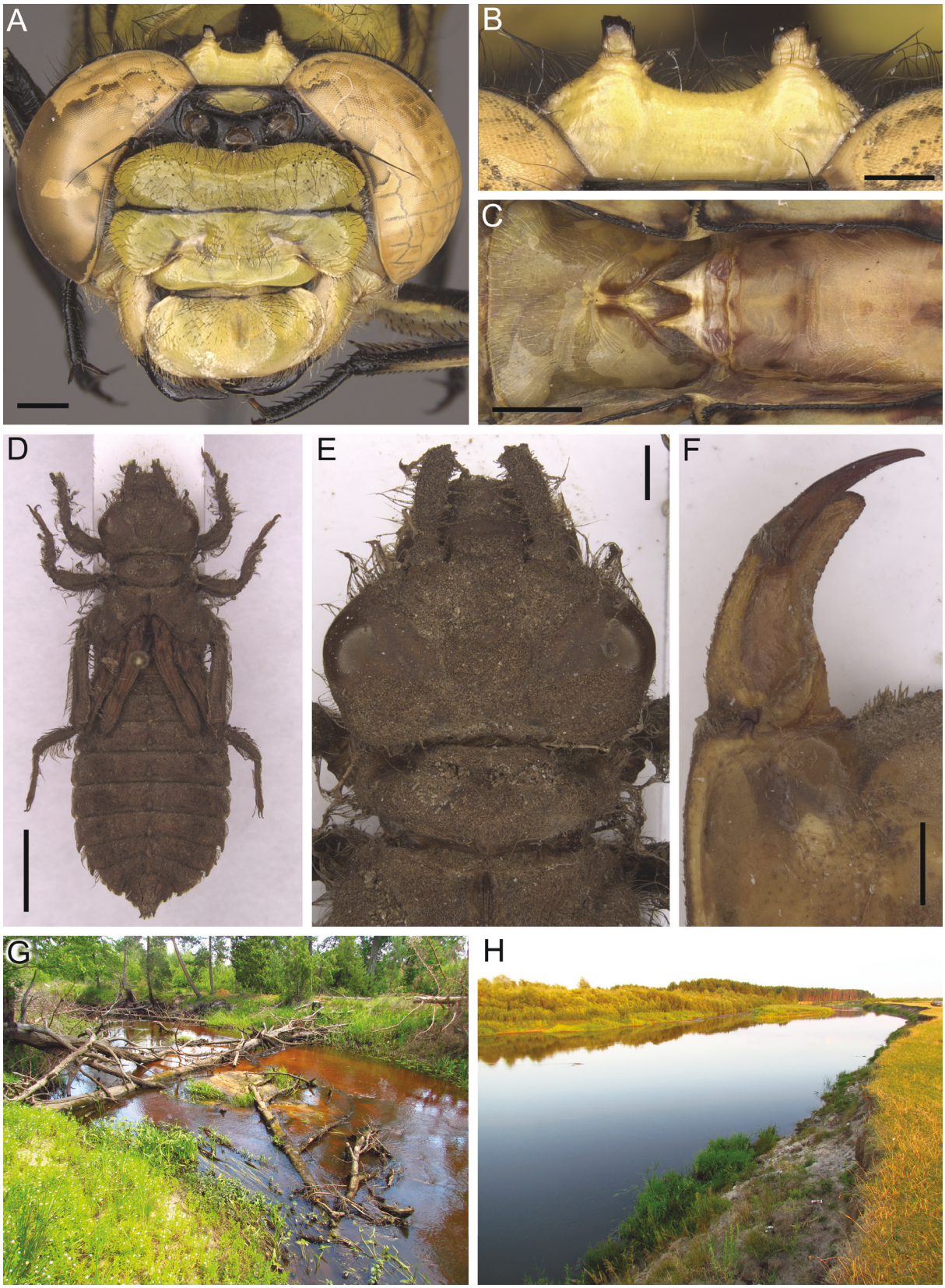

Image 5. *Ophiogomphus cecilia* (Fourcroy, 1785), female imago (A–C), larva (D–F), habitats (G, H): A—female, head, frontal view, scale 1mm | B—female, horns on head, frontal view, scale 0.5mm | C—female, valvular vulvae, scale 1mm | D—total dorsal view, scale 5mm | E—head and pronotum, dorsal view, scale 1mm | F—labial palp, dorsal view, scale 0.5mm | G—Stvyga River, between Glynne and Poznan' villages, Rivne Region (08.vi.2018) | H—Sluch River, vicinity of Sarny town, Rivne Region (02.viii.2017). © Alexander V. Martynov.

