

## International Dragonfly Fund - Report



## Journal of the International Dragonfly Fund

1-38

**Vladimir E. Skvortsov & Natalya Yu. Snegovaya**

A second addition to the Odonata fauna of Azerbaijan

*Published 13.10.2015*

# 87

ISSN 1435-3393

The International Dragonfly Fund (IDF) is a scientific society founded in 1996 for the improvement of odonatological knowledge and the protection of species.

Internet: <http://www.dragonflyfund.org/>

This series intends to publish studies promoted by IDF and to facilitate cost-efficient and rapid dissemination of odonatological data..

Editorial Work: Martin Schorr, Milen Marinov and Bernd Kunz  
Layout: Martin Schorr  
IDF-home page: Holger Hunger  
Indexed: Zoological Record, Thomson Reuters, UK  
Printing: Colour Connection GmbH, Frankfurt  
Impressum: Publisher: International Dragonfly Fund e.V., Schulstr. 7B,  
54314 Zerf, Germany. E-mail: oestlap@online.de  
Responsible editor: Martin Schorr

Cover picture: ***Libellago lineata***

Photographer: Adolfo Cordero-Rivera

## A second addition to the Odonata fauna of Azerbaijan

Vladimir E. Skvortsov<sup>1</sup>  
Natalya Yu. Snegovaya<sup>2</sup>

<sup>1</sup> Evolution Department, Faculty of Biology, M.V. Lomonosov  
Moscow State University, Moscow, 119992, GSP-1, Russia.  
E-mail: west-urnus@yandex.ru

<sup>2</sup> Zoological Institute NAS of Azerbaijan, proezd 1128, kvartal 504,  
Baku, AZ 1073, Azerbaijan.  
E-mail: snegovaya@yahoo.com

### Abstract

The article contains new faunistic data on 53 Odonata species based on material collected by the authors in Azerbaijan between 2013–2014 and added by revising an old collection made by A.V. Bogachev in the 1930–1940s. Of these, 13 species are new for the country: *Lestes dryas*, *L. sponsa*, *L. virens*, *Coenagrion hastulatum*, *C. lunulatum*, *C. ornatum*, *C. pulchellum*, *Aeshna affinis*, *Brachytron pratense*, *Cordulegaster picta*, *Somatochlora flavomaculata*, *Sympetrum flaveolum*, *S. vulgatum*. The new locality of *Cordulegaster picta* is the easternmost for the species. Two new populations of a very rare species *Cordulegaster vanbrinkae* (discovered in the country in 2011) are found. *Somatochlora flavomaculata* and *Brachytron pratense* are generally very rare in the entire Caucasus. *Pantala flavescens* has been re-discovered in the country 100 years after the first record. A large population of *Caliaeschna microstigma*, a species very rare in Azerbaijan, has been found in the northern part of the country; it represents a peculiar dark morph whose features are described in detail. Particularly discussed are the variability of *Coenagrion puella*-complex in Azerbaijan and diagnostic features of two other *Coenagrion* species closely related to each other, *C. ornatum* and *C. vanbrinkae*.

**Key words:** Odonata, fauna, new records, Azerbaijan, *Caliaeschna microstigma*, *Cordulegaster vanbrinkae*, *Coenagrion puella*-complex, *Coenagrion ornatum*, *Coenagrion vanbrinkae*

### Introduction

The history of odonotological studies in Azerbaijan is more than century-long, but most of the data are scattered in literature devoted to neighbouring regions or larger territories such as the Caucasus in general, or even the Palaearctic. A significant number of records were provided by Bartenev (1910; 1911; 1912a, b), who was the first one to publish from this territory some rare and interesting species, which were

rediscovered here only in the 21st century (see e.g. *Pantala flavescens* and *Selysia-themis nigra* in the current paper).

Two detailed but strictly local studies were published in the 1930s: a paper by Bogachev (1937) describing the odonatofauna of Kakh (Gakh) District, Central Azerbaijan, and an inventory of the dragonfly fauna of Nakhichevan Republic (an autonomous district south of the main territory of Azerbaijan) written by Akramovsky (1939), yet based mostly on a collection made earlier by D.V. Znoiko. A series of further publications by Akramovsky (1948; 1958, and some others) dealt with the territory of Armenia, though these include some data concerning Azerbaijan as well. Bogachev (1951) wrote a short review of Azeri Odonata; however it was only a part of a popular book on the wildlife of Azerbaijan and contained no special faunistic data.

Prof. A.G. Kasymov, a freshwater hydrobiologist, published two monographs on the invertebrate hydrofauna of the Lower Kura and the whole Soviet Caucasus (1965 and 1972, respectively). Both include Odonata sections with faunistic records based exclusively on larval material. Unfortunately, there are no available collections related to his study, and no references in the books themselves concerning the examined material on Odonata larvae or the places where it was deposited. It is not possible therefore to check any data provided by Kasymov, while these contain a number of doubtful records, such as *Cordulegaster boltonii* (Donovan, 1807) or *Erythromma najas* (Hansemann, 1823). Another example is seven (!) records of *Coenagrion mercuriale* (Charpentier, 1840) from different parts of Azerbaijan versus only three localities of the very common *C. puella* (Linnaeus 1758). Hence, in our research we generally hold that, given the lack of appropriate material, the old larval records are not sufficient to confirm the presence of any certain dragonfly species in the country.

In the new century, Dumont (2004) was the only author who had published a paper dedicated to Azeri dragonfly fauna before our study began. He mentioned 32 species, with some taxa new for Azerbaijan or rare in the Eastern Transcaucasia.

The authors of the current paper met in 2012 and decided to refresh odonotological research in Azerbaijan on the ground of regular and long-term field work. Our first report (Skvortsov & Segovaya 2014) mentioned 35 species six of which were new for the country, while the overall checklist of recently found species (including those found by Dumont) increased to 48. The current paper represents the results of two next field seasons we spent working in the country.

## **Material and methods**

Our records are mainly based on original material collected in the field and identified in hand or in laboratory when a great magnification was necessary. All specimens cited in the article are now kept in the Laboratory of Arachnology of the Zoological Institute NAS of Azerbaijan. So far, we have been entirely focused on imaginal

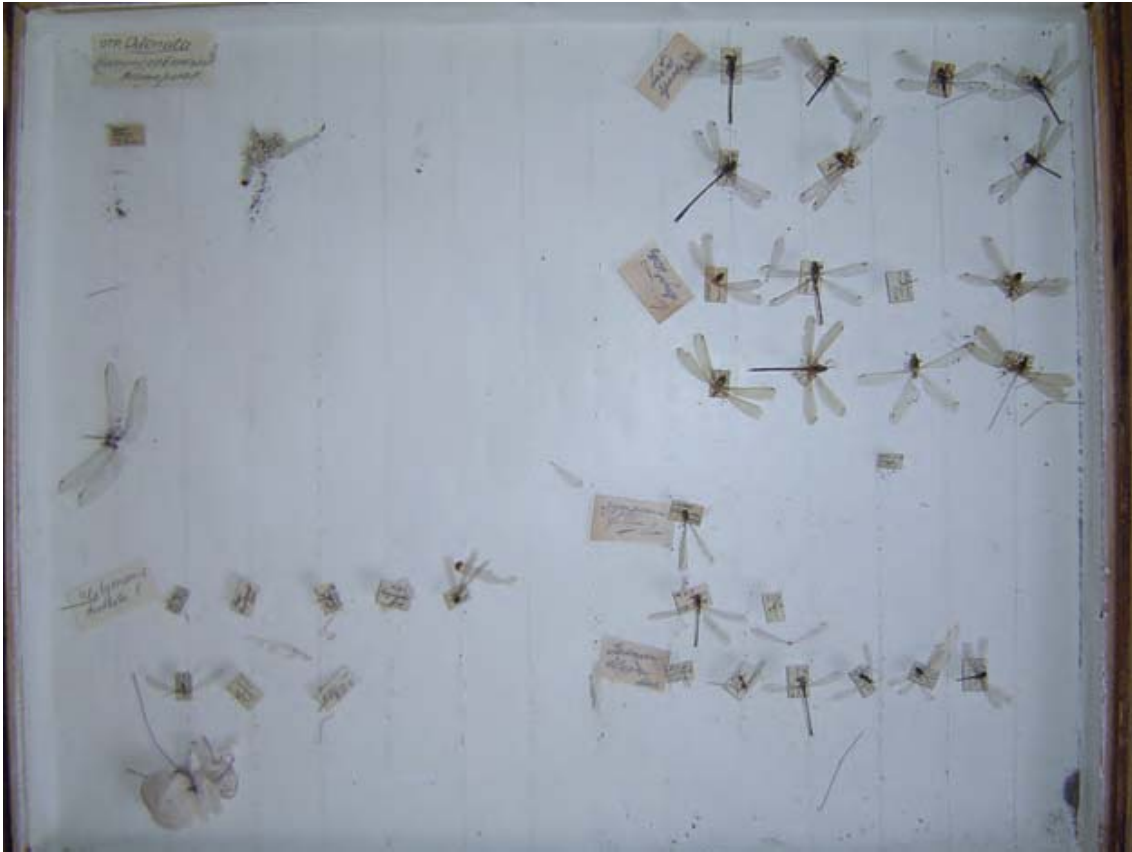


Figure 1. Examples from the Odonata collection of A.V. Bogachev. (Natalya Snegivaya (NS))

material, and the few larvae or exuvia that we collected occasionally during our trips make no substantial addition to the whole body of faunistic data.

Sometimes (rather rarely) we used visual identification without catching the insects (with the naked eye or using binoculars). Some specimens were collected by our colleagues from the Zoological Institute. A few species were identified by photographs provided by different people who worked or travelled in Azerbaijan; only doubtless cases are listed in the paper.

In addition to the fieldwork, we went on searching any possible older data on dragonflies in the country. The most interesting output was the discovery of an almost 70-years old Odonata collection made and identified in the 1930–1940s by A.V. Bogachev (Figure 1). The collection has been abandoned for at least some decades and is in extremely poor condition now, so most specimens would go to pieces at a single touch. The labeling is practically in disorder, too, because only few specimens have labels attached to the pins; in most cases the labels have simply been pinned nearby, and there is no certainty of how accurately they now match the specimens. We have taken photographs of the whole collection – best to our abilities – and checked the identification for all the interesting or doubtful specimens. Unfortunately,

