

## The Odonata of Kyrgyzstan, part I - Critical national checklist, annotated list of records and collected data of the summer half-years 2008 and 2009

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*This work is dedicated to the worldwide unique Kyrgyz Walnut forests of the Jalalabad province – may the people of Kyrgyzstan increasingly and in time recognize the invaluable worth of this severely threatened and vanishing green oasis of life.*



Picture 1: Male of *Cordulegaster coronata*. “Ütsch Tschoku”, southern foothills of Bau-bash-Ata range, Jalalabad Oblast 2400m a.s.l., 2008-06-28.



## Summary

Based on the results of fieldwork and collecting in 2008 and 2009 and the evaluation of literature an updated national checklist of the Odonata of Kyrgyzstan is presented. The list comprises a total of 63 species, whereas 55 species were encountered in the field by the author, including five new for the country: *Aeshna serrata*, *Onychogomphus lefebvrii*, *Orthetrum sabina*, *Crocothemis servilia*, *Selysiothemis nigra*. 826 specimens of 49 species have been collected (dep. in coll. A. Schröter). All 55 species recorded in 2008 and 2009 are listed and annotated. Moreover, the unclear or controversial taxonomical status of several species is briefly debated. Interesting ecological observations include the emergence of *Libellula quadrimaculata* from running water and cleptoparasitism by *Ischnura forcipata* in spider webs.

### 1. Introduction

The Republic of Kyrgyzstan is the second smallest successor state of the five Central Asian Ex-Soviet Republics and covers an area of roughly 200.000 square kilometres. It is a landlocked country and shares borders with China, Tadzhikistan, Uzbekistan and Kazakhstan. Dominated by the high mountain ranges of the Tian Shan and the Pamiro-Alay roughly 50% of the national territory are situated at an altitude above 3000m a.s.l. and almost 90% above 1500m a.s.l. (Adishev 1987, von Maydell 1983). The country's geographical position between the adjacent desertic Turan Lowland and the glaciated peaks of the central Tian Shan, however, offers an amazing variety of different habitats, landscapes and climate units at a small scale.

The dragonfly fauna of Kyrgyzstan in many respects is among the less explored of the Central Asian Republics. Whilst the publication outlet on the Odonata fauna of adjacent countries are quite remarkable (compiled list of references in Kosterin et al. 2004), not a single reference dealing exclusively with the Kyrgyz dragonfly fauna was published to date. However, a comprehensive review about the dragonfly fauna of Central Asia was published recently (Borisov & Haritonov 2007, 2008) and the below presented updated checklist basically builds on the compiled species list for Kyrgyzstan contained therein.

The aim of this study is to give a rough overview of the hitherto recorded species and to present selected aspects of their ecology, taxonomical status and distribution based on field survey of the author. In this regard the presented results are the first part of a more detailed and comprehensive



synopsis of the Kyrgyz dragonfly fauna subsequently worked out the following years. Part II will comprise the results of the mapping project, a list of the sampled localities and the presentation of the main types of dragonfly habitats in Kyrgyzstan.

### **1.1 Material and methods**

The checklist is mainly based on the species list compiled by Borisov & Haritonov (2007, 2008) and the results of intensive fieldwork and collecting by the author. The list of data collected in 2008 and 2009 comprises records throughout the country.

In this context all important landscape units and representatives of all aquatic habitat types at any altitudes accessible for dragonflies were explored. However, big parts of Kyrgyzstan still remain completely unroaded, remote and hard to access, which makes an evenly spread survey almost impossible. Thus, both survey and collecting method (“hit and run”) was highly depending on the scope of the respective opportunities to enter a particular area.

### **1.2 Results**

The new updated checklist comprises 63 species (table1), which noticeably confirms the position of the Kyrgyz dragonfly fauna as the second richest after Kazakhstan (cf. Chaplina et al. 2007, Borisov & Haritonov 2007). A total of 55 species were encountered in the field by the author, five of them new for Kyrgyzstan. For 50 species autochthony could be evidenced and 826 specimens of 50 species were collected (dep. in coll. A. Schröter). Needless to say that this roundup of a “one-man-project” is preliminary and not exhaustive. The recorded data of several species are still far too poor to mirror the reality of the species distribution and frequency of occurrence in Kyrgyzstan. Further research might surely add new species to the Kyrgyz list. However, due to Kyrgyzstan’s mountainous character the options for dragonflies generally seemed to be somehow limited and not surprisingly the highest density of species was recorded in the few lower regions of the country, particularly at the subtropical western slopes of the Fergana range at the upper reaches of the Syrdarja and, to less extend, at the floodplain of the Chui-valley north of Bishkek at the bordering area to Kazakhstan. Especially the lowest parts on the northern slopes of the Pamiro-Alay and the Turkestan range (Batken and Osh Oblast) in the bordering areas to the Uzbek and Tadjik Ferghana Valley are yet poorly covered by this study and seem to be most promising for further research.



## 2. Checklist of the Odonata of Kyrgyzstan

The following evaluated references contain dragonfly records which could be allocated to today's Kyrgyz territory: Valle (1942), Popova (1951), Bartenev (1912), Haritonov (1988), Belyshev et al. (1989), Krylova (1972)<sup>1</sup> Sadeghi (2008), Brauer (1880), Dumont et al. (1995), zur Heyden (1889), Grigoriev (1905), Krylova & Chirov (1971), Jödicke et al. (2000), Hagen (1856), Borisov & Haritonov (2007, 2008). The species list for Kyrgyzstan compiled by Borisov & Haritonov (2007, 2008) contains all reliable species mentioned by the above listed authors. Thus these references by pragmatic reasons were not included in the following tabular analysis.<sup>2</sup>

**Table 1: Checklist of the Odonata of Kyrgyzstan. Sources: Borisov & Haritonov (2007, 2008) and this study. Species new for Kyrgyzstan recorded during this study are marked with N!**

Nr.	Species	This study	Borisov & Haritonov (2007, 2008)
1	<i>Calopteryx virgo</i>	-	X
2	<i>Calopteryx splendens</i>	X	X
3	<i>Calopteryx samarcandica</i>	X	X
4	<i>Lestes barbarus</i>	X	X
5	<i>Lestes sponsa</i>	X	X
6	<i>Lestes dryas</i>	X	X

<sup>1</sup> The species list given in Krylova (1972) is composed of both field records of the author and evaluation of the collection of the National Kyrgyz University as well. However, from both sources unfortunately several species were misidentified or mixed up thus the list of species in parts is highly questionable and is therefore cited here only under reserve. However, these obviously misidentified species were consequently omitted by Borisov & Haritonov (2007, 2008).

<sup>2</sup> The record of a female museum specimen of *Libellula pontica* mentioned by Schoorl (2000) is labelled „Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq 1892“. However, the City of Margilan (Marg`ilon) is one of the famous old Silk Road Cities of Uzbekistan and situated round 30 km beyond the Kyrgyz border, which is why this interesting (although fairly questionable) record had to be omitted. This record has not been evaluated or accepted by Borisov & Haritonov (2007, 2008) either.



Nr.	Species	This study	Borisov & Haritonov (2007, 2008)
7	<i>Lestes macrostigma</i>	X	X
8	<i>Lestes virens</i>	X	X
9	<i>Sympecma fusca</i>	X	X
10	<i>Sympecma paedisca</i>	X	X
11	<i>Sympecma gobica</i>	X	X
12	<i>Coenagrion armatum</i>	X	X
13	<i>Coenagrion puella</i>	X	X
14	<i>Coenagrion pulchellum</i>	X	X
15	<i>Coenagrion scitulum</i>	X	X
16	<i>Coenagrion hastulatum</i>	-	X
17	<i>Coenagrion lunulatum</i>	-	X
18	<i>Erythromma viridulum</i>	-	X
19	<i>Platycnemis pennipes</i>	-	X
20	<i>Enallagma risi</i> <sup>3</sup>	X	X
21	<i>Ischnura fountaineae</i>	X	X
22	<i>Ischnura elegans</i>	X	X
23	<i>Ischnura forcipata</i>	X	X
24	<i>Ischnura pumilio</i>	X	X
25	<i>Ischnura evansi</i>	X	X
26	<i>Nehalennia speciosa</i>	-	X
27	<i>Aeshna affinis</i>	X	X
28	<i>Aeshna juncea</i>	X	X
29	<i>Aeshna mixta</i>	X	X

<sup>3</sup> In Borisov & Haritonov (2007, 2008) stated as *Enallagma cyathigerum* Charpentier, 1840. See annotated species list Nr. 15.



Nr.	Species	This study	Borisov & Haritonov (2007, 2008)
30	<i>Aeshna serrata</i>	X N!	-
31	<i>Aeshna isoceles</i>	X	X
32	<i>Anax parthenope</i>	X	X
33	<i>Anax ephippiger</i>	X	X
34	<i>Anax imperator</i>	X	X
35	<i>Ophiogomphus reductus</i>	X	X
36	<i>Onychogomphus flexuosus</i>	X	X
37	<i>Onychogomphus lefebvreii</i>	X N!	-
38	<i>Lindenia tetraphylla</i>	X	X
39	<i>Gomphus ubadschii</i> <sup>4</sup>	X	X
40	<i>Cordulegaster coronata</i>	X	X
41	<i>Cordulia aenea</i>	-	X
42	<i>Libellula quadrimaculata</i>	X	X
43	<i>Libellula depressa</i>	X	X
44	<i>Orthetrum albistylum</i>	X	X
45	<i>Orthetrum brunneum</i>	X	X
46	<i>Orthetrum cancellatum</i>	X	X
47	<i>Orthetrum anceps</i>	X	X
48	<i>Orthetrum sabina</i>	X N!	-
49	<i>Crocothemis erythraea</i>	X	X

<sup>4</sup> In Borisov & Haritonov (2007, 2008) stated as *Stylurus flavipes liniatus* (sic!), Bartenef, 1929. As the name *Gomphus lineatus* originally was used for *Paragomphus lineatus* it has to be replaced by the name *ubadschii* sensu Schmidt (1953). Moreover, following Dijkstra & Lewington (2006) this taxon is given full species rank here. See also Hacet & Aktaç (2008) and Kalkman (2006).



Nr.	Species	This study	Borisov & Haritonov (2007, 2008)
50	<i>Crocothemis servilia</i>	X N!	-
51	<i>Sympetrum arenicolor</i>	X	X
52	<i>Sympetrum depressiusculum</i>	X	X
53	<i>Sympetrum flaveolum</i>	X	X
54	<i>Sympetrum haritonovi</i>	X	X
55	<i>Sympetrum meridionale</i>	X	X
56	<i>Sympetrum pedemontanum</i>	X	X
57	<i>Sympetrum sanguineum</i>	X	X
58	<i>Sympetrum striolatum pallidum</i>	X	X
59	<i>Sympetrum vulgatum decoloratum</i>	X	X
60	<i>Sympetrum fonscolombii</i>	X	X
61	<i>Sympetrum danae</i>	-	X
62	<i>Selysiotthemis nigra</i>	X N!	-
63	<i>Pantala flavescens</i>	X	X

### 3. Annotated list of records of Kyrgyz Odonata in 2008 and 2009

#### Calopterygidae

Dominated by vast mountain ranges Kyrgyzstan is far from being a *Calopteryx* paradise. Over long stretches many of the glacier and snowfed streams are too cold and fast running for dragonflies in general or at least for *Calopteryx* species. Only a fraction of superficially promising looking rivers and brooks are actually populated. The spatial distribution of *Calopteryx* is very uneven and unpredictable, small populations often appear to be enclosed by an invisible fence.

#### 1. *Calopteryx splendens* (Harris, 1780)

(*Calopteryx splendens johanseni* Belyshev, 1955; *Calopteryx. splendens ancilla* Selys, 1853; *Calopteryx splendens caprai* Conci, 1956; *Calopteryx splendens* var. *Faivre* Lacroix, 1919)



As taxonomical validity of most of the numerous described palaeartic subspecies of *Calopteryx splendens* is far from sure, it is refrained for the time being from assigning Kyrgyz *C. splendens* to certain subspecies in this list. Generally most of the found individuals were phenotypically more or less identical to specimens from Central Europe with which they were compared. Specimens from a few rather isolated populations, f.ex. the Chatkal range (Jalalabad Oblast) tended to be stouter and more broadwinged and showed a somewhat enlarged dark-blue wingspot (see picture 2). These populations phenotypically resemble specimens from northern Italy and southern Switzerland which by the majority of authors are assigned to *Calopteryx splendens caprai* Conci, 1956 (= *Calopteryx splendens ancilla* Selys, 1853). No androchrome females were found (cf *C. splendens* var. *Faivreii* Lacroix, 1919 in Bernard & Kosterin 2010). In some other *Calopteryx* populations from the northwest of Kyrgyzstan the males showed completely coloured wing apices and are probably close to *Calopteryx splendens intermedia* but could not be collected and confirmed yet. Further field research will probably reveal several new taxa/ forms in Kyrgyzstan. For a comprehensive and profound analysis of the phylogeography and morphological and genetic diversity of *C. splendens* across Eurasia see Sadeghi (2008).



Picture 2: A male of *Calopteryx splendens* from the Sary Chelek reserve (Jalalabad Oblast) with fairly prominent wing spots. Photo: P. Borchardt.



## 2. *Calopteryx samarcandica* Bartenev, 1911

(*Calopteryx maracandica* Bartenev, 1913; cf *Calopteryx unicolor* Bartenev, 1912)

Specimens of a very distinct *Calopteryx* form locally found in southwest Kyrgyzstan along river systems at the Osh Oblast, like the catchment area of the Ak Buura River, probably pertained to the taxon *samarcandica*. The males were relatively broadwinged with a large brownish and dull wingspot without metallic gloss, extending from the apex well beyond the nodus and fading out without a clear border.