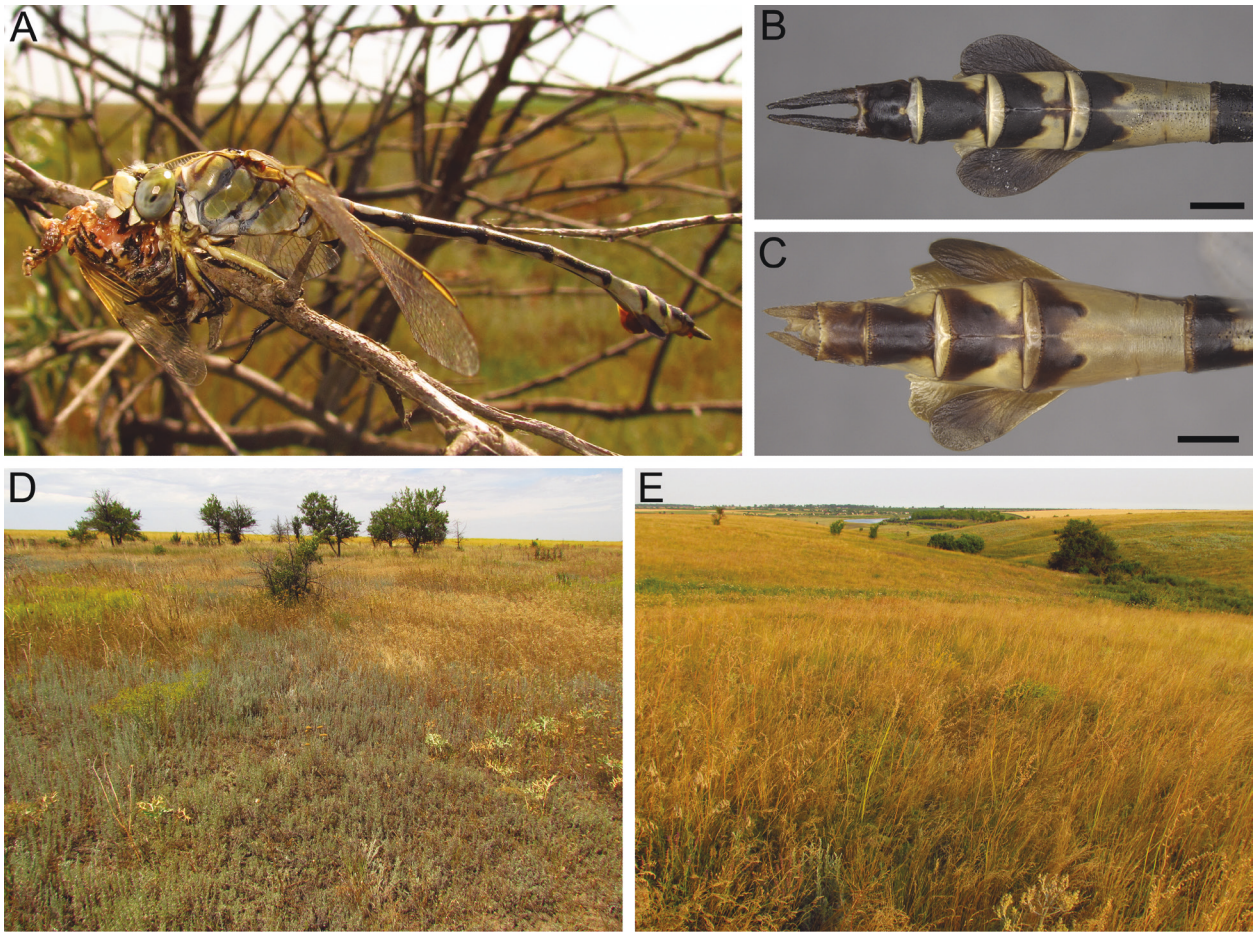

Image 6. *Lindenia tetraphylla* (Vander Linden, 1825), imago (A–C) and habitats (D, E): A—male with a prey | B—male, apex of abdomen, dorsal view, scale 2mm | C—female, apex of abdomen, dorsal view, scale 2mm | D—steppe area near upper part of Utlyukskyi Estuary, vicinity of Davydivka village, Zaporizhzhya Region (18.vi.2019) | E—steppe area near Malyi Utluk River, vicinity of Mala Ternivka village, Zaporizhzhya Region (19.vi.2019). © Alexander V. Martynov.