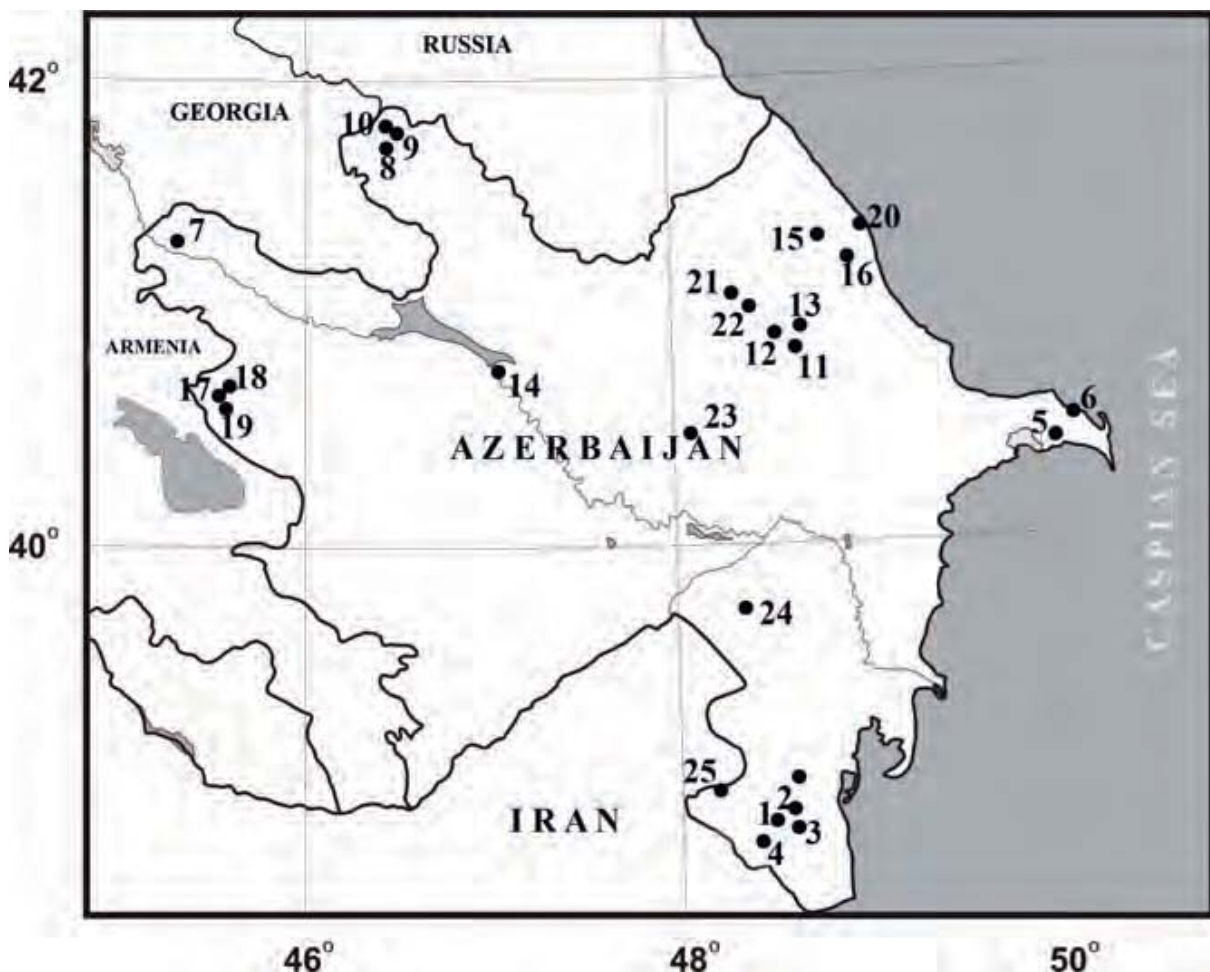


Figure 2. Map of localities.



**Figure 3.** A minor stream near Azfilial settlement (Lenkoran District) where Azerbaijan's largest population of *Cordulegaster vanbrinkae* was discovered. (Vladimir Skvortsov (VS))



**Figure 4.** A complex landscape along an irrigation canal between Azfilial settlement and Parakend village. (NS)



**Figure 5.** A large piece of hilly grassland near Azfilial settlement where *Pantala flavescens* occurred in mass. (VS)

the most intriguing names turned out to be something different, e.g. *Coenagrion armatum* (Charpentier, 1840) from Demirchi, Shemakha, 8-vii-1937, is *C. pulchellum* (Vander Linden, 1825) in reality. All the material on *Lestes* needed a full revision, which revealed numerous mistakes in identification or labeling. A major part of collection represents rather common species, yet there are some that we have not seen or collected in nature so far and whose current status in Azerbaijan is unknown. As it is obvious that the collection will not last long, we decided to publish all the reliable (or revised) data from it in this paper.

A further study into the most complicated taxonomical groups (e.g. *Coenagrion puella* species complex) involved multiple series of SEM images to reveal the structure of the most important diagnostic features such as male anal appendages. Some of the images are included in the article and will be discussed below.

### Localities (see Figures 2-22)

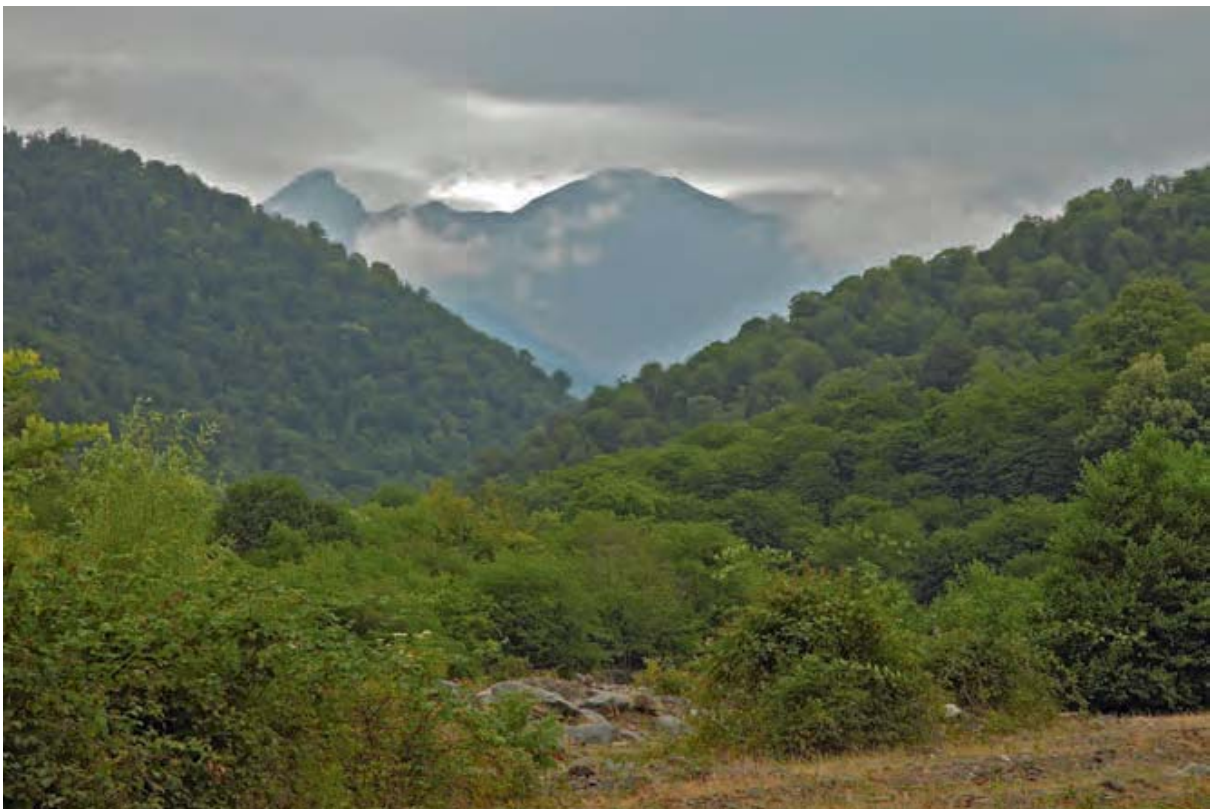
The list does not include localities from the old Bogachev's collection described above because they are much less exact than ours; the labels are cited directly in the main text.

Sampling was made by the authors if other is not specified.

- (1) Environs of Azfilial settlement (N38°40'56.5"; E48°46'58.5"; 51m a.s.l.) (Figures 3-5).
  - (1a) A group of small stagnant water bodies with dense reed belts; their water surface is only clear in spring then fully covered with water ferns (*Azolla filiculoides*).
  - (1b) An irrigation canal with dense water vegetation.
  - (1c) A small slowly-flowing rivulet in the forest with brambles and elder thickets on its banks.
  - (1d) A meadow near settlement with no open waters.
- (2) Environs Lenkoran, environs of Dashtatyuk (Daştatük) village (N38°40'33.24"; E48°045'38.94"; 95m a.s.l.). A small lake stretched along the forest margin; its banks are all covered with reeds and brambles outside the reeds, while the water surface gets totally overgrown with *A. filiculoides* every summer.
- (3) Parakend village (N38°39'22.8"; E48°47'28.1"; 50m a.s.l.). A series of glades following the forest margin, near an irrigation canal. There is also a small rivulet running along the forest margin, however, it gets completely dry in summer.
- (4) Gosmalyan settlement (N38°39'30.00"; E48°22'56.00"; 1540m a.s.l.). An open upland with small streams and a low-grass vegetation which is dense along the streams and rather sparse on the dry slopes. There are single small clumps of shrubs in some places.
- (5) Absheron Peninsula, between the settlements Surakhany and Gara-Chukhur (N40°24'07.70"; E50°00'05.66"; 60m a.s.l.), a shallow lake with reeds and tamarisk bushes on its banks.
- (6) Buzovna settlement (N40°31'15.63"; E50°08'26.90"; 29m a.s.l.) near the Caspian shore. A coastal place overgrown with reeds.



- (7) Agstafa, environs of Poylu village (N41°15'6.39"; E45°24'59.09"; 214m a.s.l.). A patch of riparian woodland with a small slow-flowing river and reeds on its banks.
- (8) Environs of Dzhidzhikhana (Cicixana) (N41°40'33.9"; E46°29'34.8"; 316m a.s.l.). A low-mountain forested area along a small fast-running river with a number of tributaries and some shallow puddle-like standing waterbodies. The riverbanks are covered with low herbs while the nearby area is overgrown with tall grasses and brambles (see Figure 23).
- (9) A pond near Tsalban village (N41°43'31.74"; E46°27'20.94"; 495m a.s.l.). A small standing water body with grassy banks.
- (10) Siltik, a place in Zagatala State Nature Reserve (N41°46'26.99"; E46°28'19.25"; 695m a.s.l.). Broadleaf mountain forest with some glades along the dirt road. (Figure 6).



**Figure 6. Siltik: Zagatala nature Reserve (Balaken District) close to Georgian and Russian boundaries. (VS)**

- (11) Shemakha, Chukhuryurd (Çuxurürd) village (N40°43'13.9"; E48°38' 2.041"; 1119m a.s.l.). A natural pond with open banks and a stream flowing into the lake, with tall grass stands in some places. ) [Figure 7]
- (12) Pirguli (Pirqulu) (N40°46'14.3"; E48°36'21.6"; 1317m a.s.l.) near Shemakha Astrophysical Observatory. A mosaic of small stands of forests and glades in a hilly landscape. (Figure 8).
- (13) Shakhdag National Park, (N40°47'08.7"; E48°36'39.1"; 1253m a.s.l.) near a ford across the Pirsaat River. Small and shallow natural ponds with some reeds around them. (Figures 9 & 10)



**Figure 7. Chukhuryurd: A natural pond at Chukhuryurd village (Shemakha District). A large population of *Coenagrion scitulum* inhabits the pond and the bogged valley of a small river that feeds it. (NS)**



**Figure 8. Pirguli: A semi-open mountain landscape around Shemakha astrophysical observatory. (VS)**

(14) Mingechaur (Mingəçevir), the field base of the Zoological Institute NAS of Azerbaijan (N40°46'37.85"; E47°01'54.32"; 36m a.s.l.). A group of nursery ponds with clumps of trees between them.



**Figure 9. The valley of the Pirsaat River, Shemakha District. (VS)**

**Figure 10. A chain of shallow natural ponds and bogs along the watercourse of the Pirsaat River. (VS)**

- (15) Shabran, Gandov (Gəndov) village (N41°15'14.51" E48°54'12.03" 64m a.s.l.), leg. Ilkhama Kerimova. A treeless agricultural area irrigated from the nearby-flowing Samur-Divichnsky canal.
- (16) Siyazan (Siyəzən) Saadan village (N41°03'33.68"; E49°01'54.05"; 613m a.s.l.). A thin mixed broadleaf forest with open places inside it and shrubs thickets along its margins. A very dry area, all surface waters disappearing by mid-June, while the ground waters have sunk because of oil wells drilled downhill. (Figure 11).