According to Dumont et al. (1997) *samarcandica* in “pure form” appears to be restricted to the river Amu-Darja and its major tributaries, whereas the map of records in Borisov & Haritonov (2007) indicate records even far north as the Jambyl province in Kazakhstan. However, as long as the status of other regional taxa with coloured apices remains unclear, it is pointless to deliberate about pureness, hybridisation or ongoing introgression processes of this Kyrgyz populations. As the taxonomic status of all taxa and forms of the *Calopteryx splendens* group is by no means clear, also *C. samarcandica* is assigned here to species rank for pragmatic and conventional reasons only.

## Lestidae

Well adapted to seasonal waterbodies and the continental dynamic climate conditions of the region, lestid species are the dominating Zygoptera of Kyrgyzstan.

## 3. *Lestes barbarus* (Fabricius, 1798)

Common throughout the country and as a vivid wanderer *Lestes barbarus* was regularly recorded in large numbers in the open landscape and at higher altitudes far from any suitable waterbodies. In contrast the number of confirmed reproduction was unbalanced and disproportional low in this species, which might indicate that at least parts of the total amount of specimens recorded were of external origin.

## 4. *Lestes sponsa* (Hansemann, 1823)

*Lestes sponsa* was found to be surprisingly rare, with only two records so far in the north of the country. Both populations revealed only few individuals each and only one positive proof of reproduction could be yielded yet. The distribu-



tion of *L. sponsa* along its southern border of occurrence in Central Asia seems to be poorly known and the insufficient accurate data provide a somehow ambivalent idea of its distribution. Chaplina et al. (2007:354) consider *L. sponsa* as one of the commonest dragonflies of Kazakhstan. According to Jödicke (1997) it has neither been recorded in adjacent Uzbekistan nor in Turkmenistan. In contrast, it is stated for all five Central Asian countries except Turkmenistan by Borisov & Haritonov (2007). However, a record of a single female from the very northeast of Afghanistan close to the Tadjik border is mentioned by Schmidt (1961). The species has possibly been overlooked during this study and might be more widespread, but on the basis of the current data no clear assessment of the species' status in Kyrgyzstan is possible. Evidence suggests, however, that the southern border of the species coherent distribution area might run roughly through Kyrgyzstan.

#### 5. *Lestes dryas* Kirby, 1890

Scattered populations of *Lestes dryas* were recorded all over Kyrgyzstan but mainly in low abundances and it could be only locally found in higher numbers. Rather surprisingly the highest density of records was situated in the southern half of the country. In Kyrgyzstan *L. dryas* clearly preferred habitats with a minimum supply of slow running water and all stronger populations were found at habitat types described as for Nr. 18 *Ischnura forcipata*. However, *Lestes dryas* seemed to be confined to higher altitudes and was not found to reproduce below 1200m a.s.l. so far.

#### 6. *Lestes macrostigma* (Eversmann, 1836)

Rare, and only found in 2009. A total of a dozen individuals were encountered in the very north of Kyrgyzstan at shallow pools and in open grazed riparian steppic meadows along the river Chui in the frontier area to Kazakhstan. Beside one pair in tandem linkage perching in a standing of *Bolboschoenus maritimus* at a small temporary pool, no signs of reproduction were noticed. These small and probably unsteady Kyrgyz outposts are probably connected with the more coherent distribution area of the species in the Kazakh lowland steppe, where it was reported amongst others from the river Ili in adjacent southern Kazakhstan (Reinhardt 1995, Belyshev 1961). Although Kyrgyzstan comes up with a good deal of saline ponds and brackish marshes, the options for this lowland species (cf Jödicke 1997) in mountainous Kyrgyzstan generally seems to be limited as most of these habitats are situated at inappropriate altitudes,



like for instance the numerous salty lakes and marshes along the southern shore of lake Issyk-Köl at 1600m a.s.l.

### 7. *Lestes virens* (Charpentier, 1825)

This species was rather uncommon and very local, but in optimal habitats and under preceding favourable weather conditions it may appear in tremendous high abundances, which was the case in 2009 in the subtropical Arslanbob region (Jalalabad Oblast). The infraspecific taxonomy of *Lestes virens* is puzzling and the status of several populations and described taxa allied to this species remains unclear (Jödicke 1997, Samraoui et al. 2003). In view of the humeral stripe, the colouration of the mesepisternum and the prothorax and the extension and pattern of pruinosity the Kyrgyz populations of *Lestes virens* feature an interesting mosaic of traits of both the nominate taxon and *vestalis*, and



Picture 3. Seasonal trait displacement: From August onwards a dark discoloration (like shown on the photo) frequently interrupted the actually complete yellow antehumeral stripes in male Kyrgyz *Lestes virens*, suggesting the taxon *vestalis*. Moreover, the metapleural sutures actually marked with a clear black line (*vestalis* character) became superimposed by whitish-blue pruinosity in old males. However, as can be seen on the photo, the mesepisternal green bands never reached the metapleural suture (character of the nominate taxon *virens*). This seasonal change of traits has never been observed in females yet. Gumkhana, Jalalabad Oblast 2009-08-07.





**Picture 4: A female of *Lestes virens* with uninterrupted yellow antehumeral stripe well reaching the wingbases of the forewings (*virens* character). The mesepisternal green band didn't reach the metapleural suture (*virens* character), whilst the latter is rather prominent marked, suggesting the taxon *vestalis*. Gumkhana, Jalalabad Oblast, 2009-07-09.**

additionally show some unique traits as well. From August onwards a dark discoloration (see picture 3) frequently interrupted the actually complete yellow antehumeral stripes in males, suggesting the taxon *vestalis*. Moreover, the metapleural sutures actually marked with a clear black line (*vestalis* character) became superimposed by whitish-blue pruinosity in old males. However, as can be seen on the photo, the mesepisternal green bands never reached the metapleural suture (character of the nominate taxon). This seasonal “trait displacement” has never been observed in females yet (see picture 4). In many aspects Kyrgyz *Lestes virens* match with the lectotypes of the taxon *marikovskii* Belyshev, 1961 deposited in the SZMN, Novosibirsk. Thus, the case could be made to assign these distinct Central Asian populations by pragmatic reasons to *marikovskii*.



### 8. *Sympecma fusca* (Vander Linden, 1820)

*Sympecma fusca* was very common throughout Kyrgyzstan, particularly in the southern half, where it was by far the most abundant *Sympecma* species and over wide stretches the dominating damselfly. It was found reproducing in a wide spectrum of different types of waterbodies up to at least 1800m a.s.l.

### 9. *Sympecma paedisca* (Brauer, 1877)

The vast majority of records of *Sympecma paedisca* were from the Chui, Talas and Issyk-Köl Oblast, and in contrast to *S. fusca* it seemed to have its distribution stronghold in the northern parts of the country, becoming increasingly local and less common towards a line roughly south of the Naryn River. In Kyrgyzstan *Sympecma paedisca* generally appeared to be less numerous than its two regional congeners.



Picture 5: A female of *Sympecma paedisca* in its mountainous estivation refuge. Alamedin canyon (Chui Oblast), Kyrgyz-Alatoo, 2009-09-03.



### 10. *Sympecma gobica* (Foerster, 1900)

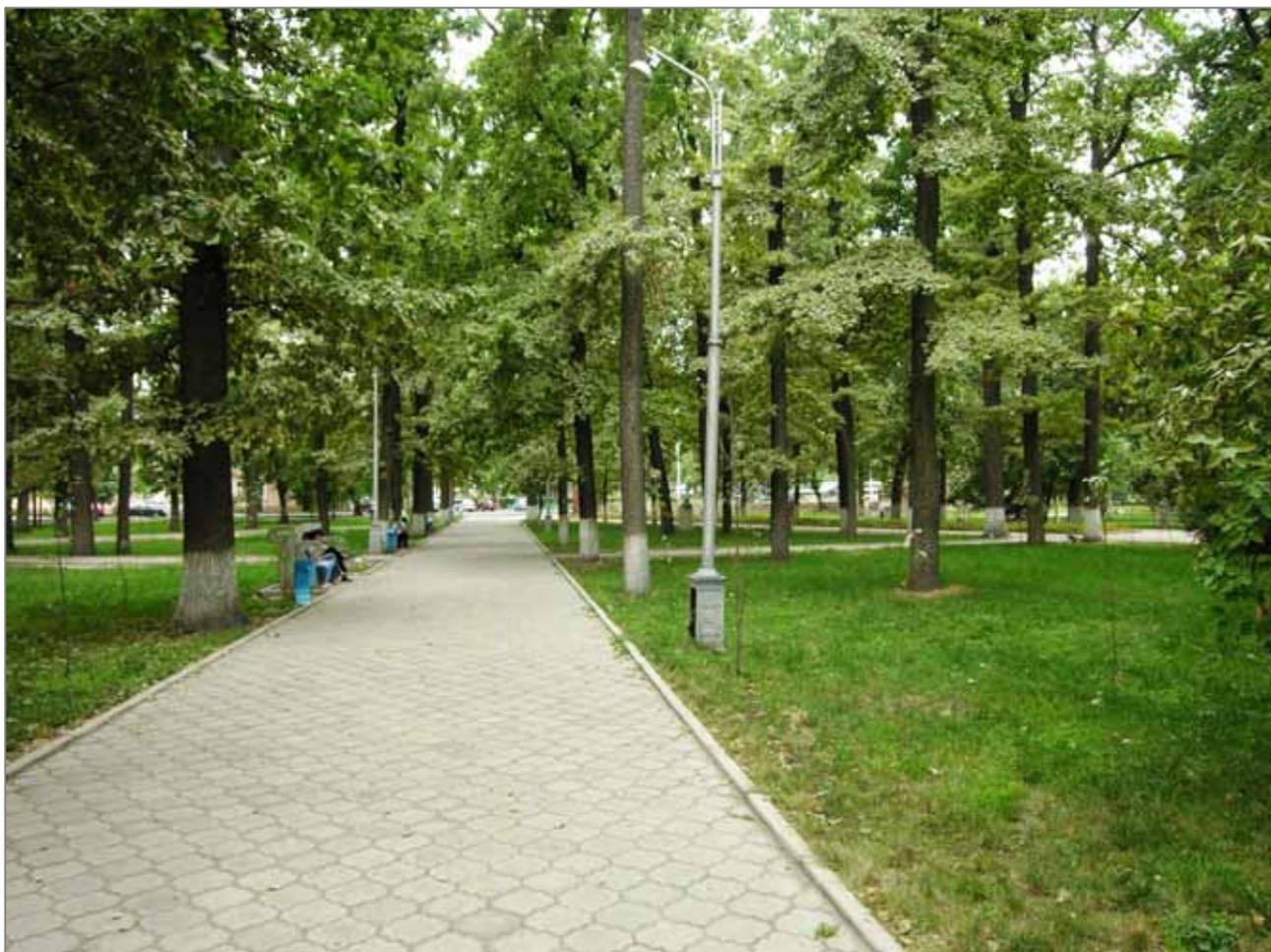
The Kyrgyz distribution centre of *Sympecma gobica* was clearly situated in the northern districts (Talas, Chui and Issyk-Köl Oblast) of the country and up to now comparatively few individuals were found in the southern part of the Jalalabad and Osh Oblast. *S. gobica* was the dominating *Sympecma* species of the huge pre-reproductive estivation swarms which in July/August migrated up the valleys of the Kyrgyz-Ala-Too (flight type 3 sensu Corbet 1999:384), where it could be found gathering in tremendously numbers in horse-grazed bushy meadows and open windshaded *Juniperus*-forests along the river banks at about 1500-2000m a.s.l. (see picture 6). Moreover, *S. gobica* could even be



Picture 6: View of a typical estivation refuge of *Sympecma gobica*, *paedisca* and *fusca*. This valley runs from north to south and is therefore sheltered from westerly winds. The park-like *Juniperus*-forest was held open by horse grazing. Alamedin canyon (Chui Oblast), Kyrgyz Ala-Too, 2009-09-03.

found in huge numbers estivating in green areas in the centre of the capital Bishkek, in the “Oak-Park” along the Chui-Prospekt for instance (see picture 7). During the estivation period *S. gobica* clearly preferred to perch on dull gray substrates and in doing so it relied perfectly on its camouflage and behaved





**Picture 7: Virtually all green spaces in the Kyrgyz Capital Bishkek were frequented by numerous estivating *Sympecma gobica*. Especially in this park in the centre of Bishkek in August/September hundreds of *S. gobica* were encountered. They preferred to perch at sheltered places on dry shrubs, hedges and especially on newly planted small trees like the ones the right side of the path. Bishkek, 2009-08-19.**

easily. Several individuals even showed signs of phytomimeses (see picture 8). The so far known Kyrgyz populations of *S. gobica* were characterized by remarkably phenotypical uniformity concerning both colouration and size. As far as confusion with *S. paedisca* is concerned (cf Jödicke 1997:132-138) at least the Kyrgyz *S. gobica* populations are almost always easily recognised by its light-gray and robust overall appearance, the typical thorax pattern and its overall length of about 39mm (37-42mm; n=85♂♂) (see picture 9). Like in *S. fusca* and *S. paedisca* the two subsequent imaginal generations phenologically regularly overlapped and at least single individuals of *S. gobica* were recorded continuously from May till September (pers. obs.) At Arslanbob (Jalalabad Oblast) in 2009 at least one male and two females of *S. gobica* of the previous





**Picture 8: Probably for reason of camouflage *Sympecma gobica* perched specifically on pale grey substrates. Several individuals even showed signs of phytomimeses. This male, for instance, strikingly resembles the thin twig in the background. Bishkek, 2009-08-19.**

year's generation were infested with ectoparasitic mites (Hydrachnidia). Probably due to the basically incompatible life-cycle of host and parasite this has previously only rarely been observed in *Sympecma* (see Schneider & Wildermuth 2007). Borisov (2006b) gave a short outline of pre-reproductive movements of the three *Sympecma* species in the northern Tian Shan in adjacent Kazakhstan.