within Donetsk Region (Martynov 2014b). I registered imagoes of the species in a few places within southern Zaporizhzhia. Imagoes were recorded on steppe areas near Malyi Utluk River and Molochnyi Estuary, where they hunted for different insects (Image 6A–E). *Lindenia tetraphylla* was abundant in the region, up to seven specimens were registered on some areas. Larvae of the species are associated with lakes and slow-flowing rivers, therefore, the development of *L. tetraphylla* in regional waterbodies (e.g., Malyi Utluk River, Tashchenak River, Utlyukskyi Estuary) is quite possible. In my opinion the species possibly occurs in Odesa, Kherson, and Mykolaiv Regions.

Material and observations: Seven imagoes, Ukraine, Zaporizhzhya Region, vicinity of Davydivka village, steppe areas near upper part of Utlyukskyi Estuary, 46.517917N & 35.186437E and 46.506342N & 35.178574E, Martynov A.V., 18.vi.2019

Five imagoes, Ukraine, Zaporizhzhya Region, vicinity of Lymans'ke village, steppe area near Molochnyi Estuary, 46.427449N & 35.343673E, Martynov A.V., 21.vi.2019.

Four imagoes, Ukraine, Zaporizhzhya Region, vicinity of Mala Ternivka village, steppe area near Malyi Utluk River, 46.566884N & 35.197273E, Martynov A.V., 19.vi.2019.

Three imagoes, Ukraine, Zaporizhzhya Region, vicinity of Mala Ternivka village, steppe area near Malyi Utluk River, 46.583020N & 35.199763E, Martynov A.V., 24.vi.2019.

Six imagoes, Ukraine, Zaporizhzhya Region, vicinity of Shelyuhy village, steppe area near Malyi Utluk River, 46.546087N & 35.202348E, Martynov A.V., 24.vi.2019.

***Cordulegaster boltonii* (Donovan, 1807)**

The species is very rare in Ukraine and is included in

the Red Data Book of Ukraine (2009). The species was previously known from Ukraine from several records (mainly imagoes) from Chernivtsi, Ivano-Frankivsk, Kyiv Chernihiv, Sumy, Donetsk and Volyn Regions (Brauner 1910; Gorb 1991; Sheshurak & Berest 2003; Sheshurak & Parkhomenko 2005; Red Data Book 2009; Kavurka et al. 2018; Sheshurak et al. 2018; Kyselyuk et al. 2018; Viter 2018). The distribution features of *Cordulegaster* within Ukraine suggest that any record of the genus within Donetsk Region (Viter 2018), whose Odonata fauna is well investigated, is doubtful and needs confirmation by the material. It should be noted that few years ago *Cordulegaster heros* Theischinger, 1979 was recorded from Ukraine (Chernivtsi Region) for the first time (Bernard & Daraż 2015). Furthermore, the correctness of Brauner's (1910) identification is doubtful, but can't be checked because the material was lost; the morphological proximity of *C. heros* and *C. boltonii* could cause misidentifications, especially considering the fact that *C. heros* was still undescribed in the early 20th century (Bernard & Daraż 2015). The record of *C. boltonii* from Ivano-Frankivsk Region given by Kyselyuk et al. (2018) is considered doubtful because of the similarity of two species mentioned above and available data on distribution of species within Ukraine. Unfortunately, the specimen mentioned in the article is absent in the collection of the authors (Slobodyan O.M., pers. comm. 2020). According to Gorb (1991), only known records of *C. boltonii* larvae from the territory of Ukraine (Tal' River, Kyiv Region) (Trylis 1988) are unreliable because the material was lost. The investigations carried out at Tal' River in the vicinity of Rudnya-Shpylivs'ka village in January 2020 did not reveal any larvae of *Cordulegaster*; further investigations of the river will be continued.