**Figure 11. Saadan: A mountain landscape (ca. 600m a.s.l.) with granite outcrops near Saadam Settlement, Siyazan District. The local climate is rather humid, however open waters are very rare here due do numerous oil wells. (Ilkhama Kerimova)**



**Figure 12. Lake Bashkendgel (1800 m a.s.l.), Kedabek District, near Armenian boundary. (NS)**



**Figure 13. Grassy wetlands on the northern shore of Bashkendgel Lake, a habitat of more than 15 dragonfly species, including a very numerous population of *Sympetrum flaveolum*, which is rather rare in the country. (VS)**

- (17) Kedabek (Qəddəbəy), Lake Bashkendgel (N40°37'38"; E45°32'40"; 1400m a.s.l.), 8 km south of Novosaratovka settlement. A medium-size mountain lake with tall grass stands along the water line. On its northern bank there is a group of small shallow water bodies overgrown with cattails in many places. (Figure 12 & 13).
- (18) A small river (referred to as the Findiglichay by local people) starting from the lake Bashkendgel and flowing a long way close to the road connecting the lake with Novosaratovka settlement (N40°37'15"; E45°33'02"; 1350m a.s.l.). The valley is mostly narrow, steep and open but there are also some wider and flat places with tree clumps, grassy bogs and backwaters. (Figures 14 & 15).
- (19) Environs of Novoivanovka village (N40°33'33"; E45°30'49"; 1500m a.s.l.), along a small river. Open grassy or boggy places on both banks of the river (Figures 16 - 18).
- (20) Divichi firth (Ağ-Zibir lake), 12 km NE of Shabran (N41°15'45.44"; E49°05'06.87"; -29 m a.s.l.). An old sea inlet now separated from the sea by a narrow stripe of land and a belt of dunes. The lake banks are all covered with reeds and large stands of cattails. (Figure 19).



**Figure 14. The valley of the Findiglichay River, Kedabek District. (VS)**



**Figure 15. The upper reaches of the Findiglichay River. (VS)**



**Figure 16. A small unnamed river near Novoivanovka settlement, Kedabek District. (VS)**



**Figure 17. A mountain landscape west of Novoivanovka settlement. (VS)**



**Figure 18. A mountain landscape south of Novoivanovka settlement. (VS)**



**Figure 19. The shore of Divichi firth (Ağ-Zibir lake) near the Caspian Sea (Shabran District). (NS)**





**Figure 20. The valley of the Galadjikchay River, Ismailli District. (NS)**



**Figure 21. The bogged valley of a small river near Velyasin settlement, Ismailli District. (NS)**



**Figure 22. A waterfall (ca. 100 m a.s.l.) at Ostair village (I. Kerimova)**

- (21) Ismailli (İsmayılı), environs of Galadjik (Qalacıq) village, along the Galadjik-chay River (N41°00'43"; E48°02'36"; 1552m a.s.l.). A forested area stretching on both sides of the river. (Figure 20)
- (22) Velyasin, a place named after an abandoned village nearby (N40°57'27.3"; E48°09'20.6"; 1145m a.s.l.). Glades in the forest; some of which are bogged, with shallow open water. (Figure 21).
- (23) Kyurdamir (Kürdâmir), Sigirli (Sığırılı) village (N40°16'07.74"; E48°24'33.36"; 15m a.s.l.), leg. I. Kerimova. An irrigation canal, with pomegranate orchards on both sides and the watercourse overgrown by brambles and reeds in many places.
- (24) Imishli (İmişli), Xalfeli. (Xəlfəli) village (N39°47'50.41"; E48°19'13.55"; 4m a.s.l.), leg. I. Kerimova. Agricultural fields sown with beta and irrigated from small ditches.
- (25) Yardimli, a waterfall near Ostair (Ostayır) village (N38°55'37.18"; E48°12'41.15"; 995m a.s.l.), leg. I. Kerimova. The river is small and shallow with a stony bottom and woody vegetation on the banks. (Figure 22).
- (26) Masalli (Masallı), environs of Nazaroba settlements (N38°53'48.8"; E48°39'05.5"; 50m a.s.l.). A group of lakes surrounded by meadows or boggy grasslands with open shallow water.

## Results

### Species checklist

Only imaginal data are given. New taxa for Azerbaijan are marked with an asterisk (\*). The labels from A.V. Bogachev's collection are cited separately from our original data, following the acronym BC; any comments within the entries (such as the modern names of sampled sites) are highlights in italics.

#### Family Calopterygidae

*Calopteryx splendens intermedia* (Selys, 1887)

Material: (10) 30-vi-2014 1♂; (18) 21-vi-2014 1♂1♀.

*Calopteryx splendens orientalis* (Selys, 1887)

Material: (25) v-2014 1♂; (26) 5-v-2014 1♂.

#### Family Euphaeidae

*Epallage fatime* Charpentier, 1840

Material: (1) 26–28-v-2014 1♂; (4) v-2012 1♂. Identified by a photograph made by S. Kakunin; (25) v-2014 1♂.

#### Family Lestidae

\**Lestes dryas* Kirby, 1890

Material: (11) 27-vi-2013 1♂; (12) 28-vi-2013 1♂1♀; (13) 28-vi-2013 1♀; (17) 19–21-vi-2014 1♂1♀.

BC: Shemakha 26-vi-1937 1sp; Shemakha 5-vi-1937 2sp.

Here the species is published from Azerbaijan for the first time. Besides our own findings, some specimens in Bogachev's collection also represent the species, although the labeling is confusing. Most specimens labeled there as *L. dryas* actually belong to *L. barbarus*, except a single one from Shemakha. Two more specimens, also from Shemakha, we discovered among the material identified by Bogachev as *L. sponsa*. Our recent observations suggest that the species is quite frequent in some high mountain areas; especially in Shemakha District where we found it at every standing or flowing water body where reeds or other tall grass stands were well-developed.

\**Lestes sponsa* Hansemann, 1823

Material: (17) 19–21-vi-2014 3♂♂2♀♀.

*L. sponsa* has been recorded in Azerbaijan by imaginal material only from Nakhichevan, Bichenek settlement (Akramovsky 1939). Kasymov (1972), based on larvae, mentioned two more localities: 'Varvarinskoye reservoir and ponds at Ali-Bayramli (now Shirvan) fish farm', however no such specimens are available now. Bogachev's collection contains some labels with this name, all coming from Shemakha District. We revised all specimens not worn and still allowing

identification: some of them proved to be *L. barbarus*, some belonged to *L. dryas*. The species is quite frequent in Armenia (Tailly et al. 2004), and both reliable records in Azerbaijan are made close to Armenian boundary.

\**Lestes virens* Rambur, 1842

Material: (1c) 16–19-ix-2013 2♂♂1♀; (12, 13) viii-2013 3♂♂; 28-vi-2013 1♂.

So far, *L. virens* has been known from Azerbaijan by very few larval data not supported by any available collections: 'An excavation filled with water near Mingechaur city' and "Lake Geygel" (Kasymov 1965). We discovered the species near standing waters both at very low (Lenkoran) and quite high (Shemakha) altitudes.

*Lestes barbarus* (Fabricius, 1798)

Material: (20) 17–18-vii-2014 2♂♂1♀.

BC: Ali-Bayramli 5-v-1937 1sp; Goradiz 9-vii-1941 1sp; Port Ilyich, Lenkoran Distr. (now Liman) 12-ix-1934 3sp. Shemakha, Marasy 2-vii-1937 1sp; Shemakha 26-vi-1937 3sp.

Family Coenagrionidae

*Enallagma cyathigerum* (Charpentier, 1840)

Material: (11) 27-vi-2013 1♂ (12) 28-vi-2013 1♂1♀; (13) 28-vi-2013 3♂♂1♀; (17) 19–21-vi-2014 2♂♂2♀♀; (17) 19–21-vi-2014 1♂.

BC: Shemakha 26-vi-1937 1sp; Gek-Gol (or Goy-Gol, Göygöl), Kirovabad District (now Gyanja (Gəncə)) 6-viii-1940 1sp; Kalinovka, Lenkoran distr. 2-v-1929 1sp.

*Ischnura elegans* (Vander Linden, 1820)

Material: (9) 30-vi-2014 1♂; (17) 19–21-vi-2014 2♂♂1♀; (19) 21-vi-2014 1♂; (20) 17–18-vii-2014 3♂♂2♀♀; (26) 5-v-2014 1♂.

BC: Alatemur, Gakh 19-viii-1937 3sp; Ali-Bayramli 5-v-1937 2sp; Eldar, Poylu 16-v-1935 1sp.

*Ischnura fountaineae* Morton, 1905

Material: (14) 8-vii-2013 1♂.

In our previous paper, we mentioned the species as identified on a photograph of a male (Skvortsov & Segovaya 2014). Another specimen was collected in 2013, and is the only individual of *I. fountaineae* we could see so far in nature.

*Ischnura pumilio* (Charpentier, 1825)

(17) 19–21-vi-2014 1♀; (26) 5-v-2014 1♂.

BC: Kalinovka, Lenkoran 2-v-1929 1sp.

*Coenagrion australocaspicum* Dumont & Heidari, 1995

(1a) 23–27-vi-2014 1♂1♀.

\**Coenagrion hastulatum* (Charpentier, 1825)

(11) 27-vi-2013 3♂♂.

Two larval records of *C. hastulatum* (one of which comes from Nakhchivan AR) were mentioned by Kasymov (1972); however, no specimens are available. Except this, no faunistic data on the species exist for either Russian Caucasus or any of the Caucasian countries formerly belonged to the USSR (Akramovsky 1948; Skvortsov 2010). Thus our imaginal material collected in Shemakha District is the first reliable record of *C. hastulatum* for the entire area.

\**Coenagrion lunulatum* (Charpentier, 1841)

Material: (12) 28-vi-2013 1♀.

Another new species for Azerbaijan. Some findings are known from Armenia (Bartenev 1912b; Akramovsky 1948; Tailly et al. 2004), while in Georgia only one locality, Adzharia, Kobuleti: (Bartenev 1912b), was published. There are no findings from the Russian part of the Caucasus (Skvortsov 2010).

\**Coenagrion ornatum* (Selys, 1850)

Material: (11) 27-vi-2013 1♂.

A number of records are known for Armenia but most of them (if not all) are treated now as *C. vanbrinkae* (Tailly et al. 2004). There are no available for Georgia (including Abkhazia), and only few old records for Russian Caucasus (Bartenev 1910; Artobolevski 1929); however, Skvortsov (2010: 534, 550, 589) recently found a typical *C. ornatum* in the environs of Krasnaya Polyana, Sochi District.

*Coenagrion ponticum* (Bartenev, 1929)

Material: (11) 27-vi-2013 1♂.

*Coenagrion puella* (Linnaeus, 1758)

Material: (12) 28-vi-2013 2♂♂2♀♀; (17) 19–21-vi-2014 4♂♂1♀; (18) 21-vi-2014 3♂♂; (22) 23-vii-2014 4♂♂2♀♀; (19) 21-vi-2014 5♂♂2♀♀. From almost every locality there are both typical specimens and those intermediate between *C. puella* and *C. australocaspicum*.

\**Coenagrion pulchellum* (Vander Linden, 1823)

Material: (9) 30-vi-2014 1♂; (11) 27-vi-2013 1♂; (12) 28-vi-2013 1♂.

BC: Demirchi, Shemakha 8-vii-1937 1sp.

*Coenagrion scitulum* (Rambur, 1842)

Material: (11) 27-vi-2013 7♂♂1♀; (12) 28-vi-2013 1♂; (13) 28-vi-2013 2♀♀, viii-2013 2♂♂; (17) 19–21-vi-2014 1♂.

*C. scitulum* is very abundant everywhere in Shemakha District (being the third most common in numbers and occurrence in 2013) and not infrequent in Kedabek (in 2014). Dumont (2004) found it near the Caspian shore, while all our findings are only high in mountains.

*Erythromma viridulum orientale* Schmidt, 1960

Material: (11) 27-vi-2013 1♂; (13) 1♀; (15) vii-2013 4♂♂.

BC: Shemakha 26-vi-1937 1sp; Kirovabad 26-vi-1935 1sp; Duvanniy, Kichikdag 6-vi-1947 1sp.