Picture 9: *Sympecma gobica* in their estivating habitat, like this male, usually behaved strikingly fearless and showed almost no flight reaction. Bishkek, 2009-08-27.



## Coenagrionidae

All four found *Coenagrion* species are remarkably uncommon and local or even extremely rare and despite the general ubiquitous *Ischnura elegans* no Kyrgyz member of the Coenagrionidae is common throughout.

### 11. *Coenagrion armatum* (Charpentier, 1840)

(*Coenagrion armatum minor* Belyshev, 1955)

Only one single probably isolated small population was found in 2009 with seven males and two females at a system of shallow spring-fed mires vegetated with dense *Carex*-growths and aquatic plants like *Utricularia vulgaris* and *Hippuris vulgaris* at about 2200m a.s.l. in the steppe of the entirely treeless Suusamyр high valley (Chui Oblast). Other Odonata recorded co-occurring and reproducing in the same habitat were *Enallagma risi*, *Aeshna juncea*, *Libellula quadrimaculata* and *Sympetrum flaveolum*. The habitat and surroundings of this *C. armatum* population structurally matched with the likewise southernly situated and isolated *C. armatum* habitats from the Armenian Highland (Kalkman 2006, Tailly et al 2004) see pictures 10 and 11, however, to rather less extend with the ones described from the Georgian Transcaucasus (Bartenev 1929, see also Ketenchiev & Haritonov, 1998).



Picture 10: View of the habitat of *Coenagrion armatum*. Suusamyр high valley (Chui Oblast), 2009-08-12.





Picture 11: Detailed view of a section of the habitat of *Coenagrion armatum* where the only case of oviposition could be observed. The dense aquatic vegetation is largely dominated by *Utricularia vulgaris* and *Hippuris vulgaris*. The male *Parnassius actius* was just an occasional guest. Suusamyr high valley (Chui Oblast) 2009-08-12.

## 12. *Coenagrion puella* (Linnaeus, 1758)

Uncommon and so far only two populations were found in the north of the country. Most probably *C. puella* is more widespread and the poor data records do not mirror the real status of this species in Kyrgyzstan. To our current knowledge Kyrgyz *C. puella* do not substantially deviate from Central European populations in view of morphology and colouration and do for sure not pertain to *C. australocaspicum* Dumont, 1996.

## 13. *Coenagrion pulchellum* (Vander Linden, 1825)

(*Coenagrion pulchellum asiaticum* (Belyshev, 1964); *Coenagrion pulchellum saisanicum* Belyshev, 1964)



Local, uncommon and only found in the Walnut forest region of the Jalalabad Oblast yet, where the species seems to be confined to running water (see 18. *Ischnura forcipata*). Strikingly some *Phragmites*-ponds (see 25. *Aeshna isoceles*) nearby such a brook-dwelling *Coenagrion pulchellum* population, which virtually fitted perfectly the classical European habitat pattern of *C. pulchellum*, were found completely unfrequented by this species. All found specimens were strikingly dark, the blue markings on S3-S8 are almost completely reduced in males. Moreover, 85% (n=28♂♂) entirely lacked the blue humeral stripes. Although this melanistic tendency is hardly appropriate to substantiate a taxonomical status, there might be reasonable ecological arguments to legitimate an exceptional position of these dark Kyrgyz populations confined to running water. However, according to Belyshev (1961) *Coenagrion pulchellum* is one of the most abundant species at Lake Zaisan (Kazakhstan), from where the taxon *saisanicum* is described. Also Krylova (1969) reports *C. pulchellum* from the lakes of the Sary-Chelek reserve in Kyrgyzstan (Chatkal range; Jalalabad Oblast), a system of interconnected mountain lakes at roughly 1500m asl., but in this case it is not stated whether *C. pulchellum* was found in the standing waterbodies of the lakes proper or at their respective discharges and tributaries, which amongst others hold a vital population of *C. splendens*. For the time being the question of possible rheophilic habitat requirements of particular Kyrgyz populations of *Coenagrion pulchellum* and their status remains open.

#### 14. *Coenagrion scitulum* (Rambur, 1842)

Very rare and like in *C. armatum* only one small population at 1600m a.s.l. in the Walnut forest region (Jalalabad Oblast) around the town of Arslanbob was found so far. Up to 15 males and three females were encountered at a wind-protected small (under average conditions probably perennial) pond largely covered with riverine vegetation consisting mainly of *Juncus inflexus*, *Eleocharis palustris* agg., *Schoenoplectus lacustris* and dense submerge vegetation with *Potamogeton lucens*, *Hippuris vulgaris* and *Ranunculus aquatilis* agg.

This single population was situated in the area most thoroughly explored during this study and several more ponds of the same type in the same altitudinal belt were scrutinized without avail, which might indicate the species' actual scarceness in the whole region. This Kyrgyz population is of special zoogeographical interest as it represents the easternmost outskirts of the species' distribution.



The distribution of *C. scitulum* in the region seems to be unclear to a large extent and insufficient accurate data provide a somehow ambivalent idea of its distribution.

From western Turkey (Kalkman 2006) towards the east *C. scitulum* generally seems to thin out and only a scattered records are known from Iran (Bartenev 1929, Schmidt 1954, Heidari & Dumont 2002), Turkmenistan and Tadjikistan (Belyshev 1989, Popova 1951). According to Chaplina et al. (2007) it is not part of the dragonfly fauna of Kazakhstan, whereas it is stated for Kazakhstan, Tadzhikistan and Kyrgyzstan in Borisov & Haritonov (2007).

### 15. *Enallagma risi* Schmidt, 1961

(*Enallagma cyathigerum risi*, Schmidt, 1961)

*Enallagma risi* was observed only locally so far with scattered populations spread all over the country. It typically colonizes mountainous spring-fed mires up to at least 2200m a.s.l. and often very abundant where found. Reproduction was not confirmed below 1600m a.s.l. All examined populations were remarkably homogenous in both colouration and shape of the appendices (Figure 1) and to current knowledge there is no tendency in Kyrgyz *E. risi* for melanism. As far as the taxonomic status is concerned the line of argument presented in Bernard & Kosterin (2010) is followed thus *E. risi* is given full species rank here.

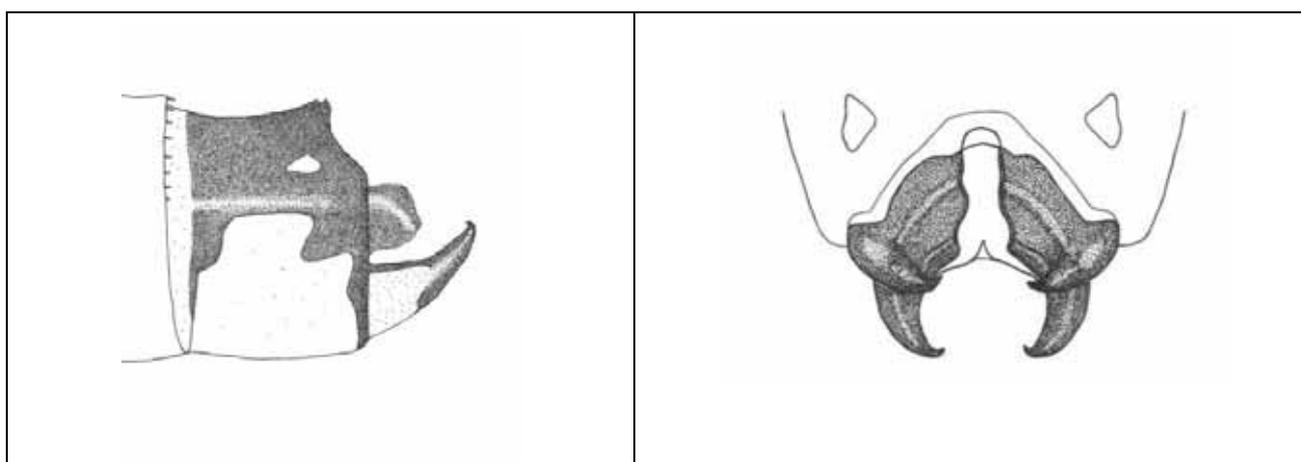


Figure 1: *Enallagma risi* male appendages lateral view (left) *Enallagma risi* male appendages dorsal view (right). Suusamyр high valley (Chui Oblast), 12.08.2009.



**16. *Ischnura fountaineae* Morton, 1905**

(*Ischnura bukharensis*, Bartenev 1913)

To my current knowledge *Ischnura fountaineae* is rare in Kyrgyzstan and only few specimens at shallow artificial reservoirs and their surroundings in the *Carduus albidus*-steppe zone of the Jalalabad Oblast close to the Uzbek border were discovered yet. Like other *Ischnura* species *I. fountaineae* is possibly overlooked and might be more frequent elsewhere in the south of the country. However, records from the Almaty province in adjacent Kazakhstan (Belyshev 1961) points out, that this species also may be expected in the lowland north of Kyrgyzstan.

**17. *Ischnura elegans* (Vander Linden, 1820)**

Like in most parts of Europe *Ischnura elegans* is an ubiquitous resident of almost all standing waters at moderate and low altitudes. In Kyrgyzstan it rarely exceeded 1800m a.s.l. and it was most common in the lowest parts. The position of the appendices superiores of all found populations was more or less identical to Northern and Central European populations.

**18. *Ischnura forcipata* Morton, 1907**

(*Ischnura musa*, Bartenev 1913)

The northern distribution limit of this interesting and poorly known delicate species runs through Kyrgyzstan and *Ischnura forcipata* has never been recorded in adjacent Kazakhstan (cf Chaplina et al. 2007, Borisov & Haritonov 2007). In Kyrgyzstan it generally seemed to be scarce and local, but may have been overlooked due to its rather cryptic, inactive behaviour and its overall appearance suggesting *Ischnura pumilio*. During this study it was found only at the western slopes of the Fergana range (Jalalabad and Osh Oblast). For a member of the genus *Ischnura* it appeared to have a surprisingly clear defined set of ecological requirements and to current knowledge *I. forcipata* seems to be confined to densely overgrown shallow running water between 1000m to 1500m a.s.l. These habitats were typically fed by small slow running helocrenes whose water trickles down the banks of larger mountain rivers and collecting in small impounded depressions (see pictures 12, 14 & 15). These waterbodies were frequently overgrown with *Carex viridula* (= *serotina*), *Carex songarica*, *Glyceria notata*, *Catabrosa aquatica*, *Juncus inflexus*, *Juncus reticulatus*,





**Picture 12:** Like the species itself most of the typical habitats of *Ischnura forcipata* were very inconspicuous and small dimensioned and from a distance most of them were barely recognizable as such. The particular habitat shown on the picture was the marshy green area on the riverbank fed by a small spring. Gumkhana, Jalalabad Oblast, 2009-08-07.



**Picture 13:** At this area of the spring swamp with complete vegetation cover the highest density of individuals of *Ischnura forcipata* were encountered. There, foraging, concurrence fights of males and mating wheels were observed frequently. Gumkhana, Jalalabad Oblast. Gumkhana, Jalalabad Oblast 2009-07-10.





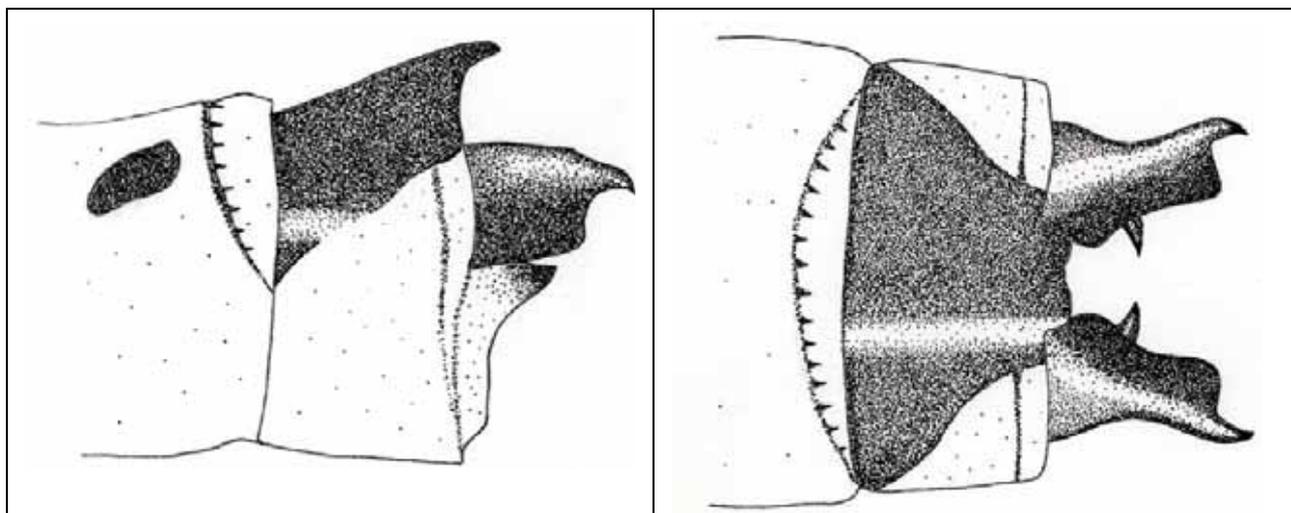
Picture 14: Ovipositing females of *Ischnura forcipata* could be observed only at more open parts of the respective habitats, like this shallow water pool. However, this fact might be biased as it seemed to be easy for ovipositing females in the more densely vegetated parts to evade the odonatologist's eyes. Gumkhana, Jalalabad.