I recorded larvae of *C. boltonii* in Mohylivka River within Zhytomyr Region (Image 7A–G). This is the first confirmed record of the species' larvae within country. Investigated section of the river had riparian vegetation, and was shallow (depth up to 0.5m, but mainly about 0.2m), with numerous small bays; with current velocity up to 0.2–0.3 m/s, but mainly with standing water; sandy bottom was covered with detritus, leaf litter and branches; the bottom was presented with only sand in some sections of the main stream. Larvae were collected in bays, from a thick layer of detritus. The additional parameters of waterbodies in collecting places measured during the sampling were—water temperature 16°C, water hardness 47ppm, pH 8.5.

Material and observations: Three larvae, Ukraine, Zhytomyr Region, vicinity of Verbivka village, Mohylivka River, 50.706248N & 27.591347E, Martynov A.V., 21.ix.2018.

***Somatochlora arctica* (Zetterstedt, 1840)**

This species is very rare within Ukraine. For a long time, it was known only by almost 100-year old records from Zhytomyr Region (Gorb et al. 2000). Only in 2006 and 2007 this species was recorded within Poliskyi and Rivnenskyi Nature Reserves (Zhytomyr and Rivne Regions) (Khrokalo & Nazarov 2008; Martynov & Martynov 2009). *Somatochlora arctica* was known by a few imagoes only from both reserves, but the development of the species at the swamps of the protected areas is doubtless. Previously, the species was recorded from two sites within Rivnenskyi Nature Reserve in Bil's'k forestry in 2006 (Martynov & Martynov 2009) 51.491731N & 27.243597E and 51.477513N & 27.249568E (approximate coordinates). During further fieldworks within this reserve, I have got new records of the species from Bil's'k, Pivnichne, and Biloozers'ke forestries (Image 8A–E).

Material and observations: Two imagoes, Ukraine, Rivne Region, vicinity of Bil's'k village, small lake in the forest on the margin of *Sphagnum* bog, 51.493833N & 27.255117E, Martynov A.V., 23.v.2017.

Two imagoes, Ukraine, Rivne Region, vicinity of Bil's'k village, artificial lentic waterbodies (ditches) along forest road Bil's'k – Khmil', 51.472883N & 27.265267E and 51.484933N & 27.278117E, Martynov A.V., 23.v.2017.

Two imagoes, Ukraine, Rivne Region, vicinity of Khmil' village, Bile Lake on *Sphagnum* marsh, 51.479283N & 27.311233E, Martynov A.V., 23.v.2017.

One imago, Ukraine, Rivne Region, vicinity of Perebrody village, glade near drainage channel, 51.689947N & 27.086134E, Martynov A.V., 26.v.2017.

One imago, Ukraine, Rivne Region, vicinity of Rudka village, black-eared swamp, tributary of Berezyna River, 51.486267N & 25.709517E, Martynov A.V., 02.viii.2017.

For now, Rivnenskyi Nature Reserve is the territory with the highest number of records of *S. arctica* within Ukraine. The main reason of species' rarity and local distribution within Ukraine is the disappearance of waterbodies suitable for species' development, namely sphagnum and sphagnum-sedge bogs. The disappearance of these bogs is caused by—(i) ameliorative measures; (ii) decrease in the annual rainfall in Polissia, which leads to the drying up of bogs; and (iii) large volumes of illegal amber production in the region, which leads to the complete destruction of the necessary microhabitats and/or waterbodies suitable for the development of *S. arctica*. Therefore, I think that this species should be considered for inclusion in the