#### Family Platycnemididae

*Platycnemis dealbata* Selys in Selys and Hagen, 1850

Material: (1) 26–28-v-2014 5♂♂; (18) 21-vi-2014 1♂; (20) 17–18-vii-2014 2♂♂2♀♀; (26) 5-v-2014 3♂♂.

BC: Alatemur, Gakh 19-viii-1934 1sp; Agjabedi 6-vi-1934 2sp; Dallar 10-viii-1938 2sp; Guba 17-x-1933 1sp; Marsan, Gakh 3-viii-1934 1sp; Shemakha 5-vii-1937 1sp.

#### Family Aeshnidae

\**Aeshna affinis* Vander Linden, 1823

Material: (1d) 23–27-vi-2014 1♂.

*A. affinis* was reported from Azerbaijan only twice, from the same point at Minge-chaur: sandpits filled with water on the right bank of the Kura: Kasymov (1965, 1972), without any certain material cited. Our find in Lenkoran is therefore the first reliable record for the entire country. Field observations during 2011–2014 suggest that *A. affinis* is quite rare in Azerbaijan. For the rest of the post-Soviet Caucasus, most records of *A. affinis* come from Armenia, but they are also not very numerous. Both Russian and Georgian records are rather old and scarce (Skvortsov 2010).

*Aeshna mixta* Latreille, 1805

Material: (10) 30-vi-2014 1♀; (12) 26-vi-2013 1♀; (21) 22-vii-2014 5♂♂1♀.

BC: Baku, Lokbatan x-1946 1sp; Baku 7-x-1946 1sp; Eli-su 2-viii-1934 1sp; Eli-su 24-vii-1931 1sp; Talish, Alekseevka 30-v-1936 1sp.

*Aeshna isoceles* (Müller, 1764)

Material: (1d) 23–27-vi-2014 1♂; (2) 20-vi-2013 1♀; (7) 8-vi-2013 1♂; (8) 25-vi-2013 1♂; (26) 5-v-2014 1♂.

BC: Baku, Zagulba 2-vi-1947 1sp; Talish, Alekseevka 30-v-1936 1sp.

*Anax parthenope* (Selys, 1839)

Material: (3) 10-iv-2013 1♂; (5) 22-vi-2013 visual observations.

BC: Baku, Mardakyani 30-viii-1934 2sp; Kyurdamir 13-v-1950 4sp; Sharur (former Norashen) 4–5-vii-1955 1sp; Baku, Shuvelyan 24-viii-1938 1sp.

*Anax imperator* Leach, 1815

Material: (1a) 23–27-vi-2014; (26) 5-v-2014 1♂.

\**Brachytron pratense* (Müller, 1764)

Material: (3) 10-iv-2013 2♀♀.

The discovery of *B. pratense* in Lenkoran makes not only a significant addition to the Azerbaijanian odonatofauna but also one of its very few findings in the entire post-Soviet Caucasus. Only three very old records can be found in the available literature: Mingrelia, Georgia (Brauer 1876), environs of Novorossiysk



**Figure 23. Habitat of *C. microstigma* in the environs of Dzhidzhikhana. (VS)**

city, Russia (Brauner 1903), and the city of Krasnodar, Russia (Bartenev 1910). The habitat in Lenkoran (an irrigation canal surrounded with reedy vegetation and a nearby forest) looks quite typical for the species.

*Caliaeschna microstigma* (Schneider, 1845)

Material: (4) v-2012 1♂ (identified by a photograph made by V. Tikhonov); (8) 2-vii-2014 5♂♂.

This species has been reported to occur in Azerbaijan only from Lenkoran District (Bartenev 1912a), which makes the south-western coastal corner of the country. One of the two new records published here was made high in mountains, roughly in the same area (Lerik District); the only male individual found there appears, in term of morphology, absolutely typical for the species.

The second locality was found by the authors themselves in western Azerbaijan, close to Georgian boundary, in a low-mountain forested landscape strongly disturbed by pasture. The small river along which the dragonflies were traced mostly flows in a gorge, and its source is hidden somewhere higher in mountains. The population is concentrated in a small area where the river leaves the gorge and runs in a broader ravine overgrown with trees, with some open sunny glades along the watercourse (Figure 23). The insects were active both in the forest and in the open places though most of them were seen only after 5 p.m.; they flew well until dusk. We observed only two females, when these were ovipositing, but we failed to catch any.







**Figure 24a-c. Total of a male *C. microstigma*. (NS: photo in the middle; VS: two other photos)**

This newly discovered population represents a most peculiar dark morph (Figure 24) that could easily be separated from the normal *C. microstigma*. All the examined individuals (more than 20) were adult males in which the frontal surface of thorax, instead of broad 7-shaped antehumeral stripes, only bore narrow and simple, non-hooked streaks (Figure 25). In some adult males collected in June 2015 the antehumeral stripes are reduced even stronger, so that only a small blue speck can be seen in the upper part of the frontal surface of synthorax (Figure 26). All the males observed in 2014–2015 also lacked additional pale markings between two main blue bands on thorax sides, and the bands themselves were rather narrow. Comparison with the specimen found in locality (4) shows that the reduced antehumeral stripes do not mean mere melanistic individuals. Pale abdominal markings are more reduced in the one from (4) than in the here discussed morph, yet the antehumeral stripes are still large and typically 7-shaped. Thus the unusual thoracic pattern may be considered as a characteristic feature that does not directly depend on the development of pale colouration on the body.

In addition, the pterostigmata in the males' hindwings (Figure 27a) are always longer than 2.0 mm (2.2–2.5 mm) and clearly larger in size (i.e. both longer and broader) than those in forewings (Figure 27b). In typical European *C. microstigma* the pterostigmata are believed to be at most 2 mm long in both wing pairs (see Dijkstra et al. 2006: 178–179); though, it is difficult to discuss the signi-



Figure 25. Head and thorax of a male *C. microstigma*. (NS)



Figure 26. View on frontal surface of Synthorax of a male *C. microstigma* caught in 2015. (NS)

ificance of this feature due to the lack of comparable data from other regional populations or on the species in general. For the time being we refrain from any taxonomical conclusions, yet the unusual morphology of this local population suggests that the eastern races of the species may be more variable than those living in Europe, which needs more general, region-wide investigation.

Family Gomphidae

*Onychogomphus flexuosus* (Schneider, 1845)

Material: (7) vi-2013 3♂♂1♀.

BC: Shemakha 24-vi-1937 1sp; Samukh, Tomullu 9-vi-1935 1sp; Samukh, Tomullu 14-vi-1935 3sp; Samukh, Alazan 9-vi-1935 1sp.

The first mention of the species in Azerbaijan is in Bartenev (1912b), while A.V. Bogachev did not publish his own material on this species. We have observed *O. flexuosus* in 2013–2014 in many places, sometimes hundreds of kilometers apart. On the other hand, no individuals were seen in 2012 even where it became so frequent next season.

*Onychogomphus forcipatus albotibialis* Schmidt, 1954

Material: (8) 2-vii-2014 2♂♂1♀; (25) v-2014 1♂.

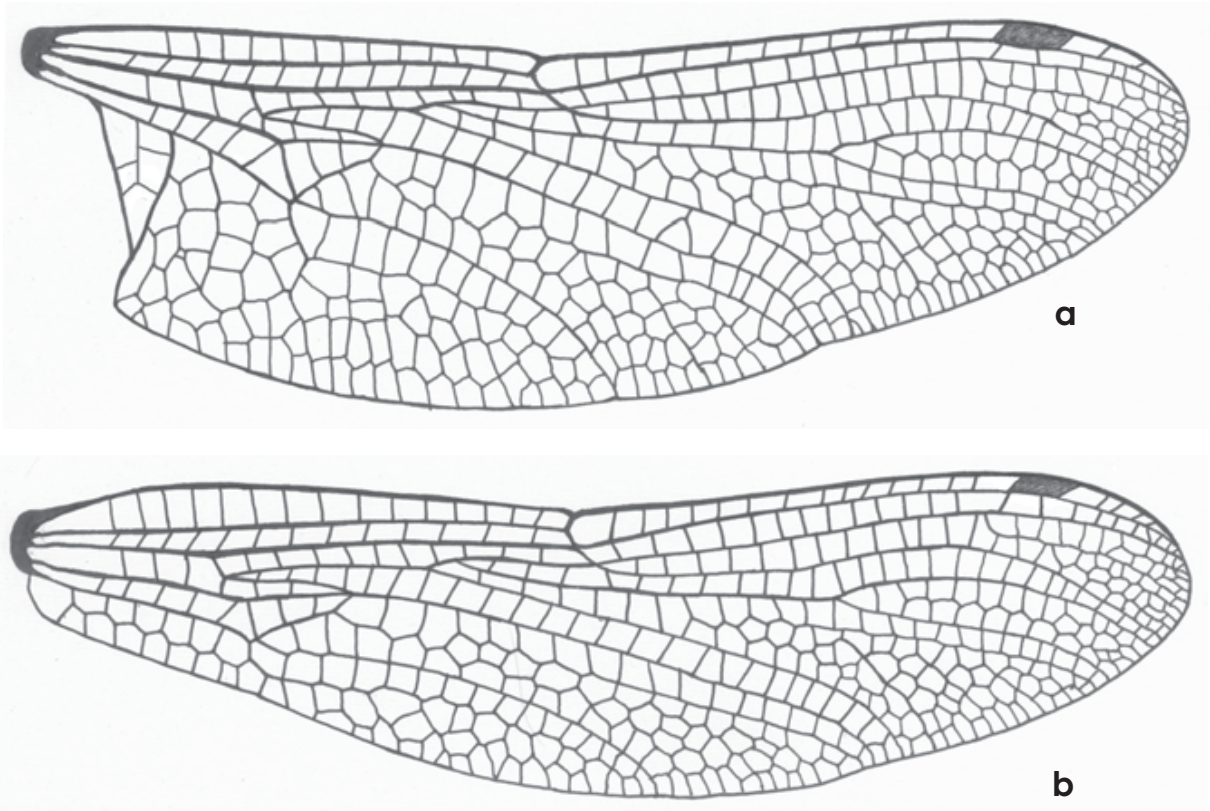


Figure 27a-b. Hindwing (a) and forwing (b) of *C. microstigma*. (Eugenia V. Semenova)

*Lindenia tetraphylla* (Vander Linden, 1825)

Material: (6) 22-vi-2013 1♀.

First identified by a photograph (Skvortsov & Snegovaya 2014), this species was at last captured near the city of Baku in 2013. Though the Caspian shore appears a favorable habitat for this gomphid; we could not find more specimens in other places in Absheron peninsula.

## Family Cordulegastridae

? *Cordulegaster charpentieri* (Kolenati, 1848)

BC: Fakhrakush, Shemakha 4-vii-1937 1sp., det. A. Bogachev (as *C. insignis nobilis*).

A totally destroyed specimen leaving no chance to revise it. We publish it here only to acknowledge A.V. Bogachev's personal contribution to the dragonfly studies in Azerbaijan. The name *C. insignis nobilis* was applied by Akramovsky (1948) to specimens collected in Nachichevan AR and Armenia. However, Taily et al. (2004) recently reidentified all the Armenian material on *C. insignis nobilis* as *C. insignis charpentieri*. Thus, the cited specimen most likely belongs to the same taxon, which we prefer to treat as a species.

\* *Cordulegaster picta* (Selys, 1854)

BC: Zagatala 21-vii-1947 1sp, coll. L. Akhundova, det. A. Bogachev (as *Cordulia* (sic!) *charpentieri* Kol.).

The specimen is also in a poor condition but it still allows identification. Its re-examination has shown that it belongs to *boltonii*, not *bidentata* species group, and that all observable features clearly indicate *C. picta* as the most suitable species. The taxon is mentioned for Azerbaijan by a few authors (see e.g. Kalkman et al. 2004), yet the specimen cited here seems to be the only real evidence of the presence of *C. picta* in the country. Furthermore, it is the first record for the entire post-Soviet Caucasus. *C. picta* is a species of principally western distribution in the Caucasus, frequently occurring in west and northwest Turkey), with the easternmost locality previously recorded at Lake Van (Kalkman 2006). The currently discussed locality in Zagatala is far east of the species' main range and makes its new eastern outpost.