Picture 15: After a few metres the water which fed the small *Ischnura forcipata* habitat flowed into the raging mountain river (as seen on the left side of the picture). Gumkhana, Jalalabad Oblast, 2009-07-10.



*Veronica beccabunga*, *Nasturtium officinalis*, and *Mentha asiatica* and frequently with submerge Characeae (see picture 13). In these habitats *I. forcipata* is almost always accompanied and often outnumbered by the generally much more abundant *I. pumilio*. Other species consistently found to co-occur with *I. forcipata* were *Orthetrum anceps*, *Lestes dryas* and in much lower abundances *Coenagrion pulchellum*. Instances of cleptoparasitic gleaning in *I. forcipata* could be observed twice regarding two different males from two different populations, which both hovered in front of the web of the abundant spiders *Araneus pallasii* and *Araneus quadratus* respectively and decidedly picked out small gnats *Dasyhelea* sp. (Ceratopogonidae). In one case the spider was even lurking in the centre of its web while the *I. forcipata* male pilfered the gnat. This cleptoparasitic behaviour is known from some other *Coenagrionidae* as well including *Ischnura* species (Corbet 1999:683; Fischer 2009).



**Figure 2:** *Ischnura forcipata* appendages lateral view (left). *Ischnura forcipata* male appendages dorsal view (right). Gumkhana (Jalalabad Oblast), 22.06.2008.

The appendices superiors of *I. forcipata* are distinctly larger than the appendices inferiors – a feature unique among European and Central Asian *Ischnura*-species, see figure 2 and picture 16.

Due to the species' very distinct distribution pattern it could be classified as a representative of the Sindhi distribution type (cf De Lattin 1967, cf Dumont 1974, Dumont & Heidari 1996).





**Picture 16:** Although this species bears a striking similarity to *Ischnura pumilio*, with a bit of practise *Ischnura forcipata* is easily recognized even in the field by means of the shape of the male appendages: The appendices superiors are distinctly larger than the appendices inferiors – a feature unique among European and Central Asian *Ischnura*-species. Gumkhana, Jalalabad Oblast, 21.06.2008.

### **19. *Ischnura pumilio*** (Charpentier, 1825)

Though mainly unobtrusive and local in habitats providing slow running water, *Ischnura pumilio* was frequently observed all over the country. Dispersing individuals could be expected everywhere and regularly far away from the next suitable waterbody.

### **20. *Ischnura evansi*** Morton, 1919

So far only a handful of specimens were caught at an artificial reservoir between Jalalabad and Bazar-Korgon (Jalalabad Oblast) and two additional probably wandering males in the open steppe south of the Shamaldy Say reservoir (Jalalabad Oblast). The species might have been overlooked during this study and is probably more common in the very south of Kyrgyzstan (Batken and Osh Oblast).



However, considering recent Kazakh records as far north as the Ustjyurt plateau (Kosterin & Gorbunov 2010) future records even in the northern half of Kyrgyzstan are to be expected. The species is known to migrate (Waterstone & Pittaway 1991).

## Aeshnidae

The Kyrgyz aeshnid species composition is not easily interpreted. Only one of the eight species found could be considered common and for several species in many respects, however, Kyrgyzstan seems to be borderland. As the evaporation rate in the Tian Shan is too high for ombrotrophic moor typical peat bog dwellers are notably absent. Moreover, the very eastern limits of distribution of two of the recorded representatives of the family roughly run through Kyrgyzstan, whilst one further species most probably does not regularly belong to the Kyrgyz fauna and was encountered accidentally only.

### 21. *Aeshna affinis* (Vander Linden, 1820)

*Aeshna affinis* (Picture 17) generally seemed to be local in Kyrgyzstan and reproducing records were confined to few scattered areas. In suitable habitats, however, and in case of preceding optimal weather and precipitation conditions this specialist of shallow seasonal reedy ponds demonstrated an impressive population dynamic and emerged in incredible numbers and subsequently showed a tendency to mass swarm migration (most probably corresponding flight type 4 sensu Corbet 1999:384). Such an event took place in 2009 at typical seasonal ponds with *Schoenoplectus lacustris*, *Phragmites australis*, *Eleocharis palustris* agg., *Juncus inflexus* and *Polygonum amphibium* in the region around Arslanbob (Jalalabad Oblast) at the western slopes of the Fergana range (see picture 19). With mass emergence from Mid-June onwards the regional population was built up to a tremendously high individual density. Probably boosted by additional migrating swarms flocking in from elsewhere the situation finally erupted in coordinated and target-oriented swarm migration of tens of thousands of individuals (Schröter in prep.). In contrast *A. affinis* was never found estivating (flight type 3 sensu Corbet 1999:384) in mountain valleys like *Aeshna mixta* and in this respect did not show a postponed reproductive maturation.





Picture 17: Male of *Aeshna affinis*. Gumkhana, Jalalabad Oblast, 2009-07-12.

Picture 18: Any kind of dragonfly predator benefited highly from the local mass abundance of *A. affinis* in 2009. In virtually all of the numerous webs of the powerful *Argiope lobata* for instance one or more individuals of *A. affinis* ended up. Gumkhana, Jalalabad Oblast, 2009-08-11.





Figure 19: *Aeshna affinis* hatching-box: This shallow semi-perennial *Scirpus lacustris* swamp in the hot and humid subtropical Walnut-Fruit forests of the Fergana range represents exemplarily an optimal local habitat of *Aeshna affinis*. In the background the 4427 m high Baubash Ata ridge. Gumkhana; Jalalabad Oblast, 1300 m a.s.l., 2009-06-18.



## 22. *Aeshna juncea* (Linnaeus, 1758)

*Aeshna juncea* was found throughout the country at higher altitudes, though seldom numerous. Of all Kyrgyz dragonflies *A. juncea* appeared to be best adapted to cold conditions and successful reproduction was evidenced even in the perma frost mires at the southeastern shore of lake Song Köl (Naryn Oblast) at 3000m a.s.l., where one particularly small exuvia and two mature females were found. Kyrgyz *A. juncea* imagines showed strikingly broad lateral yellow thoracal stripes (see picture 20). The tendency of reduction of the dark coloured part of the thorax towards the eastern half of the respective area of occurrence is a well known fact in several representatives of the genus *Aeshna* e.g. in *Aeshna mixta* (cf Selys 1878) and *Aeshna isoceles* (Schmidt 1954) and has induced authors to define new taxa. Mainly based on such traits also several infraspecific taxa of *Aeshna juncea* were described and the Central Asian populations are usually assigned to *mongolica* Bartenev, 1929. However,



Picture 20: *Aeshna juncea* male. Kyrgyz representatives of this species amongst others showed very prominent yellow lateral thoracal stripes, which is why such individuals are usually assigned to the taxon *mongolica* Bartenev, 1929. Upper reaches of Chui river (Naryn Oblast) SW Orto-Tokoj reservoir, 2009-08-21.

although this extension of the yellow parts of the thorax provoked a quite deviant overall appearance when flying to and fro and appeared to be fairly uniform within Kyrgyzstan, it is doubtful if such a variable feature could substantiate a taxonomical status. Single specimens of some Caucasian populations (cf taxon “*crenatoides*” Bartenev, 1925) of *A. juncea* for instance by far exceeded



even *mongolica* in view of the extension of yellow on the thorax, but other individuals from one and the same Caucasian population might be considerably darker and similar to Kyrgyz *mongolica* (own observations). More substantial and interesting than its deviant colouration might be the fact, that Kyrgyz *A. juncea* in high altitudes appeared to breed frequently in calm stretches and vegetated backwaters of the very cold and fast running headwaters of the major rivers, like the upper Chui River south of Kochkor (Naryn Oblast, see picture 21). In these habitats *A. juncea* usually was the only dragonfly species. In dry parts of the country where standing water is limited rivers might be even the major habitat for *A. juncea*. The potency of this species to access high altitudes in the region was also noticed by Wojtusiak (1974).



**Picture 21: In Kyrgyzstan *Aeshna juncea* was found to reproduce regularly even in favourable stretches of deep, cold and fast running rivers. At the small calm-water area with aquatic vegetation on the foreground on the river's left bank, for instance, oviposition took place and several males patrolled in the surroundings. Upper reaches of Chui river (Naryn Oblast) SW Orto-Tokoj reservoir, 2009-08-21.**



**23. *Aeshna mixta*** Latreille, 1805

(*Aeshna coluberculus* Harris, 1782)

Compared to *A. affinis* this species was found to be well distributed throughout the country, but was generally less numerous and unlike its congener in Kyrgyzstan it regularly undertook seasonal refuge wandering (flight type 3 sensu Corbet 1999:384) to westwind shaded valleys at 1500-2200m a.s.l. in the Kyrgyz-Ala-Too and the Fergana range (see pictures 22 and 23). Compared to European populations the Kyrgyz *A. mixta* tended to be more bluish and showed a less clearly defined dorsal yellow “nail”-marking on S2.



Picture 22: Male of *Aeshna mixta* in its mountainous estivation refuge. Alamedin canyon (Chui Oblast), Kyrgyz-Alatoo, 2009-09-03.





Picture 23: Female of *Aeshna mixta* in its mountainous estivation refuge. Alamedin canyon, (Chui Oblast) Kyrgyz-Alatoo, 2009-09-03.

#### 24. *Aeshna serrata* Hagen, 1956

Recorded in Kyrgyzstan for the first time. One single probably wandering male of this huge *Aeshna* species was caught perching on a bush on 3.ix. 2009 in the Alamedin Canyon (Chui-Oblast) at about 1500m a.s.l. while it was eating one of the numerous estivating *Sympecma* present. The occurrence of this species is regularly linked with the steppe belt across the Asian continent (e.g Kosterin 1999). According to Borisov & Haritonov (2007, 2008) in Central Asia the species is confined to Kazakhstan, where its status is classified by Chaplina et al. (2007:356) as “comparatively common in North Kazakhstan”. However, the knowledge of the proper distribution of *A. serrata* in Asia beyond the well known Baltic populations generally seems to be rather poor, especially as far as the southern limit of its distribution is concerned. Several mainly older records from the very south of its area from Turkey (Morton 1914) and the Caucasus (e.g. Ketenchiev & Haritonov 1998, Akramowski 1964) indicate a fragmented southern fringe with small scattered isolated populations. As recent



records show, this seems to be the case along the northern limit of distribution as well (Bernard & Daraz 2010). In this aspect also in the steppes at the frontier area between Kyrgyzstan and Kazakhstan yet undiscovered disjunct populations might exist. If this single Kyrgyz record, however, could be connected to such a nearby population or rather refers to a wandering specimen from the coherent Kazakh populations further away north is open to question.

## 25. *Aeshna isoceles* (Müller, 1767)

(*Aeshna isoceles antehumeralis* Schmidt, 1954)

To current knowledge *Aeshna isoceles* is confined to two small isolated regional populations, whereas successful reproduction could be confirmed so far only at few *Phragmites australis*-ponds with dense aquatic vegetation, most notably *Myriophyllum spicatum*, *Ceratophyllum demersum*, *Polygonum amphibium*, *Utricularia vulgaris* and *Potamogeton lucens* near the town of Arslanbob (Jalalabad Oblast) see picture 26. Single individuals however were observed at some overgrown reedy fishponds northeast of Bishkek as well. This area of former state fishfarming offered plenty of appropriate habitats for *A. isoceles*, thus reproduction in this area seemed to be likely. Together with the records at the Ili river in adjacent Kazakhstan (Belyshev 1961), where it is local and confined to the south of the country (Chaplina et al. 2007), these Kyrgyz populations represent the easternmost records of this species at all and are thus of special zoogeographical interest. Kyrgyz *A. isoceles* constantly showed an extended yellow thoracal pattern. The posterior lateral thoracal stripes almost completely covers the metepimeron (see picture 24) and the nail-shaped whitish-yellow antehumeral stripes are fairly prominent (see picture 25). Such *A. isoceles* are usually assigned to the taxon *antehumeralis* Schmidt, 1950. See also Nr. 22. *Aeshna juncea*.





Picture 24: Male of *Aeshna isoceles*. Kyrgyz *A.isoceles* constantly showed extended yellow thoracal pattern and clear nail-shaped whitish-yellow antehumeral stripes, which corresponds with the description of the taxon *antehumeralis* Schmidt, 1950. Gumkhana, Jalalabad Oblast, 2009-05-28.



Picture 25: *Aeshna isoceles* male in frontal view, showing distinct whitish-yellow antehumeral stripes. Gumkhana, Jalalabad Oblast, 2009-05-28.





**Picture 26: A typical Kyrgyz habitat of *Aeshna isoceles*: Like elsewhere, reedy ponds with well developed aquatic vegetation were the preferred habitat in Kyrgyzstan. Gumkhana, Jalalabad Oblast, 2009-08-11.**

## **26. *Anax parthenope* Selys, 1839**

*Anax parthenope* generally seemed to be local and fairly uncommon in Kyrgyzstan and reproduction could be confirmed only in the subtropical Arslanbob region (Jalalabad Oblast), the catchment area of the lower reaches of the Naryn southwest of the Toktogul reservoir (Jalalabad Oblast) and the Kara Unkur River (Jalalabad Oblast). Elsewhere only a few single wandering specimens were encountered.

