

# Notes on Central Asian dragonflies (Insecta: Odonata)

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New and old material from Central Asia is published. In total 38 species are recorded from various locations in this region. For the more interesting species notes and figures are provided. One probably new *Ischnura* species is briefly described, but not formally named. For a, possibly new, subspecies of *Sympetrum sinaiticum* Dumont, 1977, a short diagnosis with figures is provided.

## Introduction

During an expedition for collecting moths, the author with some friends also caught dragonflies on various locations in Tajikistan and Turkmenistan (both former parts of the Soviet Union and now independent states) in June and July 1991. Dr V.A. Sruoga and Dr R.K. Puplėsis (Vilnius, Lithuania) were so kind to provide additional material to this collection from Turkmeniya, collected in 1993. Various authors have earlier reported on Odonata from this region: e.g. Bartenev (1913); Belyshev (1958, 1960, 1961); Borisov (1983, 1985, 1986, 1987), Borisov & Karitonov (1986); Brauer (1880); Foerster (1900); Kimmins (1950); Puschnig (1911); Ris (1897); and de Selys Longchamps (1887). However, this area (with roughly the size of central and southern Europe) is still poorly explored. For this reason, the authors considered it worthwhile to publish the new records and the material already preserved in the National Museum of Natural History, Leiden, The Netherlands. Annotations and/or figures are provided for most species. For some species lengths of abdomen (Abd.) and hindwing (HW.) are noted for comparison with European and Iranian material (cf. Schmidt, 1954). One unidentified and presumably undescribed *Ischnura* species is shortly diagnosed and partly figured. A subspecies of *Sympetrum sinaiticum* is briefly described, since it may concern a new subspecies. Figures of the male genitalia are presented for most *Sympetrum* species recorded, since identification of material of this genus from Central Asia and its environments is rather complicated. All material listed is deposited in the National Museum of Natural History, Leiden (RMNH).

## Main localities and habitats

Dashti-Kurk - Tajikistan, about 20 km W Tavil' Dara, about 38°N, 70°E. A branched stream from the mountains with grasses along it fed a pond with some floating vegetation and some marshes with many tall grasses, *Juncus* and much of a *Chara* species. Leg. J.W. Schoorl and V.A. Sruoga.

Firyuza - Turkmenistan, env. Ashkhabad, Kopet-Dag, 37°55'N and 58°03'E (very close to Iranian border). The dragonflies were caught along a stream (width about 3 m.) with diverse vegetation along it, running through the desert hills of the Kopet-Dag. Leg. J.W. Schoorl.

40 km E Kara-Kala - Turkmenistan, Kopet-Dag, about 38°N, 56°E. A small river

with riverine forest in a valley of the Kopet-Dag. Leg. V.A. Sruoga and R.K. Puplesis.

Kondara - Tajikistan, about 3 km N Varzob, about 38°.5'N and 68°.5'E, alt. about 1200 m. Most specimens were caught along a river in the botanic reserve with a width of about 3 m. This river has fast streaming water, but is branched at various places and has then also small, slowly streaming branches. At various places there is reed on its borders. The situation of the upper course has not been checked. Leg. J.W. Schoorl, V.A. Sruoga, R.K. Puplesis and J. Bajarunas.

Varzob - Tajikistan, about 15 km N Dushanbe, 38°.49'N, 68°.54'E, alt. about 1200 m. The specimens were collected in a complex of two ponds (with sandy banks and reed vegetation at its borders), a marsh with tall grasses and a little stream (feeding this complex). Leg. J.W. Schoorl, V.A. Sruoga, J. Bajarunas and R.K. Puplesis.

Tedzhen - Turkmenistan, about 37°.26'N, 60°.30'E. A marsh in an oasis (a `tugai') near a river. The marsh with much reed (*Phragmites australis* (Cav.) Trin. ex Steud.), and with many bushes and trees around it. Leg. J.W. Schoorl.

### Material

#### 1. *Epallage fatime* Charpentier, 1840

Material: 1 ♂, Turkmenistan: nr. Firyuza, 7.vii.1991; 12 ♂♂, 8 ♀♀, 40 km E Kara-Kala, 4.v.-27.vi.1993.