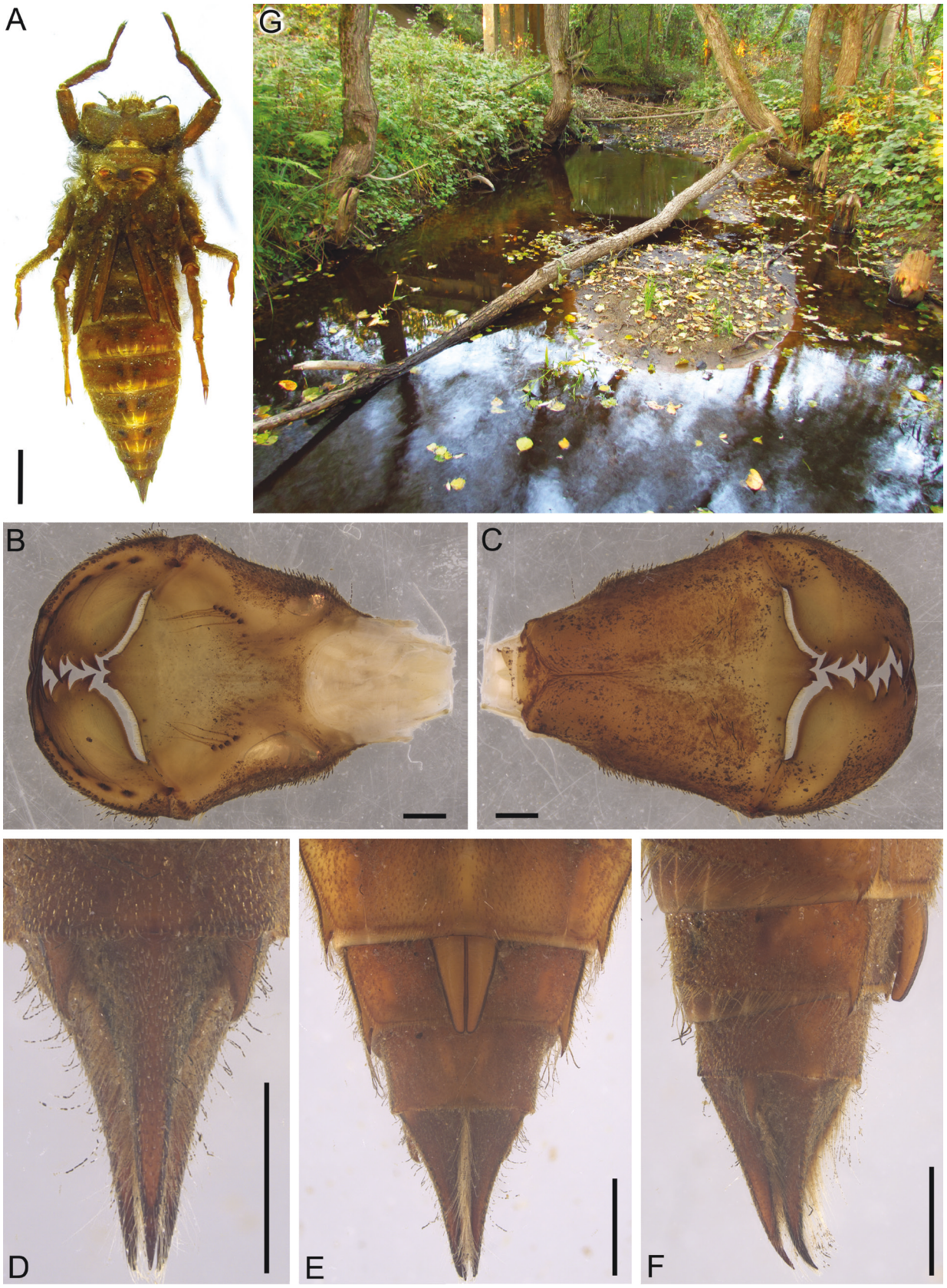

Image 7. *Cordulegaster boltonii* (Donovan, 1807), larva (A–F) and habitat (G): A—total dorsal view, scale 5mm | B—mask, dorsal view, scale 1mm | C—mask, ventral view, scale 1 mm | D—apex of abdomen, dorsal view, scale 2mm | E—the same, ventral view, scale 2mm | F—the same, lateral view, scale 2mm | G—Mohylivka River, vicinity of Verbivka village, Zhytomyr Region (21.09.2018). © Alexander V. Martynov.

Image 8. ***Somatochlora arctica*** **(Zetterstedt, 1840), male imago (A, B) and habitat (C–E): A—anal appendages, dorsal view, scale 0.5mm | B—the same, lateral view, scale 0.5mm | C—ditches along forest road, vicinity of Bil's'k village, Rivne Region | D—Bile Lake, vicinity of Khmil' village, Rivne Region (03.vii.2017) | E—black-eared swamp, vicinity of Rudka village, Rivne Region (02.viii.2017). © Alexander V. Martynov.**

next edition of the Red Data Book of Ukraine.