## **27. *Anax ephippiger* (Burmeister, 1839)**

Single wandering specimens of *Anax ephippiger* were observed throughout the country. It was fairly numerous in 2009 in the Kyrgyz Fergana valley at the lower reaches of the river Naryn southwest of the Toktokul reservoir in the Usbek frontier region (Jalalabad Oblast), whereas successful reproduction evidenced by exuviae findings was noticed only once. During this study *A. ephippiger* was found to end up in vehicle grills regularly.



## 28. *Anax imperator* (Leach, 1815)

*Anax imperator* is apparently scarce and very local in Kyrgyzstan and together with the disjunct Pakistanian populations (cf Geijskes & van Tol 1983) the Kyrgyz ones mark the easternmost distribution limit of this species and are thus of special faunistical interest. During this study it was found regularly only in the Arslanbob region (Jalalabad Oblast) and in the surroundings of Bazar Korgon (Jalalabad Oblast), where it reproduced in densely vegetated *Phragmites australis* ponds, little backwaters and calm stretches of rivers strictly below 1500m a.s.l.

Around the town of Arslanbob it was a familiar sight on meadows and clearing fringes in the open *Juglans regia*-forest (see picture 27), elsewhere north of the Fergana range only two individuals were encountered near the city of Tokmok (Chui Oblast).



Picture 27: A copula of *Anax imperator* perching on an apple tree in a clearing of the Walnut-Fruit forests of the western slopes of the Fergana range. These Kyrgyz populations mark the species' eastern distribution limit. Gumkhana, Jalalabad Oblast, 2009-06-16.



## Gomphidae

As a mountainous country Kyrgyzstan offers numerous watercourses, but low water temperatures and strong currents with regular flash floods in summer seem to reduce the number of stretches favourable for rheophilic dragonflies considerably (see *Calopteryx*). Except for the robust, widespread and moderately common *Ophiogomphus reductus* all gomphid dragonflies are remarkably rare and local in Kyrgyzstan.

### 29. *Ophiogomphus reductus* Calvert, 1898

Members of the genus *Ophiogomphus* seem to represent the most cold tolerant gomphid dragonfly species worldwide, even reaching the Arctic Circle (Whitehouse 1941; Karjalainen 2002, 2010). *Ophiogomphus reductus* was recorded up to 3300m a.s.l. in the Himalayas (Asahina 1979) and therefore it is not surprising that *O. reductus* in terms of water temperature and probably rheotactic adaptation also in Kyrgyzstan clearly shows the highest ecological potency and plasticity of all found members of the family (see picture 28). According to Borisov (2005) the species` distribution is linked to rivers with snow water. The records made during this study largely confirm this assumption (see pictures 29 & 30). Reproduction was recorded from the lowest regions up to at least 1700m a.s.l. at the western slopes of the Fergana range (see picture 31). In the first half of its flight period this species behaved extraordinarily shy and was hard to approach.



Picture 28: *Ophiogomphus reductus*: This Central Asian congener of *Ophiogomphus cecilia* is mainly characterized by its stouter build, considerably longer male appendages and reduced black thoracal pattern. Gumkhana, Jalalabad Oblast, 2009-08-01.





Picture 29: A typical habitat of *Ophiogomphus reductus*: At this particular river stretch frequently two or three males perched on big streamside rocks. Arslanbob suu, Gumkhana, Jalalabad Oblast, 1300m a.s.l., 2009-08-07.



Picture 30: Flash flood and strong sediment flow after heavy summerly rain: Of all Kyrgyz gomphids *Ophiogomphus reductus* seemed to cope best with the high discharge diversity of most of the Kyrgyz rivers. Arslanbob suu, Gumkhana, Jalalabad Oblast, 2009-08-01.





Picture 31: At this oxbow of the Chui river (Chui Oblast) oviposition of *Ophiogomphus reductus* could be observed. W Tokmok, 2009-08-20.

### 30. *Onychogomphus flexuosus* (Schneider, 1845)

Rare and so far only known from the lowest parts of the country like the lower reaches of the Kara Unkur river (Jalalabad Oblast) and the Chui river north of Bishkek. The latter population was already mentioned by Popova (1936) and is probably connected to those in adjacent Kazakhstan (Belyshev 1961).

*O. flexuosus* is generally considered to be confined to lower altitudes not exceeding 900m a.s.l. (Dumont 1992, Belyshev et al. 1989) which restricts the species' potential Kyrgyz distribution considerably.

### 31. *Onychogomphus lefebvrii* (Rambur, 1842)

Recorded in Kyrgyzstan for the first time. Only a few populations with a total of less than two dozen individuals were found yet. It could preliminarily be stated that, compared to *O. flexuosus*, this species avoids the lower reaches of the large rivers like the Chui or the Naryn and seems to prefer the smaller riv-



ers and tributaries at altitudes between roughly 1000 and 1500m a.s.l. like the upper Kara Unkur river (Jalalabad Oblast) and rivulets on the northern slopes of the Kyrgyz-Ala-Too (Chui Oblast). Generally, the offer of such rivulets in the above mentioned altitudinal zone is fairly good and the species is probably more widespread and common. All records dated from June which might indicate a rather short flight period in Kyrgyzstan making the species prone to be overlooked. The proper distribution of this species in Central Asia and the status of allied taxa of the *forcipatus* species group in general seem to be unclear to a large extent. Neither in the recent checklist for Kazakhstan (Chaplina et al. 2007), for instance, nor in the review of the Central Asian Odonata fauna by Borisov & Haritonov (2007) Kazakh records of *O. lefebvrii* are mentioned, but in Boudot (2010:130) a picture of a male photographed at Boroldaytau, Kokbulak Valley in southern Kazakhstan is published etc.

The records of *Onychogomphus forcipatus* from the Chui river given in Popova (1936) refer to larvae, and against the background, that the larvae of the closely related congener *Onychogomphus lefebvrii* is very similar and was described only in 1992 (Dumont et al. 1992) it remains unclear, which species or which member of the *forcipatus* taxon group was involved here (cf Dumont et al. 1992:177).

However, during this study *O. lefebvrii* was recorded from tributaries of the Chui river, and at least in the realm of the middle reaches of the latter the occurrence of *O. lefebvrii* seems well possible.

### **32. *Lindenia tetraphylla* (Vander Linden, 1825)**

A total of about 42 Individuals of *Lindenia tetraphylla* were recorded all over the country in open landscape and along rivers with a majority in the Kyrgyz part of the Fergana Valley around Shamaldy Say reservoir at the lower reaches of the Naryn river (Jalalabad Oblast) close to Uzbekistan and along the Kara Unkur river southwest of Bazar Korgon (Jalalabad Oblast), the majority of them in 2009. Two single males in the open landscape north of Bishkek in 2008 probably represent the northeasternmost findings of this species at all (cf. Schorr et al. 1998). Interestingly, at least five fresh males were observed in 2009 accompanying immense wandering swarms of *Aeshna affinis* over high mountain pastures of the Fergana range at 2700m a.s.l., which match with the species' previously stated potency for swarm wandering and nomadic behaviour (cf Schneider 1981).



### 33. *Gomphus (Stylurus) ubadschii* Schmidt, 1953

(*Gomphus flavipes lineatus* Bartenev, 1929)

The status of *Gomphus (Stylurus) ubadschii* in Kyrgyzstan remains puzzling. Eight males and one female plus one copula were spotted at the floodplain of the river Chui northwest of Bishkek in the first days of August 2009. In 2008 the species was not found there despite intensive research. The remains of a female found in the grill of a car at a petrol station near Arimdzhhan (Jalalabad Oblast) very close to the Uzbek border might indicate a possible occurrence in the Fergana valley as well. Moreover, one gomphid dragonfly with a conspicuously clubbed tail in the bill of a Blue-cheeked Bee-eater (*Merops persicus*) near the City of Kara Balta (Chui Oblast) pertained most probably to this species. It remains unclear whether this species is really rare or has only been overlooked. However, the conditions for this lowland species seem to be generally limited in Kyrgyzstan.

## Cordulegastridae

As member of the insignis taxa-complex (“bidentata-group”) *Cordulegaster coronata* is the only representative of the family that is found in Kyrgyzstan.

### 34. *Cordulegaster coronata* Morton, 1916

This species endemic for Central Asia was found on the southern slopes of the Kungey Alatau north of lake Issyk-Köl (Issyk-Köl Oblast), in the Chychkan gorge (Jalalabad/Chui Oblast) and especially in the southwestern Fergana range (Jalalabad Oblast). An exceptionally strong population was encountered in the *Juglans regia*-forest zone on the southern foothills of the Baubash-Ata range (Jalalabad Oblast). In this area in the surroundings of the villages of Arslanbob, Dashman and Kyzyl Unkur *C. coronata* inhabited with blanket coverage all local brook systems both in stretches running through the densely forested *Juglans regia*-belt and in open pastures above the treeline. During the exceptionally dry winter and the subsequent hot summer 2008 most of these brooks dried out thus causing a mass concentration of hundreds of individuals in the end of July at one of the last remaining stream stretch with permanent water. This stretch ca. 150m in length and sparsely overgrown with *Veronica beccabunga*, *Cortusa brotheri*, *Dactylorhiza umbrosa* was situated at 2300m a.s.l. just above the artificial treeline (see picture 32). Along this water course more than 50



ovipositing females could be counted and 44 copulation wheels tried to perch at the same time on some scattered *Ferula kuhistanica* and single bushes of *Rosa kokanica* and *R. fedtschenkoana* in the surroundings. In a systematic count with a mechanical hand counter 582 males passed during 2 x 15 mins which equals one individual every three seconds.



**Picture 32:** This small spring brook with steady water delivery held an exceptional strong population of *Cordulegaster coronata* and could be considered a prime example for an optimal habitat for this species. 14.07.2008 'Ütsch Tschoku', southern foothills of Baubash-Ata range, Jalalabad Oblast, ca 2100m a.s.l., 2008-07-12.

As potential food of the larvae of *C. coronata* Nematophora, Trichoptera, Hirudinae and Amphipoda were found in fairly high density. Except from some single males of *Orthetrum brunneum* perching on few muddy stretches no other dragonfly species was

recorded at this brook system. A comprehensive review of the distribution, taxonomical status and ecology of *C. coronata* is currently worked out



(Schröter in prep.). Interestingly, the lateral spot on S1 in *C. coronata* is situated at the postero-ventral margin (see picture 33). This trait otherwise is said to be strictly exclusive for representatives of the *boltonii*-species group (cf. Kalkman 2006).



Picture 33: Male of *Cordulegaster coronata* in lateral view.



Picture 34: Female of *Cordulegaster coronata*. “Ütsch Tschoku”, southern foothills of Baubash-Ata range, Jalalabad Oblast ca. 2600 a.s.l., 2008-06-28.



## Libellulidae

Some two thirds of the Kyrgyz dragonfly fauna pertain to this family and with eleven species *Sympetrum* represents the species-richest genus of the country.

### 35. *Libellula quadrimaculata* Linnaeus, 1758

This species was common and widespread along an altitudinal belt roughly between 1200m and 2500m a.s.l., where it reproduced in a broad spectrum of different types of perennial waters. A single exuvia was even found hidden between several exuviae of *Cordulegaster coronata* at a fast flowing stretch of a mountain spring brook. At higher altitudes it was on the wings as late as the end of August.

### 36. *Libellula (Platetrum) depressa* Linnaeus, 1758

In the region this species is at the edge of its distribution. However, in Kyrgyzstan *Libellula depressa* was observed throughout the lower parts of the country, though appeared to be inconspicuous and never numerous. Like elsewhere *L. depressa* seemed to be highly mobile and only a fraction of the records could be implicated in reproduction.

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

In June *Orthetrum albistylum* was one of the most frequent and numerous anisopteran dragonflies in Kyrgyzstan, especially in the southern half of the country.

This species was encountered at any kind of perennial pond or water reservoir with minimal submerge vegetation, like shallow water reservoirs for cotton irrigation or the widespread local clay-pits used for traditional mudbrick buildings.

Although a predominant and typical species of the hot lower parts of the bigger river valleys on some occasions reproduction was confirmed up to an altitude of 1800 m a.s.l.

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

As an ubiquitous species *Orthetrum brunneum* could be found throughout the lower and middle altitudinal zone of the country. In regions that offered fa-



avourable microclimatical conditions it frequently entered higher altitudes and mating and oviposition were observed up to 2400m a.s.l in the southwestern Fergana range (Jalalabad Oblast). This species was also regularly found at small calm and sunny stretches of rivulets and brooks. The Kyrgyz *O. brunneum* were morphologically more or less identical to those found in Europe and did not exhibit any traits of the taxon *lineostigma* (Selys, 1886), which is stated from adjacent China and from Mongolia (Dumont 2003).

### 39. *Orthetrum cancellatum* (Linnaeus, 1758)

Within the scope of this study the status of this species in Kyrgyzstan is puzzling and *Orthetrum cancellatum* of all species curiously remains problematic. The only records so far refer to two exuviae from a water reservoir for cotton field irrigation near Jalalabad. Most probably this data do not mirror the species' real status in Kyrgyzstan. The males of Asian populations east of Turkey tend to show a clear extension of blue pruinosity, which amongst other features led to the description of the taxon *orientale* Belyshev, 1958. Mature males of adjacent Usbek populations for instance are completely blue as in *O. brunneum* (R. Busse pers. comm.). As long as no imago has been found within this study, no assessment or infraspecific assignment of the Kyrgyz population is possible.