The specimen of Firyuza rested on a dead tree overhanging a stream and undertook from time to time a short flight from this spot. The stream was bordered by grasses, bushes and trees. The dark apical area of 5 ♂♂ specimens reaches the pterostigma, and in the other ones there is a gap of 1-4 anterior cross veins. ♂♂: Abd. 29-32 mm. and Hw. 28-32 mm. ♀♀: Abd. 29-32 mm. and Hw. 26-30 mm.

#### 2. *Calopteryx splendens* Selys, 1887

Material: 6 ♂♂, 3 ♀♀, Turkestan: Ochs, coll. Albarda, acq. 1892; 2 ♂♂, 5 ♀♀, Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq. 1892.

#### 3. *Calopteryx orientalis* Selys, 1887

Material: 5 ♂♂, 6 ♀♀, Turkmenistan: nr. Firyuza, 7.vii.1991; 3 ♂♂, 4 ♀♀, 40 km E Kara-Kala, 25.v.-18.vi.1993; 2 ♂♂, Krasnovodskiy.

Tens of specimens have been seen along a part of a stream near Firyuza, bordered by grasses, bushes and trees, and with sunny places. Because of their size and of the position of the dark area on the wings, the specimens should be assigned to the subspecies *shachrudica* (Bartenef, 1916) (cf. Schmidt, 1954: 240-243). The number of anterior cells between the nodus and the apical area amounts to 7-12. Two females (one from each locality) have slightly darker apical areas on their wings, which is most probably an aberration. ♂♂: Abd. 33-36 mm. and Hw. 24-27 mm (Firyuza); Abd. 37-38 mm. and Hw. 29-31 (E Kara-Kala). ♀♀: Abd. 30-34 mm. and Hw. 28-30 mm (Firyuza); Abd. 36-37 mm. and Hw. 32-33 mm. (E. Kara-Kala).

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

Material: 10 ♂♂, 2 ♀♀, Tajikistan: Kondara, 16.vi-18.vii.1991; 1 ♂, Turkmenistan: Tedzhen, 5.vii.1991; 1 ♂, 2 ♀♀, 40 km E Kara-Kala, 19.vi.1993.

In Kondara, the specimens have been collected along a river but they had probably come from another habitat. In Tedzhen probably tens or perhaps hundreds of specimens were noted around a marsh in an oasis together with the next species, resting on grasses and in bushes. The dark markings on the thorax vary noticeably: they may be considerably reduced (see also figs 1-2). The dark marking on second segment of

abdomen resembles that in *S. gobica* Foerster, 1900, but protrudes less far latero-anteriorly (ventrally) in distal half (see fig. 7). One should be very careful in using colour patterns for identification of the three *Sympecma* species in Central Asia, since reductions or extensions of the dark markings (see figs 1-6) frequently occur. The use of structural differences for identification is advocated (see Dumont and Borisov, 1993).

5. *Sympecma gobica* Foerster, 1900

Material: 1♂, 3♀, Tajikistan: Kondara, 20-29.vi.1991; 1♂, 3♀, Turkmenistan: Tedzhen, 5.vii.1991; 1♂, 1♀, 40 km E Kara-Kala, 18.vi.-13.viii.1993; 1♂, 1♀, Central Asia, J. von Rennenkampff; 1♂, Uzbekistan: env. Bukhara, nr. Kuldzhuktau Mts., Aiakgudzhumdy, 10.xi.1968, M.J. Falkovitch.

For remarks on its habitat, see the previous species, with which it occurred together on various locations. Dark markings on thorax and 2nd segment of abdomen are little variable (see figs 3-4, 8-9). The status of this taxon as a distinct species has been confirmed by Dumont and Borisov (1993).

6. *Sympecma paedisca* Brauer, 1882

Material: 3♂♂, 1♀, Turkmenistan, 40 km E Kara-Kala, 7.iv.-6.viii.1993.

The ventral extension of the dark thoracic marking may be reduced to an indistinct, separate dot (see figs. 5-6), or is missing. The dark marking of second abdominal segment (see fig. 10) is different from that figured by Foerster (1900: table 3).

7. *Lestes barbarus* (Fabricius, 1798)

Material: 1♀, Tajikistan: env. Nurek, nr. Zardolu, 1.vii.1991; 1♂, 2♀♀, Dashti-Kurk, 13.vii.1991; 3♂♂, 7♀♀, Turkmenistan: Tedzhen, 5.vii.1991.