Leucorrhinia albifrons **(Burmeister, 1839)**

Species is included in the Red Data Book of Ukraine (2009), known from Zhytomyr, Volyn, and Kyiv Regions, and Crimea in Ukraine (Gorb et al. 2000; Matushkina 2006; Khrokalo & Nazarov 2008; Khrokalo 2016; Honchar et al. 2019). Doubtful records of *L. albifrons* are not mentioned here (e.g. larvae of the species from Odesa Region and Dnieper–Bug Estuary).

I had found imagoes (one of the records is a copulated pair) of the species at Bile Lake on sphagnum bog in vicinity of Rivnenskyi Nature Reserve (Image 9A–D). Most likely, the larvae of *L. albifrons* had been developing here. The detailed description of the lake is given above. The species was not registered at any other neighboring waterbody.

Material and observations: Two imagoes, copulation, Ukraine, Rivne Region, vicinity of Khmil' village, Bile Lake on sphagnum marsh, 51.479283N & 27.311233E, Martynov A.V., 03.vii.2017; 1 imago, ibid, Martynov A.V., 12.vi.2019; 5 imagoes, ibid, Martynov A.V., 13.vi.2020.

Thus, a lot of rare and/or red-listed in Ukraine Odonata species are registered at Bile Lake and neighboring Black Lake (e.g. *N. speciosa*, *A. imperator*, *S. arctica* and *L. albifrons*), therefore, these lakes are recommended to be included to the territory of Bil's'ke forestry of Rivnenskyi Nature Reserve.

Leucorrhinia caudalis **Charpentier, 1840**

This is a rare species within Ukraine, known mainly from northern and western Ukraine. Only solitary records from some other southern regions are known

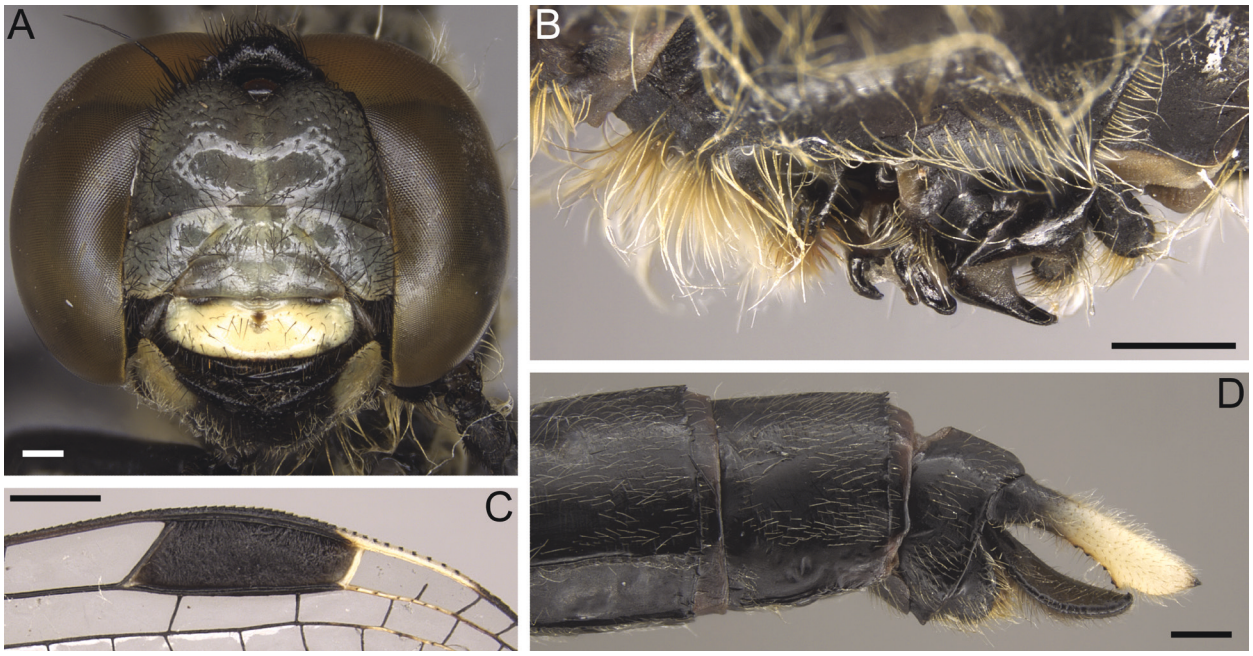

Image 9. ***Leucorrhinia albifrons*** **(Burmeister, 1839), male imago: A—head, frontal view, scale 0.5mm | B—secondary genitalia, lateral view, scale 0.5mm | C—pterostigma, scale 1mm | D—apex of abdomen, lateral view, scale 0.5mm. © Alexander V. Martynov.**