### 40. *Orthetrum anceps* (Schneider, 1854)

(*Orthetrum translatum* Bartenev, 1929, *Orthetrum coerulescens anceps* Schneider, 1854)

This rheophilic species was local but steadily abundant at small helocrenes and rivulets (see picture 35). Compared to *O. anceps* from Tunisia and Georgia the so far studied Kyrgyz males are characterized by significantly less morphological variability of the lamina anterior. As the taxonomic status of *Orthetrum anceps* and *Orthetrum coerulescens* remains unclear and depends on the respective taxonomic concept (cf. Mauersberger 2008, Diatlova 2006, Schneider 1985) it is for pragmatic reasons listed here in species rank. Although the species' habitat preferences superficially seemed to overlap widely with those of *Cordulegaster coronata* the two species surprisingly were found to be more or less mutually exclusive.





**Picture 35:** Spring brooks and rivulets at the floodplains of mountain rivers at moderate altitudes were steadily inhabited by *Orthetrum anceps*. The above shown brook ran through the grazed marshy meadow-like alluvial area of the river Arslanbob suu (Jalalabad Oblast) near the town of Arslanbob and hold a exceptionally strong population of *O.anceps*. Moreover, *Ischnura forcipata* and *Coenagrion pulchellum* in much lower abundances could be encountered here. Gumkhana, Jalalabad Oblast, 2009-08-09.

#### **41. *Orthetrum sabina* (Drury, 1770)**

New to the Kyrgyz dragonfly fauna. Two single males were encountered in 2008 only around Shamaldy Say reservoir at the lower reaches of the Naryn River (Jalalabad Oblast) in the Fergana valley close to Uzbekistan. As one of the commonest dragonflies of tropical Asia *Orthetrum sabina* touches the region in the southern part of the Turan lowland in adjacent Uzbekistan and Turkmenistan (Borisov 2009), from where some of these swift flyers via the Fergana valley might regularly find their way to Kyrgyz territory. *O. sabina* is also stated for southern Kazakhstan, where it is considered to be rare (Chaplina et al. 2007). For the present the species` status in Kyrgyzstan remains open, but as in *Selysiotthemis nigra*, at least local sporadic reproduction seems to be possible.



**42. *Crocothemis erythraea* (Brullé, 1832)**

*Crocothemis erythraea* was common countrywide in the lowest regions and might be found especially in the southern half of the country at almost all types of standing waters offering minimal aquatic vegetation. According to the diagnostic traits (especially the transversal carina of S4 of females) given in Schneider (1985) all hitherto known Kyrgyz populations of *Crocothemis erythraea* do certainly not pertain to the taxon *chaldaeorum* Morton, 1920. To current knowledge this taxon is confined to countries along the Persian Gulf and it is very unlikely that it occurs in Central Asia at all (contra Belyshev et al. 1989, contra Borisov 2009, contra Borisov & Haritonov 2008, cf review by Schneider 1985).

**43. *Crocothemis servilia* (Drury, 1770)**

New to the fauna of Kyrgyzstan, where this species was probably overlooked previously and not distinguished from its doppelganger *C. erythraea*. According to the present data *Crocothemis servilia* is rather unevenly distributed and it almost exclusively occurred in southwestern Kyrgyzstan, especially in the Fergana valley with its subtropical climate. However, at the lower reaches of the Naryn and the Kara Unkur (both Jalalabad Oblast) and in the catchments of the Ak Buura and Kurshab (both Osh Oblast) and around the city of Jalalabad respectively, *C. servilia* was one of the most abundant dragonflies and regularly co-occurred with *C. erythraea*. Elsewhere in the north only comparatively few individuals were encountered, mainly restricted to the floodplain along the river Chui hollow. However, due to insufficient data the abundance of this species in this region might be underestimated. Ecological differentiation of the two *Crocothemis* species in Kyrgyzstan is difficult to assess, but it is suggested that *C. servilia* copes somewhat better with fluctuations of the waterlevel and the seasonality of waterbodies than its congener. Moreover, *C. servilia* was the dominant *Crocothemis* species at altitudes above 1300m a.s.l. Mating and oviposition were exceptionally observed up to at least 2000m a.s.l. (Pictures 36 & 37).





Picture 36: *Crocothemis servilia*. The shown female's valvula vulvae sticks out extraordinarily caused by the inflated abdomen full of eggs. Gumkhana, Jalalabad Oblast, 2009-08-11.



Picture 37: One of numerous coves of the Toktokul reservoir (Jalalabad Oblast), where both *Crocothemis* species were found to be abundant. 2009-08-12.



#### 44. *Sympetrum arenicolor* Jödicke, 1994

This species (picture 38) was found in low abundance throughout the country, from the lowest parts up to 2500m a.s.l. Mainly single individuals were encountered, typically perching in open steppic landscape and only seldom more than a dozen individuals were found at the same place. Obvious target-oriented migration was noticed from end of July onwards at the foothills of the Kyrgyz Alatau (Chui Oblast), along the Kara Unkur river valley (Jalalabad Oblast) and along the upper reaches of the Chui river between Balykchy and Kochkor (Issyk-Köl/Naryn Oblast). In all three cases the flight movements were directed upwards to the mountains, so that this kind of migration may involve also pre-reproductive seasonal refuge wandering (flight type 3 sensu Corbet 1999:384), which would correspond to Borisov (2006b, 2009).



**Picture 38: *Sympetrum arenicolor*: At first sight quite similar to its “decolorate” congeners (especially to *Sympetrum vulgatum decoloratum*), the shape of the posterior hamule and the appendages of *S. arenicolor* are distinct: In lateral view the inner branches of the posterior hamule are entirely hidden, the outer ones pointing backwards in smooth transition to the adjoining lobe. The appendix inferior is long, reaching at least halfway between the tip of the appendices superiors and the ventral angel. Both traits are easily recognized on photos or even on perching males from short distance.**



However, during this study *S. arenicolor* was not found to be a member of the typical dragonfly estivation communities in summer refugial areas in specific mountain valleys, like *S. striolatum pallidum* and *Sympetrum meridionale*. Therefore, this particular migration pattern and the species' estivation strategy might deviate somehow from that of its congeners. The habitat preferences of *S. arenicolor* in Kyrgyzstan remained unclear to a large extent. During this study only two cases of reproduction could be evidenced. On the one hand at a sandy and sparsely vegetated riparian pool with scattered stands of *Potamogeton lucens*, *Eleocharis palustris* agg., *Typha latifolia* and *T. laxmannii* at the floodplain of the river Chui (Chui Oblast) and on the other hand at a shallow pond sparsely overgrown with *Schoenoplectus lacustris*, *Juncus inflexus* and *Polygonum amphibium* at 1600m a.s.l. in the southwestern Fergana range (Jalalabad Oblast). The characters of both habitats were quite different thus hardly any conclusions with respect to the species' preferences could be drawn yet.

According to Borisov (2006b), however, breeding of this species is basically connected to artificial lowland ponds and *S. arenicolor* is considered to be an actually mountainous species, which due to increasingly supplied artificial waterbodies for irrigation only secondarily in historic times colonized lower altitudes.

The first records for Azerbaidjan (Jödicke et al. 2009) referred to specimens photographed at artificial ponds in the Shirvan lowland along the Caspian Sea and might thus support this fact.

#### **45. *Sympetrum depressiusculum* (Selys, 1841)**

*Sympetrum depressiusculum* was found to be local and fairly uncommon, though it might occur in very high abundances in suitable habitats. In the context of this study this species was recorded only in the northern half of the country but at least one historical finding from the Uzgen district, Osh Oblast (Brauer 1880) might indicate a wider southward distribution. Large populations of *S. depressiusculum* were encountered at shallow vegetated backwaters and flood ponds at the fringes of the remaining riparian Tugai forest of the river Chui (see picture 39). During this study this species was recorded only in the northern half of the country. However, at least one historical finding from the Uzgen district, Osh Oblast (Brauer 1880) indicates a wider distribution towards the south and the occurrence in the remaining Tugai forest flood-plains



in lower regions of the south is likely. Due to its scarceness in Kyrgyzstan the ecological requirements are rather unclear. The surroundings of the floodplain forest habitats mentioned above were characterized by vegetation comprising *Eleagnus angustifolia*, *Salix wilhelmsiana*, *S. acutiflora*, *S. songorica*, *Myricaria bracteata* and *Hippophae rhamnoides*. Oviposition was observed in shallow ponds vegetated with *Eleocharis palustris* agg., *Bolboschoenus maritimus*, *Schoenoplectus tabernaemontani* and *Typha laxmannii* with scattered stands of *Phragmites australis* and submerse Characeae. Dense gatherings of adults were found in grazed steppic meadow-like riverbanks and nearby wind-shaded patches of *Agrostis gigantea* and *Calamagrostis pseudophragmites*. Like elsewhere in Kyrgyzstan *S. depressiusculum* is a typical lowland species and does probably not exceed above 1200m a.s.l.



**Picture 39:** In Kyrgyzstan *Sympetrum depressiusculum* was found to be local and confined to the floodplains of few river stretches. At suitable habitats, however, like this oxbow of the Chui river with swampy banks, it could be encountered in fairly high abundances. Chui river, W Tokmok Chui Oblast, 2009-08-20.

#### **46. *Sympetrum flaveolum* (Linnaeus, 1758)**

This species was found to be widespread but unobtrusive. Often only single migrating individuals were encountered. In Kyrgyzstan *Sympetrum flaveolum* seemed to find its habitat optimum rather in shallow and densely vegetated mountaineous spring bogs than in seasonal flooded lowland habitats like in



Europe and reproduction was recorded only above 1400 m a.s.l. The Kyrgyz population usually showed strongly reduced amber markings at the wingbase. Such specimens led to the designation of the taxon *austrinum* Akramowski, 1948, but it is questionable whether such variable colouration justifies a special taxonomic rank.

#### **47. *Sympetrum haritonovi* Borisov, 1983**

This enigmatic tiny species seems to be generally rare and in many respects it could be considered as a habitat specialist. According to current knowledge the species is confined to mountainous spring swamps and marshy spots along mountain brooks above 1800 a.s.l. (Dumont et al 1995, Kalkman 2006). The Kyrgyz habitats of *S. haritonovi* corresponded exactly to this description. During this study three small populations in two regions in the Fergana range roughly between the Baubash-Ata massif and the Chychkan gorge (Jalalabad / Chui Oblast) were found. All of them were situated at an altitude between 2100 and 2400m a.s.l. The localities were visited in the first half of August. Only in one of the three populations more than five males could be recorded. *S. haritonovi* bred in small shallow marshy depressions vegetated with *Veronica beccabunga*, *Juncus bufonius*, *Juncus articulatus*, *Dactylorhiza umbrosa*, *Cortusa brotheri* and *Swertia lactea* with slow but steadily flowing water fed by several small limnocrenes. These depressions were surrounded by open dry meadow-like vegetation with *Poa alpina*, *Poa bulbosa*, *Achnatherum splendens*, *Festuca valesiaca*, *Trisetum spicatum*, *Dactylis glomerata* and *Carex turkestanica* and additional scattered patches of *Iris ruthenica*, *Paeonia hybrida*, *Allium atosanguineum*, *Ziziphora clinopodioides*, *Ferula kuhistanica* and *F. kelleri*. None of the three habitats exceeded 100m<sup>2</sup>. Other dragonflies found reproducing in the same places were *Orthetrum brunneum* and *Sympetrum flaveolum* and furthermore single wandering specimens of *S. arenicolor*, *S. meridionale*, *S. fonscolombii*, *A. juncea*, *P. flavescens*, *A. affinis* and *I. pumilio* were at least temporarily on the wings at the same place. *S. haritonovi* gave the impression of a rather weak flyer with a small home-range. It was never recorded far away from the breeding habitats.

These Kyrgyz populations represent the northernmost occurrence at all and beside the records by S.N. Borisov (in Dumont et al. 1995) from the Alay range the only ones from Kyrgyz territory so far. All three populations found during this study were situated in intensively grazed areas with high livestock densities. The small water-filled depressions of the habitats were used as watering places for cattle and suffered severely from trampling. At least one of the habi-



tats which in 2008 held a small population of *S. haritonovi* was completely trampled in 2009 and all attempts to relocate *S. haritonovi* in the area were fruitless. The distribution of *S. haritonovi* almost completely corresponds to regions with increasing cattle breeding in the mountains as subsistence economy and in this context even the remotest mountain areas are entered and affected by cattle. The well-known isolated Turkish population in the Taurus for instance has already been exterminated by drainage and ploughing (R. Seidenbusch pers. comm.) and although no concrete data are available it is feared that many of these small vulnerable habitats of *S. haritonovi* may already be destroyed also in Central Asian and Kyrgyz mountains by too high livestock densities and general overexploitation of the mountainous areas (see also Kalkman et al. 2004).

#### 48. *Sympetrum meridionale* (Selys, 1841)

*Sympetrum meridionale* was very common throughout Kyrgyzstan and reproduced in a wide range of different types of waterbodies. As a frequent migrator at least single individuals could be found from July onwards virtually everywhere in any places at any altitudes just reachable for dragonflies. This species has been found to undertake frequently systematic pre-reproductive movements up to the mountains (flight type 4 sensu Corbet 1999:384) and



Picture 40: *Sympetrum meridionale* was the preferred host of parasitic aquatic mites (cf *Arrenurus papillator*) and especially in 2009 virtually all of the numerous individuals were heavily infested. Gumkhana, Jalalabad Oblast, 2009-08-05.



locally huge numbers of estivating individuals could be found gathering in mountain valleys offering an appropriate microclimate. Like *Sympetrum fonscolombii* in Kyrgyzstan *S. meridionale* seemed to be a favourite host of ectoparasitic mites (Hydrachnida) and in 2009 virtually every individual was severely infested (see picture 40). Together with *Sympetrum fonscolombii*, the two *Crocothemis* species, *Orthetrum albistylum* and *Aeshna affinis* this species belonged to the most abundant anisopteran dragonflies of Kyrgyzstan.