In Tedzhen, probably hundreds of specimens have been noticed around a marsh in an oasis, most of them resting on dead branches in trees and on other plants. The single specimen from the neighbourhood of Zardolu was taken in a grass verge of a road, seemingly far away from a water. In Dashti-Kurk this species occurred in a marsh with a cover of tall grasses.

8. *Lestes dryas* Kirby, 1890

Material: 1♀, Tajikistan: Dashti-Kurk, 13.vii.1991.

The specimen has been discovered in a marsh with tall grasses near a spot with *Juncus*, as a single specimen amidst many specimens of *L. barbarus*.

9. *Platycnemes dealbata* Selys & Hagen, 1850

Material: 4♂♂, 3♀♀, Tajikistan: Varzob, 17-20.vii.1991; 4♂♂, 2♀♀, Turkmenistan: nr. Firyuza, 7.vii.1991; 1♂, 40 km E Kara-Kala, 14.vi.1993.

Near Firyuza, tens of specimens have been seen along a stream with grasses, bushes and trees along it. In Varzob, the specimens have especially been caught in tall grasses near a pond.

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

Material: 3♂♂, 1♀, Tajikistan: Kondara, 28.vi.-9.vii.1991; 10♂♂, 5♀♀, Varzob, 17-20.vii.1991; 5♂♂, 6♀♀, Dashti-Kurk, 13.vii.1991.

11. *Ischnura pumilio* (Charpentier, 1825)

Material: 2♂♂, 2♀♀, Tajikistan: Kondara, 28.vi.-11.vii.1991; 8♂♂, 4♀♀, Varzob, 17-20.vii.1991; 6♂♂, 3♀♀, Dashti-Kurk, 13.vii.1991.

The specimens have been collected in marshes with grasses with flowing water nearby, and in Dashti-Kurk also along very small streams bordered by short grasses.

12. *Ischnura forcipata* Morton, 1907

Material: 4♂♂, 4♀♀, Turkmenistan: 40 km E Kara-Kala.

13. *Ischnura* unidentified species

Material: 1♂, Tajikistan: Varzob, 17.vii.1991.

This specimen may concern a new species, most closely resembling *I. elegans* (bluish form) but differing in abdominal appendages and pterostigmas. The abdominal appendages (see fig. 11) are quite distinct from those of *elegans*. Unfortunately, these are little distorted in this specimen. The pterostigmas are all approximately of the same shape and size, and they all four have a greyish inner region. The specimen has been caught together with *elegans* and *pumilio* in a grass field near a marsh. It has been further compared with material of the following species: *I. evansi* Morton, 1919, *I. fontainei* Morton, 1905, *I. forcipata* Morton, 1907, *I. asiatica* (Brauer, 1865), *I. mildredae* Fraser, 1927; and with the descriptions of *I. bukharensis* Bartenef, 1916, *I. intermedia* Dumont, 1974, *I. aralensis* Haritonov, 1979 and *I. senegalensis* Rambur, 1842. Since we have only one specimen and since the status of *I. bukharensis* is not certain (cf. Schmidt, 1954: 233), the author leaves the naming of it until more material will be available.

14. *Enallagma cyathigerum* (Charpentier, 1840)

Material: 4♂♂, Tajikistan: Dashti-Kurk, 13.vii.1991.

The specimens have only been found above a pond with some floating vegetation.

15. *Onychogomphus forcipatus* (Linnaeus, 1758)

Material: 2♂♂, 1/, Turkmenistan: 40 km E Kara-Kala, 28.v.-18.vi.1993; 1/, Uzbekistan: Chardzhou, G. von Rennenkampf.

16. *Gomphus vulgatissimus* (Linnaeus, 1758)

Material: 2♀♀, Turkmenistan: 40 km E Kara-Kala, 25.v.-12.vi.1993.

17. *Caliaeschna microstigma* (Schneider, 1845)

Material: 1♂, 2♀♀, Turkmenistan: 40 km E Kara-Kala, 15.v.1993.

The pterostigmas of these specimens are yellowish (instead of dark brownish), and episternum II is brown without paler markings in this material. This is also the case in material from Mesopotamia (Malatia) (RMNH), but not in that from northern Iran (RMNH). Hw. 37-40 mm.

18. *Anax imperator* Leach, 1815

Material: 1♀, Tajikistan: Kondara, 16.vii.1991.