*Cordulegaster vanbrinkae* Lohmann, 1993

Material: (1c) 25–28-v-2013 7♂♂1♀; (1c) 20-vi-2013 1♂; (1c) 23–27-vi-2014 4♂♂; (2) 26-vi-2014 1♂; (3) 27-vii-2014 2♂♂.

*C. vanbrinkae* has been attracting our attention since we first discovered it in Lenkoran District. By this time we have found two more populations of *C. vanbrinkae*, less numerous in individuals and more local, but obviously existing on their own. All three are generally within the same area, however, the distance between them are as long as several kilometers and the habitats themselves are dissimilar from one another. The second population (at Parakend village, 6 km south of Azfilial) inhabits a very small brook flowing through a dark beech forest on the bottom of a very deep gully with steep stony banks, while the watercourse is very shallow and divided into stepped or vertical cascades and

small pools. The third one (near Dashtatyuk village, 7 km southwest of Parakend) dwells slightly higher in mountains (almost 200 m a.s.l.) but the brook itself has an almost flat broad open valley with small swampy glades in many places.

#### Family Corduliidae

##### \**Somatochlora flavomaculata* (Vander Linden, 1825)

Material: (1c) v-2013 1♂; (2) 20-vi-2013 2♂♂.

*Somatochlora flavomaculata* has never been mentioned for Azerbaijan and Eastern Transcaucasia; moreover, it is extremely rare in the whole post-Soviet Caucasus (Skvortsov 2010), with only one, very old, previously made record: Kobuleti, Georgia (Bartenev 1911). The species was very numerous in 2013, so that we even could pick up some individuals killed by cars in a highway running through Lenkoran city. In natural habitats we observed the species flying together with *Cordulegaster vanbrinkae* along a small river over swampy glades in the forest.

#### Family Libellulidae

##### *Libellula depressa* Linnaeus, 1758

Material: (19) 21-vi-2014 1♂1♀.

BC: Helenendorf, prov. Kirovabad (now Geigel city near Gyandja) 25-v-1935 1sp; Shemakha, Meysari 2-vii-1937 1sp; Oguz, Kumlakh 24-vii-1935 1sp; Alatemur, Gakh 2-viii-1934 1sp.

##### *Libellula quadrimaculata* Linnaeus, 1758

Material: (12) 26-vi-2013 1♀; (17) 19–21-vi-2014 1♂.

A frequently occurring dragonfly, but its number is small in all localities.

BC: Shemakha, Demirchi 11-vii-1937 5 sp; Shemakha, Demirchi 10-vii-1937 1sp.

##### *Orthetrum albistylum* (Selys, 1848)

Material: (18) 21-vi-2014 1♂; (23) 13-vii-2014 1♀; (24) 27-v-2014 1♀.

BC: Almalo, distr. Gakh 5-08-1934 1sp; Marsan, distr. Gakh 3-viii-1934 1sp, leg. A. Bogachev; Lenkoran 12-vi-1941 1sp; Marsan, distr. Gakh 19-viii-1934 1sp, leg. A. Bogachev; Baku, Shuvelyan 14-vii-1948 1sp, leg. Z. Akhundova; Marsan, distr. Gakh 19-viii-1934 1sp, leg. A. Bogachev; Marsan, distr. Gakh 3-viii-1934 1sp, leg. A. Bogachev.

##### *Orthetrum brunneum* (Fonscolombe, 1837)

Material: (19) 21-vi-2014 1♂; (20) 17–18-vii-2014 1♂; (21) 22-vii-2014 1♀; (25) v-2014 1♂; (26) 5-v-2014 ♂ visually.

BC: Eldar, Kyasaman vill., valley of Kura river 18-vi-1947 1sp; Kumlakh, Oguz (Oğuz) (former Vartashen) 24-vii-1935 1sp; Adjabedy (Ağcabədi) 6-vi-1934 1sp; Gakh 10-viii-1934 (label only); Alatemur-Marsan, Gakh 3-viii-1934 1sp; Marsan. Gakh 3-viii-1934 1sp; Gabala, Tuntul (Tüntül) 22-viii-1935 1sp; Gakh 2-viii-1934 1sp; Almalo, Gakh 5-viii-1934 1sp; Alatemur, Gakh 19-viii-1934 1sp; Marsan, dist. Gakh 19-viii-1934 1sp; Alatemur, Gakh distr. 3-viii-1934 1sp; Adjabedy 5-vi-1934 1sp; Eli-su, Gakh 17-vii-1934 1sp.

*Orthetrum coerulescens anceps* (Fabricius, 1798)

Material: (1) 26–28-v-2014 1♂1♀; (1d) 23–27-vi-2014 2♀♀; (25) v-2014 2♀♀.

BC: Marsan, Gakh 19-viii-1934 2 sp.

*Orthetrum sabina* (Drury, 1773)

BC: Lenkoran 12-vi-1941 1sp; Sabirabad 10-viii-1939 1sp.

*Sympetrum depressiusculum* (Selys, 1841)

BC: Marsan, Gakh 19-viii-1934 5sp; Marsan, Gakh 3-viii-1934 2 sp; Oguz, Kumlach 24-viii-1925 1sp; Gabala, Nidj distr. 11-viii-1935 1sp; Lyalyalo, Gakh 4-viii-1934 1sp.

Bogachev (1937) mentioned *S. depressiusculum* as a common species in the lowlands of Central Azerbaijan, especially on the cotton fields. A large number of *Sympetrum* specimens in his collection are labelled as *depressiusculum* too, although most of them are in a very poor condition and only the few ones mentioned above allowed exact identification.

\**Sympetrum flaveolum* (Linnaeus, 1758)

Material: (12) 26-vi-2013 1♀; (17) 19–21-vi-2014 2♂♂1♀.

This species has been known in Azerbaijan only by a single larval record published in Kasymov (1972): Bicheneg settlement, Nakhichevan AR, which is not confirmed by any available specimen. Therefore, our material makes the first reliable record of this species for the whole country, and the first record for the main part of Azerbaijan. In fact, *S. flaveolum* is now known in several localities, in one of which (19: Lake Bashkendgel) we observed a mass emergence of the species, with hundreds of individuals flying and perching around a small grassy swamp overgrown with cattails, while they obviously avoided approaching the lake itself.

*Sympetrum fonscolombii* (Selys, 1840)

Material: (10) 30-vi-2014 1♀; (17) 19–21-vi-2014 1♂.

BC: Oguz 6–7-vii-1935 1sp; Shemakha, Demirchi 10-vii-1937 1sp; Baku, Puta 6-x-1936 2sp; Baku, Mardakyan 30-viii-1934 2sp; Marsan, Gakh 19-viii-1933 1sp; Oguz 25-vii-1935 3sp; Demirchi, Shemakha 9-vii-1937 1sp; Gobustan, Djeyran Kechmez 30-x-1935 2sp; Gobustan, Djeyran Kechmez 24-vii-1935 1sp; Baku, Puta 6-x-1936 1sp; Samukh, Karagachly 6-vi-1935 1sp; Gabala 18-viii-1935 1sp.

*Sympetrum meridionale* (Selys, 1841)

Material: (20) 17–18-vii-2014 1♀; (22) 23-vii-2014 1♂1♀.

BC: Marsan, Gakh 19-viii-1934 1sp; Marsan, Gakh 23-vii-1935 1sp; Mare Casp., ins.Sara 30-ix-1934 1sp; Milskiy sovkhos 11-vi-1934 1sp.

*Sympetrum pedemontanum* (Müller in Allioni, 1766)

BC: Nidj (Nidž, Nic (now), dist. Gabala (former Kutkašen, Kutkashen) 10-viii-1935 1sp, leg. A. Bogachev; Marsan, distr. Gakh 3-viii-1934 1sp, leg. A. Bogachev; Nidj, dist. Gabala 10-viii-1937 1sp, leg. A. Bogachev; Kumlach, Oguz (Oğuz) (former Vartashen) 24-vii-1935 1sp; Marsan, distr. Gakh 3-viii-1934 1sp, leg. A. Bogachev;

Kumlach, Oguz (Oğuz) (former Vartashen) 24-vii-1935 1sp.

Although we have not observed *S. pedemontanum* in nature, it must not be rare in Azerbaijan, as Bogachev's collection demonstrate, as well as his paper (1937) and a number of reports made by other authors. One reason why it escaped our observation could be its sporadic occurrence.

*Sympetrum sanguineum* (Müller, 1764)

Material: (1d) 23–27-vi-2014 1♂; (2) 26-vi-2014 1♀; (9) 30-vi-2014 1♂; (12) 26-vi-2013 1♂; (15) vii-2013 1♂, leg. I. Kerimova; (16) 06-vii-2013 1♀, leg. I. Kerimova.

Previously we mentioned *S. sanguineum* only as identified on a photograph of a male (Skvortsov & Snegovaya 2014). During the following field seasons, however, the species proved rather widely-occurring, however in most places only few individuals were seen. A very interesting exception was locality (15) where the species was present in great number, most individuals sitting motionless among alfalfa (*Medicago sativa*) grown in the agricultural field. They let the collector get very close to them but in the end they flew up in mass at once, yet soon would perch again.

*Sympetrum striolatum* (Charpentier, 1840)

Material: (21) 22-vii-2014 1♂1♀.

BC: Samukh, Karagachly 4-vi-1935 2 sp; Oguz 25-vii-1935 6 sp; Baku, Puta 6-x-1936 1sp; Eli-su 29-vii-1934 1sp; Baku 10-xi-1946 1sp; Mingechaur 6-vii-1947 1sp, leg. N. Samedov; Oguz, zona sylvatica 23-vii-1935 1sp.

\**Sympetrum vulgatum* Linnaeus, 1758

Material: (5) 22-vi-2013 2♀♀; (12) viii-2013 1♂1♀.

Similarly to *S. flaveolum*, this species has been known in Azerbaijan by only a single larval record (Kasymov 1972): Lake Dastagel, Nakhichevan AR, unconfirmed by any collection material. Our finding is the first reliable record of the species for the entire country, and the first record for the main part of Azerbaijan. In terms of subspecies, our specimens appear to belong to *S. v. vulgatum*.

*Crocothemis erythraea* (Brullé, 1832)

Material: (20) 17–18-vii-2014 1♂2♀♀.

BC: Gabala, Tuntul (Tüntül) 22-viii-1935 1sp; Gabala, Tuntul 12-viii-1935 7sp; Lyalyalo, Gakh 4-viii-1934 1sp; Marsan, Gakh 3-viii-1934 2sp; Marsan, Gakh 19-viii-1934 1sp.

*Crocothemis servilia* (Drury, 1773)

Material: (1d) 16–19-ix-2013 1♀.

*C. servilia* still seems to be generally rare in Azerbaijan and confined to Lenkoran District, but the new findings suggest that its first record was not only by a sheer chance.

*Selysiotthemis nigra* (Vander Linden, 1825)

Material: (1b) 20-vi-2013 1♂1♀; (5) 22-vi-2013 1♀; (14) 8-vii-2013 1♀; (20) 17–18-vii-2014 1♂1♀.

As in the case of *Ischnura fountaineae* (discussed in Skvortsov & Snegovaya 2014), it was not Dumont (2004: 91) but Bartenev (1912a & b) who published the first reliable record of *Selysiotthemis nigra* for Azerbaijan. Later, Bogachev (1951) mentioned the species as quite frequent in cotton fields of Shirvan. On the other hand, Akramovsky's (1958) notes about the presence of *S. nigra* in the Kura depression are too general and uncertain. Our findings are still few and wholly confined to Lenkoran District.

#### *Pantala flavescens* (Fabricius, 1798)

Material: (1d) 23–27-vi-2014 1♂; (2) 26-vi-2014 1♀.