#### **49. *Sympetrum pedemontanum* (Allioni, 1766)**

Like *S. depressiusculum* with which it frequently co-occurred, *Sympetrum pedemontanum* turned out to be generally scarce and local and confined to the lowest parts of the country. Yet in favourable habitats, it was encountered locally in very high abundances. In the southern half of the country surprisingly only single specimens were noticed and breeding could not be confirmed beyond the Suusamyr range. It seemed to be most abundant between the floodplain of the river Chui north of Bishkek and the northern slopes of the Kyrgyz Alatau, as well as round lake Issyk-Köl. Reproduction was recorded at sandy riparian ponds of lower river stretches (cf. *Sympetrum depressiusculum*), clay pits and irrigation ditches.

#### **50. *Sympetrum sanguineum* (Müller, 1764)**

This species was uncommon and fairly local, except from the subtropical *Juglans regia* forest in the Arslanbob region (Jalalabad Oblast). In this area a phenotypically distinct regional form inhabited frequently any kind of seasonal waterbodies. This population was characterised by the lack of black markings on the abdomen and the reduction of the black pattern on the sides of the thorax, so that this local form of

*S. sanguineum* appeared to be almost completely red (see picture 41). These traits were constant and yet no intermediate individuals were observed. These individuals of the southwestern Fergana range do by all means not match with any of the hitherto described subspecies of *S. sanguineum* (cf. Belyshev 1973).





**Picture 41: “Sanguinissimum”:** The Kyrgyz representatives of *Sympetrum sanguineum* are characterized by the absence of black abdominal patches (dorsal S 8-9 and lateroventral 3-9) and reduced black thoracic pattern. Gumkhana, Jalalabad Oblast, 2009-07-09.

### **51. *Sympetrum striolatum pallidum* Selys, 1887**

This distinct taxon was encountered predominantly in the northern half of Kyrgyzstan, estivating in great numbers in sunny and calm mountain valleys with a favourable mesoclimate in the Kyrgyz Alatau (cf Nr.10 *Sympecma gobica*). In August/September 2009, however, it could be found even in the city centre of Bishkek, where hundreds of specimens perched lined up like pearls on virtually every vertical structure available, like hoardings and fences along the main roads (see pictures 42, 43, 44 & 47). These urban estivators seemed to be perfectly adapted to the traffic chaos and the numerous passers-by. Due to reduced flight reaction they could be successfully collected and picked by hand (at the crossing Ulitsa Almatinskaya/Chui Prospekt for instance)! The nature of the contact zone of *pallidum* and the nominate taxon seems to be largely unknown (but see Dumont 2003 on the taxon *imitoides*). However, the very distinct phenotypical overall appearance of the taxon *pallidum* and the



clearly deviating shape of the secondary genitalia (see pictures 45 & 46) cast its current taxonomic status as a subspecies of *Sympetrum striolatum* seriously into doubt.



**Picture 42: Male *Sympetrum striolatum pallidum* perching on the iron fence of a petrol station in Bishkek. Except for the fossae the black pattern of the thoracal sutures were almost completely reduced in this taxon. Several (probably) older males like the one on the picture showed a distinct reddish tinge on thorax, frons and postclypeus. Bishkek, 2009-08-18.**





Picture 43: Not a typical dragonfly habitat at first sight: A crossing at the traffic artery “Chui Prospekt” in the Kyrgyz Capital Bishkek. In late summer numerous *Sympetrum striolatum pallidum* could be observed perching on any upright structures, like fences, traffic signs, bus-stop shelters etc. Interestingly, these city dwellers were adapted to the hectic hustle and bustle of this Asian major city and showed almost no flight reaction at all. Bishkek, 2009-08-18.



Picture 44: In female Kyrgyz *Sympetrum striolatum pallidum* the red abdominal pattern is almost always restricted to a narrow dorsal line thus the pair of pale spots typical for males are absent. The extension and shape of black abdominal markings, however, vary considerably. Bishkek, 2009-08-19.





Picture 45: Male of *Sympetrum striolatum pallidum* in lateral view: The genital lobes are distinctly smaller than in the nominate taxon and make the fork-like posterior hamule appear more prominent.



Picture 46: Enlarged lateral view on the male secondary genitalia of *Sympetrum striolatum pallidum*.





**Picture 47: Typical habitus of a male *Sympetrum striolatum pallidum*: Beside its stout build and the pale thorax especially the contrasting abdominal colour pattern with a distinct pair of pale spots on the postero-dorsal margin of S 3-7 provokes a rather unmistakable overall appearance. Bishkek, 2009-08-18.**

## **52. *Sympetrum vulgatum decoloratum* (Selys, 1884)**

This subspecies was recorded nationwide, but never numerous and beside its relative *S. haritonovi* this taxon might be designated the most subdued and inconspicuous *Sympetrum* species of Kyrgyzstan. The species' pattern of occurrence is fairly difficult to interpret, especially as to the nature of its movements. Single individuals were found to join mixed species gatherings at estivating habitats at higher altitudes. The number of specimens recorded at such places, however, was not significantly higher than elsewhere. Hence, the movements of *S. vulgatum decoloratum* rather correspond to unsystematic dispersal flights. Due to only a handful of records implicating mating or reproduction, up to the present it is difficult to associate this subspecies to a certain type of habitat. The distribution areas of the nominate form and *decoloratum* seem to overlap in parts of Kyrgyzstan. As to the extent of black patterns, par-



ticularly on legs and thorax, any kind of intermediate forms could be found, albeit the typical 'decolorate' type without any black markings was more frequent than the transition forms.

### **53. *Sympetrum (Tarnetrum) fonscolombii* (Selys, 1840)**

This spry flier was notably common in the Fergana valley, but particularly rarer in the northern part of the country. In the lower parts of the southwest, however, it locally occurred in high abundances, typically at rice fields, water reservoirs with shallow vegetated banks or in clay pits for traditional mudbrick house building. Phenology and life cycle of the Kyrgyz populations clearly deviated from all other strictly univoltin local *Sympetrum* species (cf. review by Corbet et al. 2006). There was some indication for trivoltinism at least locally in parts of the Osh and southern Jalalabad Oblast. However, it turned out to be difficult to test this hypothesis as local populations were regularly exposed to influx of huge swarms from elsewhere. In 2009 at least three clearly distinguishable influx waves were noticed between May and September. These migrators probably came from the Turan desert lowland and made use of the Fergana valley as gateway to Kyrgyzstan. As far as the age structure is concerned the individuals of these swarms were surprisingly heterogeneous comprising both immatures and adults including worn individuals. Gatherings of wandering *S. fonscolombii* might appear virtually everywhere up to altitudes of at least 2500m a.s.l. It was never found to undertake seasonal refuge flights (flight type 3 sensu Corbet 1999:384) like its estivating congeners that showed postponed reproductive maturation (cf. Nr. 51 *Sympetrum striolatum pallidum*). The species' eruptive and unpredictable occurrence over space and time is rather difficult to explain and using the data yet no general pattern is recognisable. However, *S. fonscolombii* is known to undertake autumnal southward migrations in the western Tian Shan in Kazakhstan (Borisov 2009).

### **54. *Selysiothemis nigra* (Vander Linden, 1825)**

New to the Kyrgyz fauna. This species was found in 2009 only and in total 14 Individuals (all males) were recorded at different places in the *Carduus albidus*-steppe along the lower reaches of the river Naryn within the Jalalabad and Osh Oblast in the Fergana Valley close to the Usbek frontier. *Selysiothemis nigra* is known as an erratic nomad and strong swarm migrant (Schneider 1981). Because reproduction has not been confirmed yet, the status of this species in Kyrgyzstan remains unclear for the present. Yet, at least sporadic reproduc-



tion in the lowlands of the Kyrgyz part of the Fergana valley is to be expected. *Selysiotthemis nigra* is stated for southern Kazakhstan in Chaplina et al. (2007).

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

Single specimens of this powerful cosmopolitan migrant were found regularly throughout Kyrgyzstan, from the lowest parts of the Fergana valley along the Naryn and river Kara Unkur (Jalalabad Oblast) to the mountains south of the Altyn Arashan valley (Issyk-Köl Oblast) above 3400m a.s.l. in the central Tian Shan (see picture 48). Totally 16 individuals including four males temporarily patrolling waterbodies like reservoirs and irrigation canals were recorded, but without any sign of reproduction.



Picture 48: Example of a migration route of *Pantala flavescens*: Several individuals were observed flying through this valley along structures like poplar lines and edges of wheat-fields. S Kochkor (Naryn Oblast), 1800m a.s.l., 2009-08-21.



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#### 5. References

- Akramowski, N.N. 1964. [Additions to the dragonfly fauna of eastern Transcaucasus (Insecta: Odonata). Izvestiya Akademii Nauk Armyanskoj SSR (Ser. Biol.) 17: 99-101.
- Asahina, S. 1979. Notes on Chinese Odonata, XI. On two north Chinese gomphids, with special reference to Palearctic Ophiogomphus species. Tombo, 22: 2-12.
- Adishev, M.M. (Ed.) (1987): Atlas of Kirgizskoi SSR, GUGK USSR, Moscow. 157 pp.
- Bartenev, A.N. 1912: Materialien zur Odonatenfauna Sibiriens. 15. Odonaten aus Transbaikalien. Zoologische Jahrbücher. Abteilung für Systematik, Ökologie und Geographie der Tiere 32: 221-284.



- Bartenev, A. N. 1929. Donnees nouvelles sur les Odonates de la Transcaucasie, de la Perse et du Turkestan. *Revue Russe d'Entomologie* XXIII (1-2): 125-129.
- Bartenev, A.N. 1929. Neue Arten und Varietäten der Odonaten des West-Kaukasus. *Zoologischer Anzeiger* 85: 54-68.
- Belyshev, B.F. 1961. On the Fauna of Dragonflies (Odonata) of Eastern Kazakhstan. *Fragmenta Faunistica* 9(4): 27–43.
- Belyshev, B.F. 1968. Contributions to the knowledge of the fauna of dragonflies (Odonata) of Siberia. IV. Geography of the dragonflies of Siberia. *Fragmenta Faunistica* 14: 407-536.
- Belyshev, B. F. 1973. The dragonflies of Sibiria (Odonata). Vol. 2, pt 1- 2. Nauka, Novosibirsk.
- Belyshev, B. F., A.Y Haritonov, C.N. Borisov, Z.D. Spuris, G.A. Mazohin-Porshnyakov, G.I. Pritikina, G.I. Ryazanova, L.N. Shalopenok, A.D. Pisanenko, G.A. Suhacheva, I.N. Haritonova, V.V. Zaika, L.I. Francevich. 1989. Fauna and Ecology of Dragonflies. Nauka, Novosibirsk.
- Bernard, B., & O. E. Kosterin, 2010. Biogeographical and ecological description of Odonata of eastern Vasyugan Plain, West Siberia, Russia. *Odonatologica* 39: 1-28.
- Borisov, S.N. 2005. Distribution and habitat characteristics of *Ophiogomphus reductus* Calvert, 1898 (Odonata, Gomphidae). *Eurasian Entomological Journal* 4(4): 273-278.
- Borisov, S.N. 2006. Distribution and Ecology of *Sympetrum arenicolor* Jödicke, 1994 (Odonata, Libellulidae) in Central Asia. *Eurasian Entomological Journal* 5(4): 278–284.
- Borisov, S.N. 2006a. Ecological Niches of Species of the Genus *Ischnura* (Odonata, Coenagrionidae) in Oases of the Pamir-Alai Mountains. *Entomological Review* 86 (6): 623–631.
- Borisov, S.N. 2006b. Summer migrations of species of the genus *Sympecma* Burmeister, 1839 (Odonata, Lestidae) in Northern Tien Shan. *Eurasian Entomological Journal* 4(3): 256.
- Borisov, S.N. 2009. Distribution patterns of dragonflies (Odonata) in Central Asia. *Entomological Review* 89(1): 26-33.
- Borisov, S.N. 2009. Study of dragonfly (Odonata) migrations in the Western Tien Shan mountains using ornithological traps. *Entomological Review* 89(9): 1025-1029.



- Borisov, S.N. & A.Y. Haritonov. 2007. The Dragonflies (Odonata) of Middle Asia. Part 1. Caloptera, Zygoptera. Eurasian entomological journal 6(4): 343-360.
- Borisov, S.N. & A.Y. Haritonov. 2008. The Dragonflies (Odonata) of Middle Asia. Part 2 (Anisoptera). Eurasian Entomological Journal 7(3): 97-123.
- Boudot, J.-P., Kalkman, V. J., Azpilicueta Amorín, M., Bogdanovic, T., Cordero Rivera, A., Degabriele, G., Dommagnet, J.-L., Ferreira, S., Garrigós, B., Jovic, M., Kotarac, M., Lopau, W., Marinov, M., Mihokovic, N., Riservato, E., Samrauoi, B. & Schneider, W. (2009). Atlas of the Odonata of the Mediterranean and North Africa. Libellula Supplement 9. 256 pp.
- Brauer, F. 1880. Verzeichnis der von Fedtschenko in Turkestan gesammelten Odonaten. Verhandlungen der Zoologisch-Botanischen Gesellschaft Wien 30: 229-232.
- Chaplina, I.A., H.J. Dumont, A.Y. Haritonov & O.N. Popova. 2007. A review of the Odonata of Kazakhstan. Odonatologica 36: 349-364.
- Corbet, P.S. 1999. Dragonflies: Behaviour and ecology of Odonata. Harley Books, Colchester. 829pp.
- Corbet, P.S., F. Suhling & D. Soendgerath. 2006. Voltinism of Odonata: a review. International Journal of Odonatology 9(1): 1-44.
- De Lattin, G. 1967. Grundriss der Zoogeographie. Stuttgart. 602pp.
- Dijkstra, K.-D. B. & R. Lewington. 2006. Field Guide to the Dragonflies of Britain and Europe. British Wildlife Publishing. 320pp.
- Dumont, H. J. 1974. *Ischnura intermedia* spec. Nov. from Turkey, and its relations to *I. forcipata* Morton, 1907 and *I. pumilio* (Charpentier, 1825) (Zygoptera: Coenagrionidae). Odonatologica 3: 153-165.
- Dumont, H.J., A.Y. Haritonov & S. Borisov, 1992. Larval morphology and range of three West Asiatic species of the genus *Onychogomphus* Selys, 1854. (Insecta: Odonata). Hydrobiologica 245: 169-177.
- Dumont, H.J., S.N Borisov & R. Seidenbusch. 1995. Redescription and geographic range of *Sympetrum haritonovi* Borisov, 1983 (Odonata, Libellulidae) with notes on its habitat and ecology. Bulletin et Annales de la Société Royale Entomologique de Belgique 131: 65-74.
- Dumont H.J. & S.N. Borisov , 1995. Status and range of the species-pair *Ischnura forcipata* Morton, 1907 and *Ischnura intermedia* Dumont, 1974 (Insecta: Odonata: Coenagrionidae). Biologisch Jaarboek Dodonaea 62(1994): 157-163.