The specimen has been found almost dead on a mountain slope. Two specimens of this species have been seen above a small, concrete reservoir in Kondara, and again two above a pond in Varzob.

19. *Anax parthenope* (Selys, 1839)

Material: 2♀♀, Turkmenistan: 40 km E Kara-Kala, 14.vii.-27.vii.1993; 1♂, Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq. 1892; 2♂♂, 1♀, Uzbekistan: env. Bukhara, Aiakguzhumdy, 10.ix.1967, M.J. Falkovitch.

20. *Cordulegaster insignis* Schneider, 1845

Material: 8♂♂ (1 teneral adult with exuviae), Tajikistan: Kondara, 21.vi.-10.vii.1991; 1♂, env. Nurek, nr. Zardolu, 1.vii.1991; 1♀, Dashti-Kurk, 12.vii.1991.

Tens of specimens of this species have been noticed above the river in the botanic reserve of Kondara. Female specimens have been noted ovipositing in small, slow tributaries of the main river. Furthermore, specimens have been caught on mountain slopes near Kondara and near Dashti-Kurk, and near a small stream near Zardolu. There is slight variation in colour patterns in the series from Kondara.

21. *Pantala flavescens* Fabricius, 1798

Material: 1♂, Tajikistan: Kondara, 23.vi.1991, along a path in the village; 1♂, Turkmenistan: 40 km E Kara-Kala, 8.vii.1993.

The species has been earlier noted for Central Asia by Borisov & Karitonov (1986: 47).

22. *Libellula depressa* Linnaeus, 1758

Material: 1 ♂, Turkmenistan: 40 km E Kara-Kala, 14.vi.1993.

23. *Libellula pontica* Selys, 1887

Material: 1 ♀, Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq. 1892.

24. *Libellula quadrimaculata* Linnaeus, 1758

Material: 2 ♂ ♂, Tajikistan: Dashti-Kurk, 14.vii.1991; 1 ♂, 2 ♀ ♀, Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq. 1892.

More than ten specimens (also in tandem) have been noted above a marsh with tall grasses in Dashti-Kurk.

25. *Orthetrum brunneum* (Fonscolombe, 1837)

Material: 2 ♂ ♂, 5 ♀ ♀, Tajikistan: Dashti-Kurk, 13-14.vii.1991; 3 ♂ ♂, 1 ♀, Varzob, 17-20.vii.1991; 1 ♀, Kondara, 18.vii.1991; 5 ♂ ♂, Turkmenistan: 40 km E Kara-Kala, 23.v.-16.vii.1993; 1 ♂, Kirgizistan: Margilan.

The species seemed to prefer the more open places (bare or with short grasses) or to sit on dead branches above water. ♂ ♂: Abd. 26-29 mm., Hw. 30-33 mm., pterostigma 3 mm. ♀ ♀: Abd. 26-27 mm., Hw. 30-33 mm., pterostigma 2.5-3 mm.

26. *Orthetrum coerulescens* (Fabricius, 1798)

Material: 1 ♂, Turkmenistan: Firyuza, 7.vii.1991.

1 ♂: Abd. 21 mm., Hw. 33 mm., pterostigma 3.5 mm.

25/26. *Orthetrum coerulescens/brunneum*

Material: 1 ♀, Tajikistan: Dashti-Kurk, 14.vii.1991; 1 ♀, Firyuza, 7.vii.1991; 3 ♀ ♀, 40 km E. Kara-Kala, 16.vii.-17.viii.1993.

One female of *Orthetrum* has been caught on the same spot as a male of *O. coerulescens* near Firyuza. This specimen probably belongs to *O. coerulescens*, but its identity is not quite certain (Abd. 29 mm., Hw. 33 mm., pterostigma 3 mm.). Among the *O. brunneum* specimens from Dashti-Kurk, there is one larger female (Abd. 29 mm., Hw. 33 mm., pterostigma 3.5 mm.), which may also belong to *O. coerulescens*.

27. *Orthetrum anceps* (Schneider, 1845)

Material: 1 ♂, Tajikistan: Dashti-Kurk, 14.vii.1991.

Also this specimen has been caught on an open place, along a small stream.