The only mention of *P. flavescens* in Azerbaijan (Lenkoran, with no exact locality) is more than 100 years old and belongs to Bartenev (1910). Later this record was cited by other authors, but no new material has appeared since then. Lenkoran is the place that we have visited more than any other area in the country, and every time we tried to spot the species in the field. Our attempts yielded no success in 2011–2013, yet in 2014 *P. flavescens* suddenly became very abundant in Lenkoran in almost every open sunny place around Talysh Nature Reserve, including many which we had explored several times before. It raises the question if there is a permanent local population of *P. flavescens* fluctuating in numbers or Lenkoran makes a natural limit for the species to travel into Azerbaijan. In the rest of the post-Soviet Caucasus there have not been reliable records of the species for a long time, except a single recent one from the Black Sea coast at Pitsunda, Abkhazia (Skvortsov 2010: 594). Now there are fresh specimens photographed near Batumi in September 2014 (<http://observation.org/soort/photos/1368?from=2014-09-03&to=2014-09-03>), which is the first documented emergence of this species within the Caucasus. This makes it possible that the population of *P. flavescens* is permanent and has existed there as long as a century.

## Discussion

Our continued research has resulted in 53 dragonfly species reported here, with 13 species new for the country and 29 species that we had not published in our first paper. Two more species have been collected by other authors and still not found by us personally: *Lestes macrostigma* Eversmann 1836 (Dumont 2004) and *Aeshna cyanea* Müller 1764 (Bartenev 1912a).

While this article was in preparation, two new species of the genus *Cordulegaster* were described by the authors (Skvortsov & Snegovaya 2015). The '*C. insignis charpentieri*' published in our first faunistic paper (Skvortsov & Snegovaya 2014) was eventually described as *C. nachitschevanica* Skvortsov & Snegovaya 2015. Another *Cordulegaster* population discovered near the here mentioned Dzhidzhikhana village (8) was described as *C. plagionyx* Skvortsov & Snegovaya 2015; it coexists with the peculiar population of *Caliaeschna microstigma* discussed above.



A third new species related to Azerbaijani Odonata fauna is *Aeshna vercanica* Schneider et al. 2015. Although its type locality is in Iran, the taxon has previously been published from Azerbaijan (Dumont, 2004; Skvortsov & Snegovaya 2014) under the name '*A. cyanea*'.

Therefore, the total of species found in the country has reached 69 species. Together with the new taxonomical discoveries, it has turned Azerbaijan from a 'blind spot' to an area of great odonotological interest.

Besides, the territory provides an excellent ground for some case studies related to different taxonomical problems. The variety of *Coenagrion* and *Cordulegaster* species and morphs already found in the country is of particular interest. Here we discuss the morphology and taxonomy of some taxa belonging to the genus *Coenagrion*.

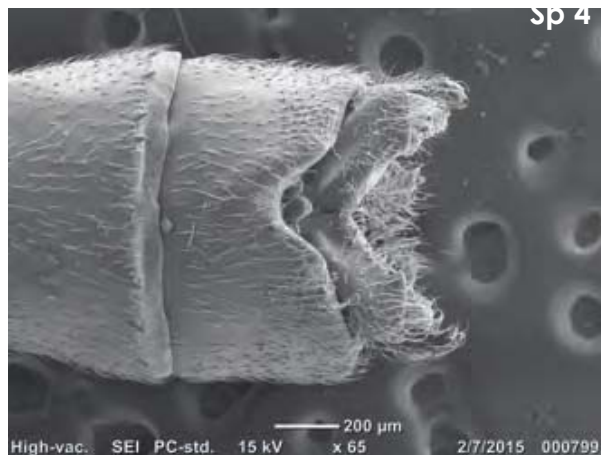
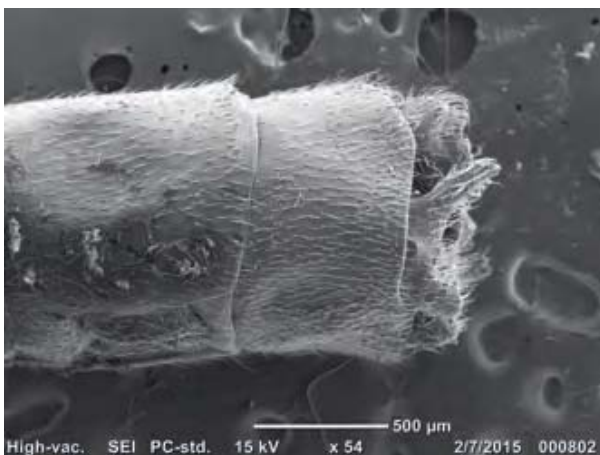
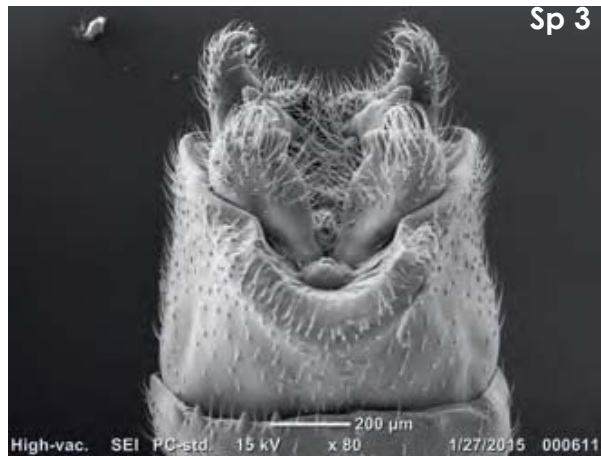
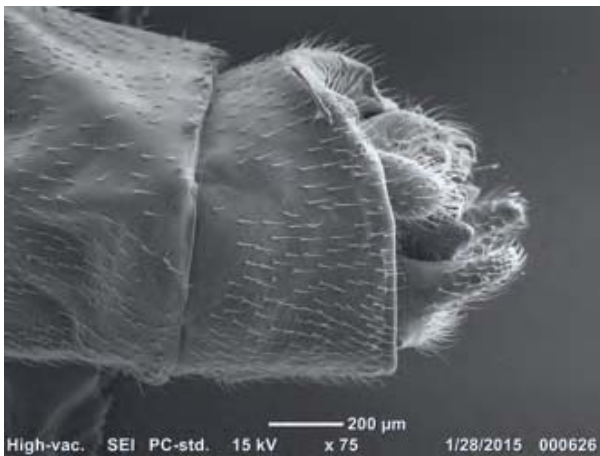
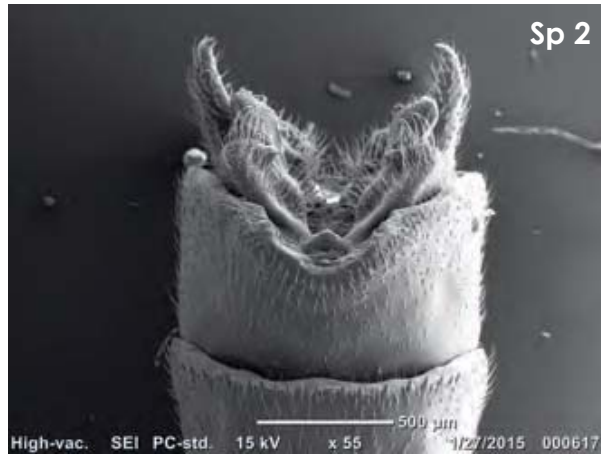
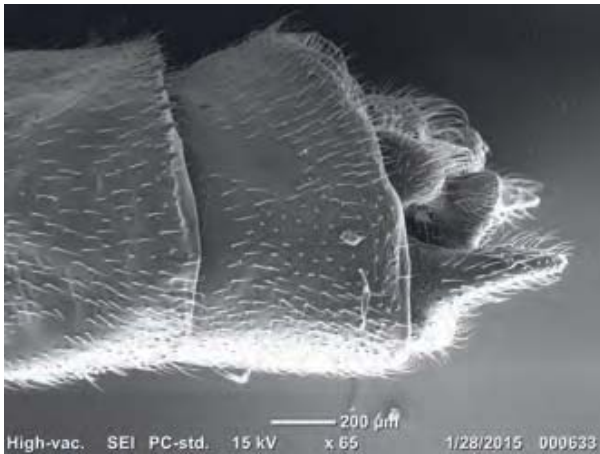
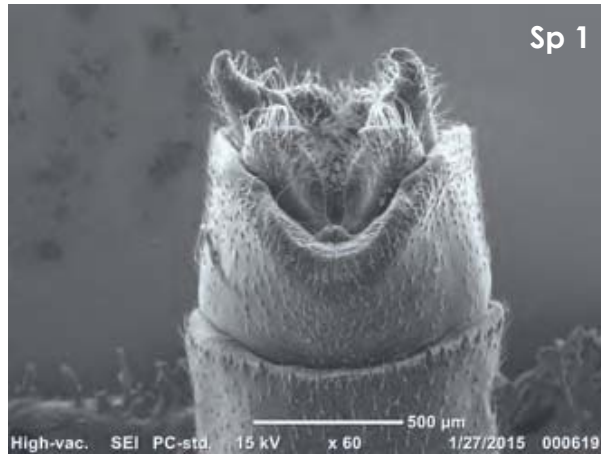
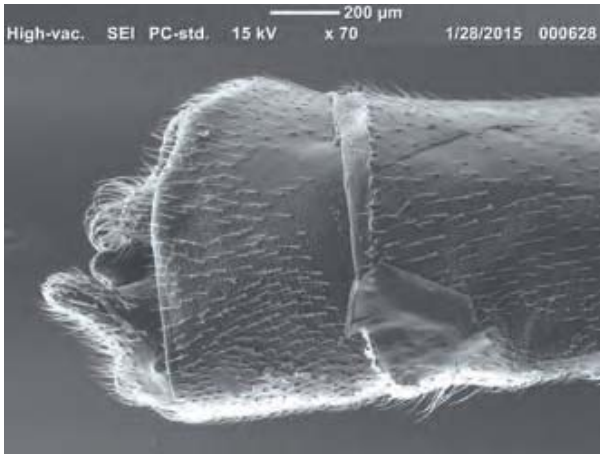
The taxonomy and geography of the damselflies related to *C. puella* in Azerbaijan is extremely complicated. For a better morphological comparison, we use in the following discussion only male features, and wherever possible, refer to the key and the drawings from Kalkman's (2006) paper since it operates data closest to our region. The material from currently studied Azeri territories can easily be split into two large groups:

- 1) male superior appendages touching near the base; black markings on S3 and S4 cover dorsally more than 1/3 of each segment (species related to *C. pulchellum*), and
- 2) upper appendages are widely separated; black markings on S3 and S4 are small (species related to *C. puella*).

Some specimens of the first group fit in well with *C. pulchellum* s. str., such as those from locality (15) in Shemakha District. In these (Figures 28 Sp 4) male appendages are identical to Fig. 6.7 in Kalkman (2006): dorsal branch of lower appendages in lateral projection is less massive than the ventral one and is not longer than the upper appendages.

*C. pulchellum* turned out to be common in some places: it was the second most abundant damselfly (after *E. viridulum*) in Shemakha in 2013. This species is also present in Bogachev's collection (though misidentified as *C. armatum*). Nevertheless, it has previously been mentioned in Azerbaijan only by Kasymov (1972) by larval findings, and even these are not confirmed by any existing collections.