- Dumont, H.J., H. Heidari, 1996. On a collection of spring Odonata from Iran, with the description of *Coenagrion australocaspicum* n.sp. Bulletin et Annales de la Société Royale Entomologique de Belgique 132: 63-78.
- Dumont, H.J., H. Heidari, & K.I Atamuradov, 1997. Hybridization in *Calopteryx orientalis* (Selys) east of the shores of the south Caspian lake (Zygopetra: Calopterygidae), *Odonatologica*, 26(2): 205-213.
- Dumont, H.J. 2003. Odonata from the Republik of Mongolia and from the Autonomous Region of Inner Mongolia. *International Journal of Odonatology* 6(2): 127-146.
- Dyatlova E. S. 2006. *Orthetrum coerulescens anceps* (Odonata, Libellulidae) in Odessa and its vicinities (Ukraine). *Vestnik zoologii* 40(3): 275–278.
- Fischer, C. 2009. *Enallagma cyathigerum* und *Ischnura elegans* als Kleptoparasiten in Spinnennetzen (Odonata: Coenagrionidae). *Libellula* 28(3/4): 187-189.
- Geijskes, D.C. & J. van Tol. 1983. *De Libellen van Nederland* (Odonata). Koninklijke Nederlandse Natuurhistorische Vereniging, Hoogwoud (N.H.). 368 pp.
- Grigoriev, B. 1905. Liste des odonates du Semiretshie. *Revue russe d'entomologie* 5: 216-220.
- Hacet, N. & N. Aktaç. 2008. Two New Records of Odonata (Gomphidae) for Turkey, *Gomphus flavipes* (Charpentier, 1825) and *Ophiogomphus cecilia* (Geoffroy in Fourcroy, 1785), with distributional notes on *G. flavipes* and *G. ubadschii* Schmidt, 1953. *Entomological News* 119(1): 81-89.
- Haritonov, A. Y. 1988. Strekozy roda *Ischnura* Charp. (Insecta, Odonata) fauny SSSR [Damsselflies of the genus *Ischnura* (Insecta, Odonata) of the fauna of USSR.] (in Russian). Strekozy roda *Ischnura* Cgharp. (Insecta, Odonata) fauny SSSR. In: *Taksonomia zhivotnykh Sibiri* 20: 32-46.
- Hagen, H. 1856. Odonatenfauna des Russischen Reiches. *Stettiner Entomologische Zeitung* 17: 363-380.
- Heidari, H. and Dumont, H.J. 2002. An annotated check-list of the Odonata of Iran. *Zoology in the Middle East* 26: 133-150.
- Jödicke, R. 1994. Subspecific division of *Sympetrum sinaiticum* Dumont, 1977, and the identity of *S. vulgatum decoloratum* (Selys, 1884) (Anisoptera: Libellulidae). *Odonatologica* 23: 239-253.
- Jödicke, R. 1997. Die Binsenjungfern und Winterlibellen Europas. *Die Neue Brehm-Bücherei* 631. 277 pp.



- Jödicke, R., S.N. Borisov, A.Y. Haritonov & O. Popova. 2000. Additions to the knowledge of *Sympetrum sinaiticum* Dumont (Odonata: Libellulidae). *International Journal of Odonatology* 3(2): 131-140.
- Jödicke, R., B. Kunz, & A. Wijker. 2009. A further step in the differentiation between *Sympetrum arenicolor* and *S. sinaiticum* – photo documentation in the field. *Agrion* 13(1): 4-7.
- Kalkman, V.J., G.J. van Pelt, H.J. Dumont, A.Y. Haritonov & M. Tailly. 2004. Critical species of Odonata in Turkey, Iran and the Caucasus. *International Journal of Odonatology* 7(1): 325-339.
- 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.
- Kazanci, N. 2010. Contribution to the knowledge of Odonata (Insecta) Fauna of Turkey: Eastern and Southeastern Anatolia. *Review of Hydrobiology* 3(1): 1-11.
- Karjalainen, S. 2002, 2010. Suomen sudenkorennot. Tammi, Helsinki. 222 pp.
- Ketenchiev, H.A. & A. Yu. Haritonov, 1998. *Opredelitel' strekoz Kovkaza*. [Identification key for the dragonflies of the Caucasus]. Kabardino-Balkarskij Gosudarstvennyj Universitet Nal'chik, Nal'chik. 120 pp.
- Kosterin, O.E. 1999. Dragonflies (Odonata) of the Dauriskii State Nature Reserve and its surroundings. - In: Dubatolov V. V. (ed.). [Nasekomye Daurii i sopredel'nykh territorii (Sbornik nauchnykh trudov). Vypusk 2. Dauriskii State Biosphere Nature Reserve, Institute of Systematics and Ecology of Animals SB RAS & Siberian Zoological Museum, Novosibirsk, pp. 5-40.
- Kosterin, O.E. & Gorbunov, P.G. 2010. Notes on the Odonata of Kazakhstan, including the first record of *Ischnura evansi* Morton (Zygoptera: Coenagrionidae). *Notulae odonatologicae* 7: 45-48.
- Kosterin, O. E., E. I. Malikova, O. E. Haritonov. 2004. Critical species of Odonata in the Asian part of the former USSR and the Republic of Mongolia. *International Journal of Odonatology* 7: 341-370.
- Krylova, V.N.; Chirov, P.A. 1971. [On the role of dragonflies in the numerical control of some blood-sucking insects in Tien-Shan]. *Materialy po chlenistonogim-entomofagma Kirgissii, Ilim, Frunze*. 92-94.
- Krylova, V.N. 1972. [Vertical limits of dragonfly distribution in Tien Shan. *Entomological Studies in Kirgizia*] *Entomologicheskie issledovaniya v Kirgizii*. Ilim, Frunze, pp. 20–25.



- Morton, K.J. 1914. Notes on a collection of Odonata from Van, Turkey in Asia. Entomologist's monthly Magazine 50: 56-59.
- Mauersberger, R. 1994. Zur wirklichen Verbreitung von *Orthetrum coerulescens* (Fabricius) und *O. ramburi* (Selys) = *O. anceps* (Schneider) in Europa und die Konsequenzen für deren taxonomischen Rang. Deutsche Entomologische Zeitschrift 41: 235–256.
- Popova, A.N. 1936. [Material on the fauna and biology of dragonfly larvae in the river Chui]. Trudy kirgizkoi komplexnoi expedicii 3 (1): 215-218
- Popova, A.N. 1951. Dragonflies (Odonata) of Tajikistan. Trudy Zoologicheskogo Instituta AN SSSR 9: 861–894.
- Reinhardt, K. 1995. Dragonfly records from Lake Balkash, Kazakhstan. Notulae odonatologicae 4: 82-85.
- Sadeghi, S. 2008. Aspects of infraspecific phylogeography of *Calopteryx spleenens*. PhD thesis. Dept. Biology, Univ. Ghent. ISBN 978-90-8756-015-7 IV. 166 pp.
- Samraoui, B.; Bouzid, S.; Boulahbal, R.; Corbet, P.S. 1998. Postponed reproductive maturation in upland refuges maintains life-cycle continuity during the hot, dry season in Algerian dragonflies (Anisoptera). International Journal of Odonatology 1(2): 118-135.
- Samraoui, B., P.H.H. Weekers & H.J. Dumont, 2003. Two taxa within the North African *Lestes virens* complex (Zygoptera: Lestidae). Odonatologica 32: 131-142.
- Schneider, W. 1981. Eine Massenwanderung von *Selysiotthemis nigra* (Vander Linden, 1825) (Odonata: Macrodiplactidae) and *Lindenia tetraphylla* (Vander Linden, 1825) (Odonata: Gomphidae) in SüdJordanien. Entomologische Zeitschrift 91: 97-102.
- Schneider, B. & H. Wildermuth. 2007. Erstnachweis von *Sympecma fusca* als Wirt parasitischer Wassermilben (Odonata: Lestidae; Hydrachnidia). Libellula 26(1/2): 113-117.
- Schneider, W. 1985. The types of *Orthetrum anceps* (Schneider 1845) and the taxonomic status of *Orthetrum ramburii* (Selys 1848). Senckenbergiana Biologica 66: 97-104.
- Schmidt, E. 1953. Zwei neue Libellen aus dem nahen Osten. Mitteilungen der Münchner Entomologischen Gesellschaft 43:1-9.



- Schmidt, E. 1954. Auf der Spur von Kellemisch. Entomologische Zeitschrift 64: 49-62, 65-72, 74-86, 92-93.
- Schoorl, J.W. 2000. Notes on Central Asian dragonflies (Insecta: Odonata). Zoologische Mededelingen 74(12): 205-213.
- Schorr, M., W. Schneider & H.J. Dumont, 1998. Ecology and distribution of *Lindenia tetraphylla* (Insecta, Odonata, Gomphidae): a review. International Journal of Odonatology 1: 65-88.
- Schröter, A. In prep. Ecology, distribution and taxonomical status of *Cordulegaster coronata* Morton, 1916 (Insecta, Odonata, Cordulegastridae). A review.
- Schröter, A. in prep. A mass migration of *Aeshna affinis* Vander Linden, 1820 (Insecta, Odonata, Aeshnidea) in the Jalalabad province of Kyrgyzstan.
- Selys-Longchamps, E. 1887. Odonates de l'Asie Mineure et revision de ceux des autres parties de la faune dite européenne. Annales de la Société entomologique de Belgique 33: 1-85.
- Tailly, M., V. Ananian & H. J. Dumont, 2004. Recent dragonfly observations in Armenia, with an updated checklist. Zoology in the Middle East 31: 93–102.
- Valle, K.J. 1942. Odonaten aus dem westlichen Zentralasien. Annales entomologici Fennici 8: 114-126.
- Von Maydell, H.-J. 1983. Forst- und Holzwirtschaft der Sowjetunion. Teil 4: Kasachstan und die mittelasiatischen Sowjetrepubliken Usbekistan, Kirgisien, Tadshikistan, Turkmenistan. Mitteilungen der Bundesforschungsanstalt für Forst und Holzwirtschaft. Kommissionsverlag Max Wiedebusch, Hamburg. 192 S.
- Waterston, A.R. & Pittaway, A.R. 1991. The Odonata or Dragonflies of Oman and neighbouring territories. Journal of Oman Studies 10(1989): 131-168.
- Wojtusiak, J. 1974. A dragonfly migration in the High Hindu Kush (Afghanistan), with a note on high altitude records of *Aeshna juncea mongolica* Bartenev, and *Pantala flavescens* (Fabricius) (Anisoptera: Aeshnidae, Libellulidae). Odonatologica 3(2): 137-142.
- zur Heyden, D. 1889. Beitrag zur Insectenfauna der östlichen Kirghisen-Steppe. Horae Societatis Entomologicae Rossicae 23: 88-95.





**Song Köl: An archetypical Kyrgyz landscape: Horseman in mountain steppe at the southern shore of lake Song Köl (Naryn Oblast), a remote endorheic mountain lake of breathtaking beauty at 3060 m .a.s.l. 2009-08-22.**



**Baubash Ata: Horsemen in an archetypical Kyrgyz landscape. Kerey pass, Jalalabad Oblast 2006-07-29 (Photo: P. Borchardt.)**





**Toktokul. The dry and desert-like Ketmentub valley (Jalalabad Oblast) with the Toktogul reservoir at roughly 1000m a.s.l. boasts an annual precipitation below 350 mm. 2009-08-12.**



**Chychkan river: The green splendour of the Chychkan gorge (Talas Oblast) is a striking example for the high variety of soils, vegetation types and microclimate units of the country. At open stretches of the riverbanks vegetated with *Betula tianschanica*, *Acer semenovii*, *Prunus ulmifolia*, *Zabelia corymbosa*, *Crataegus altaica* and *Lonicera microphylla* foraging individuals of *Cordulegaster coronata* have been observed frequently. 2009-08-12.**





**Kymys jurts: After hours of dragonfly hunting nothing beats a relaxing break in a yurt with one or two bowls of full-bodied kymys... Suusamyr high valley (Chui Oblast). 2009-08-12.**



**The unique Walnut-Fruit forests of the moist subtropical western slopes of the Fergana range between 1000-2000m a.s.l. are severely threatened due to wood fuel cutting, cattle grazing and general overexploitation. Dashman, Jalalabad Oblast, 2008-07-02.**