(Khrokalo & Matushkina 1999; Gorb et al. 2000; Sheshurak & Padalko 1996; Sheshurak & Khrokalo 2004; Khrokalo & Nazarov 2008; Khrokalo 2016; Raldugina 2019). Most southern records (e.g., Polischuk 1974) are doubtful, and this species had not been registered within southwestern Ukraine during the detailed investigation of Odonata carried out at the beginning of XXI century (Dyatlova 2006).

I had found one imago of the species within Rivnenskyi Nature Reserve on glade with seasonal lentic waterbody (Image 10A–F). Also, a large pound, drainage channel and bogs were located close to the collecting place.

Material: 1 imago, Ukraine, Rivne Region, vicinity of Perebrody village, near periodically drying up lentic waterbody, 51.690204N & 27.085416E, 141m, Martynov A.V., 11.vi.2019.

Selysiothemis nigra **(Vander Linden, 1825)**

In Ukraine, the species was registered for the first time in 2002 in Mykolaiv Region near Black Sea coast (Chirnine Lake) (Tytar 2007). Further, the species was recorded in Crimea, Kherson and Donetsk Regions (Matushkina 2007; Khrokalo et al. 2009; Savchuk & Karolinskiy 2013; Martynov et al. 2015).

I had recorded imagoes of *S. nigra* at few steppe areas near Malyi Utluk River and Molochnyi Estuary (Zaporizhzhia Region) (Image 10G–K). In some places I recorded up to eight specimens on 300m of a route. As in case of *L. tetraphylla*, larvae of *S. nigra* are perspective to be found in Malyi Utluk River, Tashchenak River, and Utlyukskyi Estuary. Also one male imago was registered at steppe area near Syvash Lake in Kherson Region.

In my opinion, the distribution of species in Ukraine is now wider and the places of development are denser than was previously known; distribution of *S. nigra* in Ukraine probably covers all coastal areas of Black and Azov Seas in Odesa, Mykolaiv, Kherson, Zaporizhzhia and Donetsk Regions, and Crimea.

Material and observations: Two imagoes, Ukraine, Zaporizhzhya Region, Yakymivka District, vicinity of Davydivka village, steppe areas near upper part of Utlyukskyi Estuary, 46.517917N & 35.186437E and 46.506342N & 35.178574E, Martynov A.V., 18.vi.2019.

One imago, Ukraine, Zaporizhzhya Region, Yakymivka District, vicinity of Lymans'ke village, steppe area near Molochnyi Estuary, 46.427449N & 35.343673E, Martynov A.V. 18.vi.2019.

Seven imagoes, Ukraine, Zaporizhzhya Region, Yakymivka District, vicinity of Mala Ternivka village, steppe area near Malyi Utluk River, 46.566884N & 35.197273E, Martynov A.V., 19.vi.2019.

One imago, Ukraine, Kherson Region, vicinity of Novomykolaivka village, steppe area near Syvash Lake, 46.204655N & 33.978565E, Martynov A.V., 13.vii.2020.