However, along with such individuals, in the same area there are those (Figure 28 Sp 5) in which male anal appendages look identically with Figs. 6.9 & 6.12 (*C. ponticum*) in Kalkman 2006. The main difference from *C. pulchellum* here is that the dorsal branch of lower appendages in lateral projection is much more massive than the ventral one and significantly (though not as much as twice) longer than the upper appendages. According to Kalkman (2006) the dorsal pattern on S3 and S4 in *C. ponticum* must be like in *C. puella*, with only small black markings, yet in our material it is the



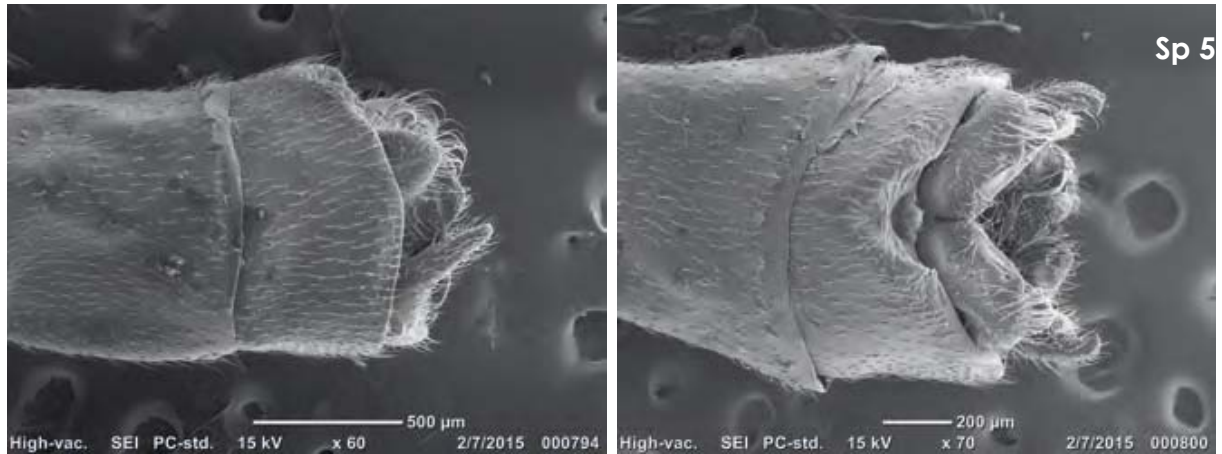


Figure 28. Sp 1 represents a typical *C. puella* (with the abdominal pattern also typical for the species, and upper appendages well-separated at base).

Sp 2 looks like a *C. puella* in terms of the abdominal pattern but it differs drastically in the appendage structure – the lower ones are long and directed straight backwards. The best drawing for comparison in Kalkman 2006 is *C. syriacum*. It cannot be a *C. syriacum*, however, since in the latter the upper appendages are believed to touch at base, and in Sp 2 they are widely separated (as in Sp 1). The next possibility is that we have a *C. australocaspicum* here. There are some differences between Sp 2 and the original description, especially the shape of the ventral part of the lower appendages – it is drawn swollen in Dumont & Heidari 1996, and is not so in our material. Still we could explain this by poorly studied variability of *C. australocaspicum*.

However, Sp 3 demonstrates an intermediate condition in the lower appendage structure, with the abdominal pattern being just the same as in Sp 1 and Sp 2. These intermediate forms are not rare in Azerbaijan as well as the typical *C. puella* itself. Dumont 2004 describes the presence of the true *C. puella* in Armenia along with *C. australocaspicum* as “surprising”, yet our case suggests that the coexistence may not be limited by Armenia, and the problem here is more on the taxonomical side than in pure biogeography. We are inclined to consider *C. australocaspicum* as a subspecies of *C. puella*.

Sp 4 is a normal *C. pulchellum* (touching upper appendages, extensively black abdomen). Sp 5 has lower appendage similar to those in *C. ponticum* (according to Kalkman 2006!) and to *C. intermedium* as it is described and illustrated in Dijkstra et al, 2006. However, the abdominal pattern is exactly as in *C. pulchellum*, while both Kalkman and Dijkstra state that it should be as in *C. puella*.

same as in *C. pulchellum*. Since structural features should be considered in this species group as more important, we think it is reasonable to apply the name *C. ponticum* to these specimens. However, certain morphological mismatch is obvious here. *C. ponticum* is very rare all around the studied area. Akramovsky (1958) mentioned it for the Middle Kura, the Middle Araks, and Talysh Mountains, but cited no definite specimens. The first reliable record in Azerbaijan was made by Dumont (2004).

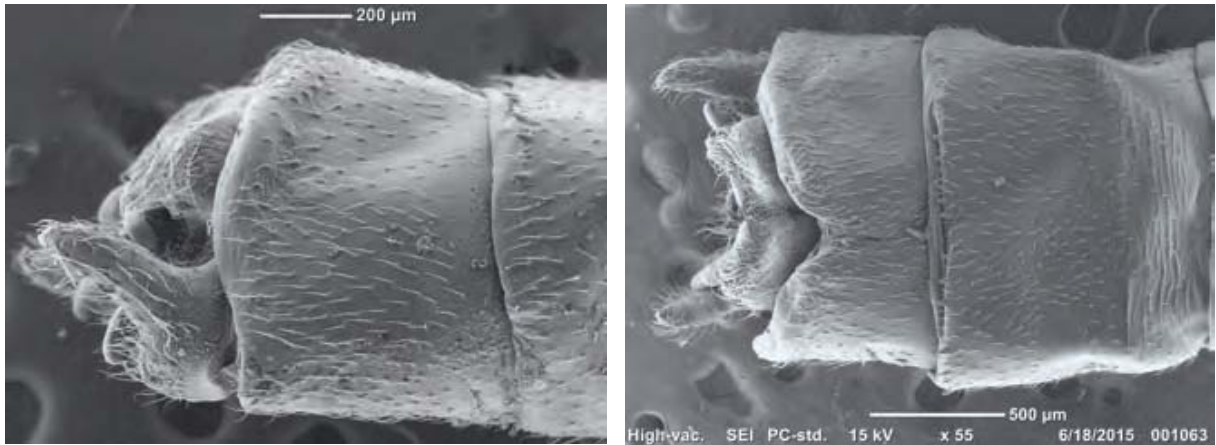
Things, however, get much worse when we consider the second group. Again, we can indicate many individuals, especially those from (15) and (19), with all the features of typical *C. puella* (Figure 28 Sp 1). They match perfectly Figs. 6.10 & 6.13 in Kalkman (2006): the dorsal branch of lower appendages is directed obliquely upwards and in lateral projection only about 1.5 times longer than upper appendages and much shorter than S10; the ventral branch is small, rectangular, not swollen.

On the other hand, a number of specimens from Lenkoran, (1a) and (1d), look very similar to Figs. 6.11 & 6.14 (*C. syriacum*) in Kalkman (2006): the dorsal branch of lower appendages directed straight backwards and in lateral projection twice (or more) longer than upper appendages, almost equaling S10 in length; the ventral branch is again small and not swollen (Figure 28 Sp 2). However, they lack one important character of *C. syriacum*: their upper appendages do not touch. On the other hand they do not entirely match the description and the figures of *C. australocaspicum* in Dumont & Heidari (1996) because in the latter the ventral branch of lower appendages is larger and clearly swollen. Anyway, regardless of the name, there is a great number of intermediate specimens from different parts of Azerbaijan making a continuous series connecting the typical *C. puella* and these specimens with long lower appendages (Figure 28 Sp 3). *C. puella*, it seems now, forms many local populations in Azerbaijan tending towards more southern species such as *C. australocaspicum* or, maybe, *C. syriacum*. However, we cannot see here any geographical trend since Dumont (2004) found *australocaspicum* near the northern boundary of the country while Lenkoran is far in the south. Judging from the material collected in Azerbaijan in three years, *C. australocaspicum* appears to be only a subspecies of *C. puella*, widely overlapping with the latter in Eastern Transcaucasia, North Iran and Turkey. Even as a subspecies, *C. australocaspicum* may have significant geographical variability, which is to be studied separately. The state of *C. ponticum* is open; however, the diagnostic morphological features of the species should be reconsidered.

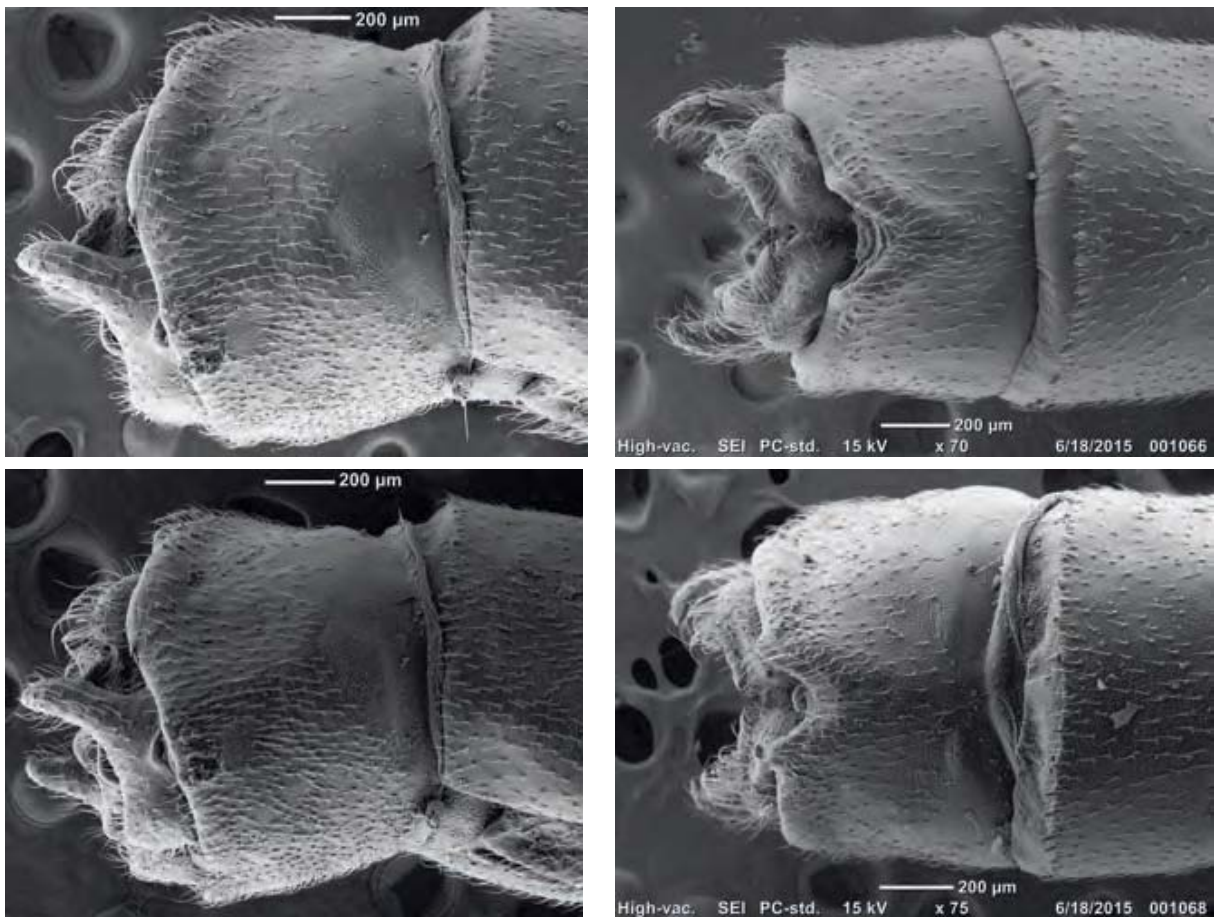
Two other species of the genus *Coenagrion* – *C. ornatum* and *C. vanbrinkae* – are of great interest for damselfly taxonomy. The differences between these taxa are elusive, and sometimes decisions about assigning either name to certain specimens seem to have been made purely on geographical base. In species description of *C. vanbrinkae* Lohmann (1993) insisted on the significance of structural traits in separating it from *C. ornatum*, so we keep at the same idea in the following discussion. Lohmann mentions two main structural differences between *C. ornatum* and *C. vanbrinkae*:

- (1) in males the inner claws of upper appendages are (almost) touching and always directed to each other in *C. ornatum*, while widely separated in *C. vanbrinkae*.
- (2) in females the median lobe of pronotum is always clearly notched in *C. ornatum*, while in *C. vanbrinkae* it is unnotched, with a flat hind margin<sup>1</sup>.