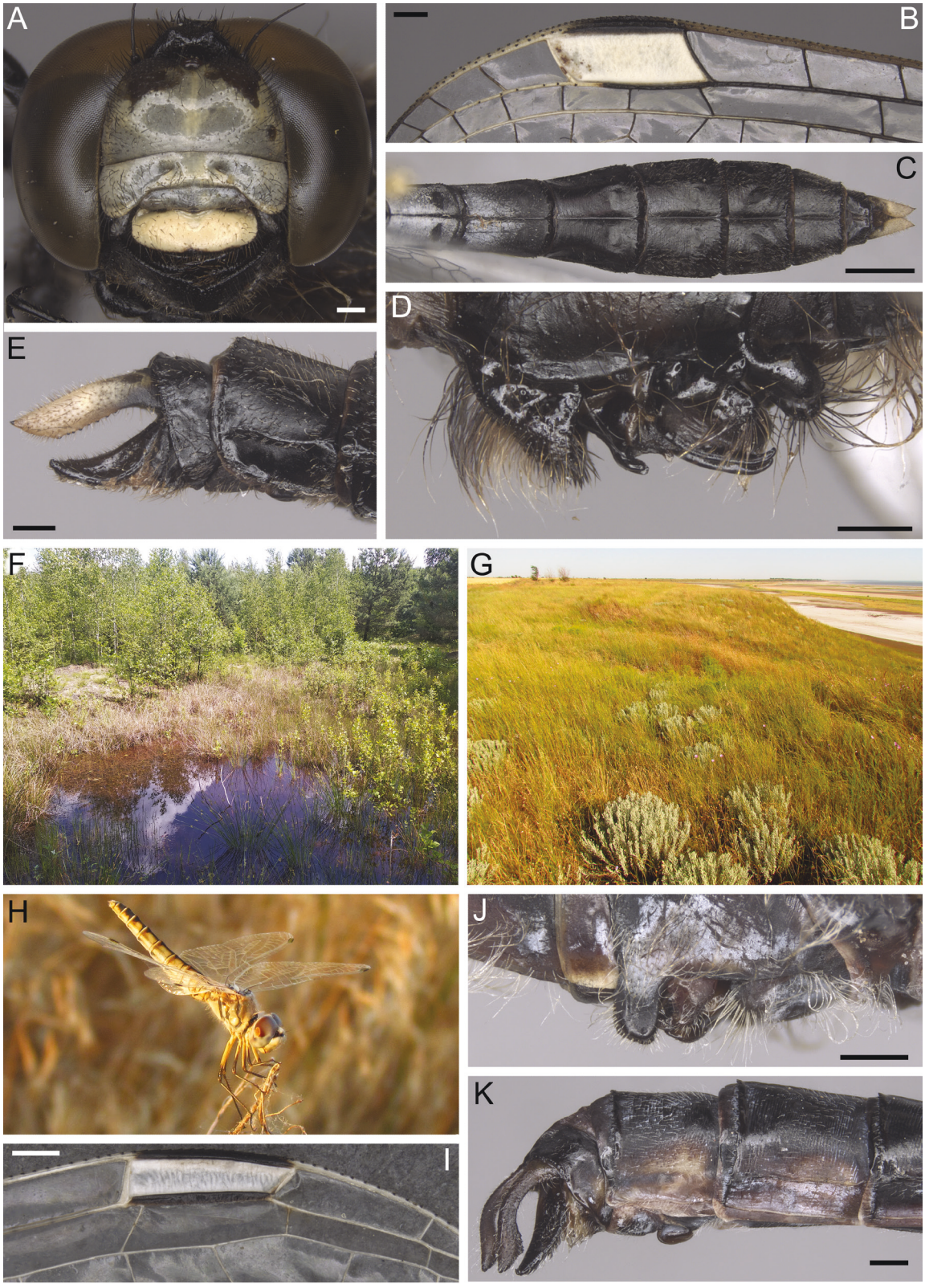

Image 10. *Leucorrhinia caudalis* Charpentier, 1840 (A–E) and *Selysiothemis nigra* (Vander Linden, 1825) (F–K), imagoes (A–E, H–K) and habitats (F, G): A—male, head, frontal view, scale 0.5mm | B—pterostigma, scale 0.5mm | C—male, abdomen, dorsal view, scale 2mm | D—male, apex of abdomen, lateral view, scale 0.5mm | E—male, secondary genitalia, lateral view, scale 0.5mm | F—periodically drying up lentic waterbody, vicinity of Perebrody village, Rivne Region (11.vi.2019) | G—steppe area near Molochnyi Estuary, vicinity of Lymans'ke village, Zaporizhzhya Region (18.vi.2019) | H—female on grass | I—pterostigma, scale 0.5mm | J—male, secondary genitalia, lateral view, scale 0.5mm | K—male, apex of abdomen, lateral view, scale 0.5mm. © Alexander V. Martynov.

Thus, the information presented in the paper shows which waterbodies of Ukraine supplement the list of habitats important for conservation of rare European Odonata species. The received data can be used for planning new protected areas, and most importantly this article shows that dragonflies and damselflies remain understudied within Ukraine.

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