<sup>1</sup> We do not have any female of *C. ornatum* or *C. vanbrinkae* in our collection. Out of purely academic interest, we examined the feature in the males discussed below and found that all of them had an unnotched median lobe.



**Figure 29.** Specimen from Shemakha (loc. 12) with the upper appendages almost typical for *C. ornatum*.



**Figure 30.** Two specimens from Nakhichevan AD retain the same *vanbrinkae*-like features in lateral view, while in dorsal view they less similar to *C. ornatum*.

Both features are illustrated on Fig 1 (Abb 1) in the cited article. Additionally, Lohmann indicates that in *C. vanbrinkae* males the hind border of S10 (seen from side) is bent towards head although he does not mention what condition of the trait is typical for *C. ornatum*. Fig 2 in the same paper does show the hind margin end in *C. vanbrinkae*, whilst in *C. ornatum* it is drawn almost straight, so that the difference is quite clear.

Lohmann does not put in words any differences between *C. ornatum* and *C. vanbrinkae* involving the lateral view of the male appendages illustrated on Fig 2. However, being an integral part of the description, the drawings can be used for further morphological comparison of the species. Remarkably, the upper branch of the inferior appendages in *C. ornatum* is shorter and directed more upwards, its tip being almost in level with the ends of the superior appendages. On the contrary, in *C. vanbrinkae* the same branch is longer and bent more backwards, with its tip protruding well beyond the ends of the superior appendages. It is easy to see that the differences are just the same as those between *C. ponticum* and *C. ponticum*, respectively.

Compared with the above-mentioned characters, the SEM images of the specimens collected in Azerbaijan show a mixture of traits pertaining to either *C. ornatum* or *C. vanbrinkae*. The specimen from Shemakha (loc. 12; Figure 29), has the upper appendages almost typical for *C. ornatum*. However, seen from side the inferior appendages are more similar to the drawing of *C. vanbrinkae* from Lohmann's description, and directed even more backwards. The hind border of S10 (seen from side) is definitely bent towards head. Two specimens from Nakhichevan AD (Figure 30) retain the same *vanbrinkae*-like features in lateral view, while in dorsal view they less similar to *C. ornatum* since the inner claws of the upper appendages are distinctly separated from each other, although not so widely as shown in Lohman 1993.

It is not surprising therefore that, without using SEM-technique, we published the specimens from Nakhichevan AD in the first paper under *C. vanbrinkae* (Skvortsov & Snegovaya 2014) and identified the specimen from Shemakha as *C. ornatum*. Yet, the more detailed comparison shows that all the specimens are intermediate. Of course it is not the time yet to arrive to any far-reaching conclusions, and we need more samples from different geographical points. Still, it is not impossible that in the long run *C. vanbrinkae* would turn out to be a subspecies, or even a synonym, of *C. ornatum*.

## Acknowledgements

We thank S. Kakunin (Krasnodar, Russia) and Dr. V. Tikhonov (Pyatigorsk, Russia) for providing us by photographs of some interesting dragonfly species taken in nature in Azerbaijan. We are grateful to Dr. I. Kerimova (Zoological Institute NAS of Azerbaijan), who collected part of here published materials on *Sympetrum sanguineum* and *Erythromma viridulum orientale*. We are also much obliged to Dr. E. Khanbekova for her kind help in our fieldwork in Shemakha District.

## References

Akramovsky (Akramovskij) N.N. 1939. Dragonflies of Nakhichevan Republic (chiefly based on the collection of D.N. Znojko). Nauchnye trudy Yerevanskogo gosudarstvennogo universiteta 9: 47–53. [Russian, English title]

- Akramovsky N.N. 1948. Dragonfly fauna of Soviet Armenia. Zoologicheskii sbornik Akademii nauk Armyanskoy SSR 5: 117–188. [Russian]
- Akramovsky N.N. 1958. Sistematicheskii obzor zhivotnykh Kavkazskogo peresheika. 9. Strekozy – Odonata. Zhivothy mir SSSR. Gornyye oblasti evropeiskoi chasti SSSR. Moskow & Leningrad. 5: 457–463. [Russian]
- Artobolevski G.B. 1929. Les Odonates du Dagestan. Revue Russe d'Entomologie 23: 225–240. [Russian, French title]
- Bartenev A.N. 1910. K faune Odonata Kubanskoi oblasti. Russkoye entomologicheskoye obozrenie 10(1–2): 27–38. [Russian]
- Bartenev A.N. 1911. Contributions to the knowledge of the Odonata from Palaearctic Asia in the Zoological Museum of Imp. Academy of Sciences of St. Petersburg. I. Ezhegodnik Zoologicheskogo Muzeya Imperatorskoi Akademii Nauk 16: 409–448. [Russian; English title and summary].
- Bartenev A.N. 1912a. Contributions à la connaissance des Odonates de l'Asie paléarctique du Musée Zoologique de l'Académie Impériale des Sciences de St. Pétersbourg 2. Ezhegodnik Zoologicheskogo Muzeya Imperatorskoi Akademii Nauk 17: 289–310. [Russian, French title]
- Bartenev A.N. 1912b. Über eine Kollektion von Odonaten des Kaukasischen Museums in Tiflis. Izvestia Kavkazskogo muzeia 7: 107–116. [Russian, German title]
- Bogachev A.V. 1937. Strekozy, sobrannyye v Kahkskom rayone Azerbaidzhanskoi SSR. Trudy Azerbaidzhanskogo filiala Akademii nauk SSSR. Seria biologicheskaya 20: 33–44. [Russian]
- Bogachev A.V. 1951. Strekozy – Odonata. Zhivothy mir Azerbaidzhana. Baku: 275–278. [Russian]
- Brauer F. 1876. Die Neuropteren Europas und insbesondere (sterreichs mit Rücksicht auf ihre geographische Verbreitung. Festschrift zur Feier des 25-jährigen Bestehens der K.K. zoologisch – botanischen Gesellschaft in Wien. 256–300.
- Brauner A.A. 1903. Zametki o strekozah (Odonata). Russkoye entomologicheskoye obozrenie 3(2): 89–91. [Russian]
- Dijkstra K.-D.B. 2006 (ed.). Field Guide to the Dragonflies of Britain and Europe including Western Turkey and North-Western Africa. British Wildlife Publisher, UK.
- Dumont H.J. 2004. Dragonflies from Azerbaijan. Zoology in the Middle East 31: 87–92.
- Dumont H.J., Heidari H. 1996. On a collection of spring Odonata from Iran, with the description of *Coenagrion australocaspicum* n. sp. Bulletin et Annales de la Société Royale Belge d'Entomologie 132: 63–78.
- Kalkman V.J. 2006. Key to the dragonflies of Turkey, including species known from Greece, Bulgaria, Lebanon, Syria, the Trans-Caucasus and Iran. *Brachytron* 10: 3–82.
- Kalkman, V.J., van Pelt, G.J., Dumont H.J., Haritonov, A.Yu., Tailly, M. 2004. Critical species of Odonata in Turkey, Iran and the Caucasus. International Journal of Odonatology 7 (2): 325–339.
- Kasymov A.G. 1965. Gidrofauna Nizhnei Kury i Mingechaurskogo vodokhranilistcha. Otryad Odonata. Baku, ELM: 265–271 [Russian].
- Kasymov A.G. 1972. Presnovodnaya fauna Kavkaza. Otryad Odonata. Baku, Elm: 97–102. [Russian].
- Lohmann H. 1993. *Coenagrion vanbrinki* spec. nov. und *C. persicum* spec. nov. aus Vorderasien (Zygoptera: Coenagrionidae). Odonatologica 22: 203–211.

- Schneider, T.; Schneider, E.; Schneider, J.; Vierstraete, A.; Dumont, H.J. (2015): *Aeshna vercanica* sp. nov. from Iran with a new insight into the *Aeshna cyanea*-group (Odonata: Aeshnidae). *Odonatologica* 44(1/2): 81-106.
- Skvortsov V.E. 2010. The Dragonflies of Eastern Europe and Caucasus: An illustrated field guide. KMK Scientific Press, Moscow.
- Skvortsov V.E., Snegovaya N.Yu. 2014. Additions to the knowledge of the Odonata fauna of Azerbaijan, with six new records. *Notulae odonatologicae* 8(3): 67–76.
- Skvortsov, V.E. & N.Y. Snegovaya. 2015. Two new species of *Cordulegaster* Leach, 1815 from Azerbaijan (Odonata, Cordulegastridae). *International Dragonfly Fund - Report* 85: 1-22.
- Tailly M., Ananian V., Dumont H.J. 2004. Recent dragonfly observations in Armenia, with an updated checklist. *Zoology in the Middle East* 31: 93–102.



## INSTRUCTION TO AUTHORS

Faunistic studies of South-East Asian and Pacific islands Odonata is a journal of the International Dragonfly Fund (IDF). It is referred to as the journal in the remainder of these instructions. Transfer of copyright to IDF is considered to have taken place implicitly once a paper has been published in the journal.

The journal publishes original papers only. By original is meant papers that: a) have not been published elsewhere before, and b) the scientific results of the paper have not been published in their entirety under a different title and/or with different wording elsewhere. The republishing of any part of a paper published in the journal must be negotiated with the Editorial Board and can only proceed after mutual agreement.

Papers reporting studies financially supported by the IDF will be reviewed with priority, however, authors working with Odonata from the focal area (as defined on the back page of the front cover) are encouraged to submit their manuscripts even if they have not received any funds from IDF.

Manuscripts submitted to the journal should preferably be in English; alternatively German or French will also be accepted. Every manuscript should be checked by a native speaker of the language in which it is written; if it is not possible for the authors to arrange this, they must inform the Editorial Board on submission of the paper. Authors are encouraged, if possible, to include a version of the abstract in the primary language of the country in which their study was made.

Authors can choose the best way for them to submit their manuscripts between these options: a) via e-mail to the publisher, or b) on a CD, DVD or any other IBM-compatible device. Manuscripts should be prepared in Microsoft Word for Windows.

While preparing the manuscript authors should consider that, although the journal gives some freedom in the style and arrangements of the sections, the editors would like to see the following clearly defined sections: Title (with authors names, physical and e-mail addresses), Abstract, Introduction, Material & Methods, Results, Discussion, Acknowledgments and References. This is a widely used scheme by scientists that everyone should be familiar with. No further instructions are given here, but every author should check the style of the journal.

Authors are advised to avoid any formatting of the text. The manuscripts will be stylised according to the font type and size adopted by the journal. However, check for: a) all species names must be given in italic, b) the authority and year of publication are required on the first appearance of a species name in the text, but not thereafter, and c) citations and reference list must be arranged following the format below.

Reference cited in the text should read as follows: Tillyard (1924), (Tillyard 1924), Swezey & Williams (1942).

The reference list should be prepared according to the following standard:

Swezey, O. & F. Williams, 1942. Dragonflies of Guam. Bernice P. Bishop Museum Bulletin 172: 3-6.

Tillyard, R., 1924. The dragonflies (Order Odonata) of Fiji, with special reference to a collection made by Mr. H.W. Simmonds, F.E.S., on the Island of Viti Levu. Transactions of the Entomological Society London 1923 III-IV: 305-346.

Citations of internet sources should include the date of access.

The manuscript should end with a list of captions to the figures and tables. The latter should be submitted separately from the text preferably as graphics made using one of the Microsoft Office products or as a high resolution picture saved as a .jpg .tif or .ps file. Pictures should be at least 11 cm wide and with a minimum 300 dpi resolution, better 360 dpi. Line drawings and graphics could have 1200 dpi for better details. If you compose many pictures to one figure, please submit the original files as well. Please leave some space in the upper left corner of each picture, to insert a letter (a, b, c...) later. Hand-made drawings should be scanned and submitted electronically. Printed figures sent by the post could be damaged, in which case authors will be asked to resubmit them.

Manuscripts not arranged according to these instructions may also be accepted, but in that case their publication will be delayed until the journal's standards are achieved.