28. *Orthetrum albistylum* (Selys, 1848)

Material: 5 ♂ ♂, 4 ♀ ♀, Tajikistan: Varzob, 17-20.vii.1991; 2 ♂ ♂, 1 ♀, Kirgizistan: Osh, coll. Albarda, acq. 1892; 1 ♂, prov. Fergana, Margilan, coll. Albarda, acq. 1892.

More than ten specimens have been seen in a grass field with bushes (resting on small trees) and above a pond bordered by reed.

29. *Crocothemis erythraea* (Brullé, 1832)

Material: 1 ♀, Uzbekistan: env. Bukara, foot of Kuldzhuktau Mts., Diakguzhumdy, 5.i.1968, M.J. Falkovitch.

Unidentified (*Crocothemis*) species

Material: 1 ♂, Turkmenistan: 40 km E Kara-Kala, 16.vii.1993.

30. *Sympetrum depressiusculum* (Selys, 1841)

Material: 4 ♂ ♂, 2 ♀ ♀, Kirgizistan: Osh, coll. Albarda, acq. 1892.

31. *Sympetrum flaveolum* (Linnaeus, 1758)

Material: 1 ♂, 1 ♀, eastern Turkestan: Syrt. Narun, 1907, coll. H. Rolle, coll. v.d. Weele.

Some tens of specimens have been seen flying close to the train in the steppes and semi-deserts of northwestern Kazakhstan.

32. *Sympetrum fonscolombii* (Selys, 1840)

Material: 1 ♂, 2 ♀ ♀, Tajikistan: Kondara 19-23.vi.1991; 6 ♂ ♂, 3 ♀ ♀, Varzob, 1-20.vii.1991; 1 ♂, Dashti-Kurk, 14.vii.1991; 1 ♀, Turkmenistan: Tedzhen, 5.vii.1991; 1 ♂, 1 ♀, Uzbekistan: env. Bukhara, nr.

Kuldzhuktau Mts., settlement Zhamansaï, sand desert, 27.i.-27.x.1968, M.J. Falkovitch.

Part of the material has been caught on the mountain slopes near Kondara, where they often have been found resting on small trees. See also figs 12-13.

33. *Sympetrum meridionale* (Selys, 1841)

Material: 4♂♂, 6♀♀, Turkmenistan: Tedzhen, 5.vii.1991; 1♂, 2♀♀, Kirgizistan: prov. Fergana, Margilan, coll. Albarda, acq. 1892.

Thousands of specimens have been seen near a marsh in an oasis, often resting on bushes and especially on dead branches (very close to each other and with their wings pointing half forward). See also figs 14-15.

34. *Sympetrum pedemontanum* (Allioni, 1766)

Material: 1♂, Tajikistan: Varzob, 17.vii.1991; 4♂♂, 3♀♀, [Turkestan]: Ochs, coll. Albarda, acq. 1892; 1♀, [Turkestan]: Ongadin, 1907, coll. v.d. Weele.

Several specimens have been noticed above a small marsh with tall grasses in Varzob.

35. *Sympetrum sanguineum* (O.F. Müller, 1764)

Material: 2♂♂, Tajikistan: Dashti-Kurk, 13.vii.1991; 1♀, Kirgizistan: Osh, coll. Albarda, acq. 1892.

See also figs 16-17.

36. *Sympetrum striolatum* (Charpentier, 1840)

Material: 1♂, Tajikistan: Dashti-Kurk, 13.vii.1991; 2♂♂, 4♂♂, Varzob, 17-20.vii.1991; 2♂♂, Turkmenistan: 40 km E Kara-Kala, 2.vi.-18.vii.1993; 1♂, Kirgizistan: prov. Fergana, Margilan.

The specimens from Varzob, Dashti-Kurk and Margilan seemingly belong to subspecies *pallidum* Selys, 1887. The black markings near the ocelli are very small and are mainly present against the lateral ones, not extending along the eyes. The lateral sutures of the pterothorax have very narrow black lines, which are often interrupted in the middle. The femora and tibiae are only ventrally narrowly blackish. The pterostigma is yellowish white. The general appearance of the specimens is very yellowish. Specimens from Kopet-Dag (40 km E Kara-Kala) seem to concern the nominate subspecies but with reduction of the black line against the eyes (cf. Schmidt, 1954: 256). See also figs 18-19.

37. *Sympetrum vulgatum* (Linnaeus, 1758)

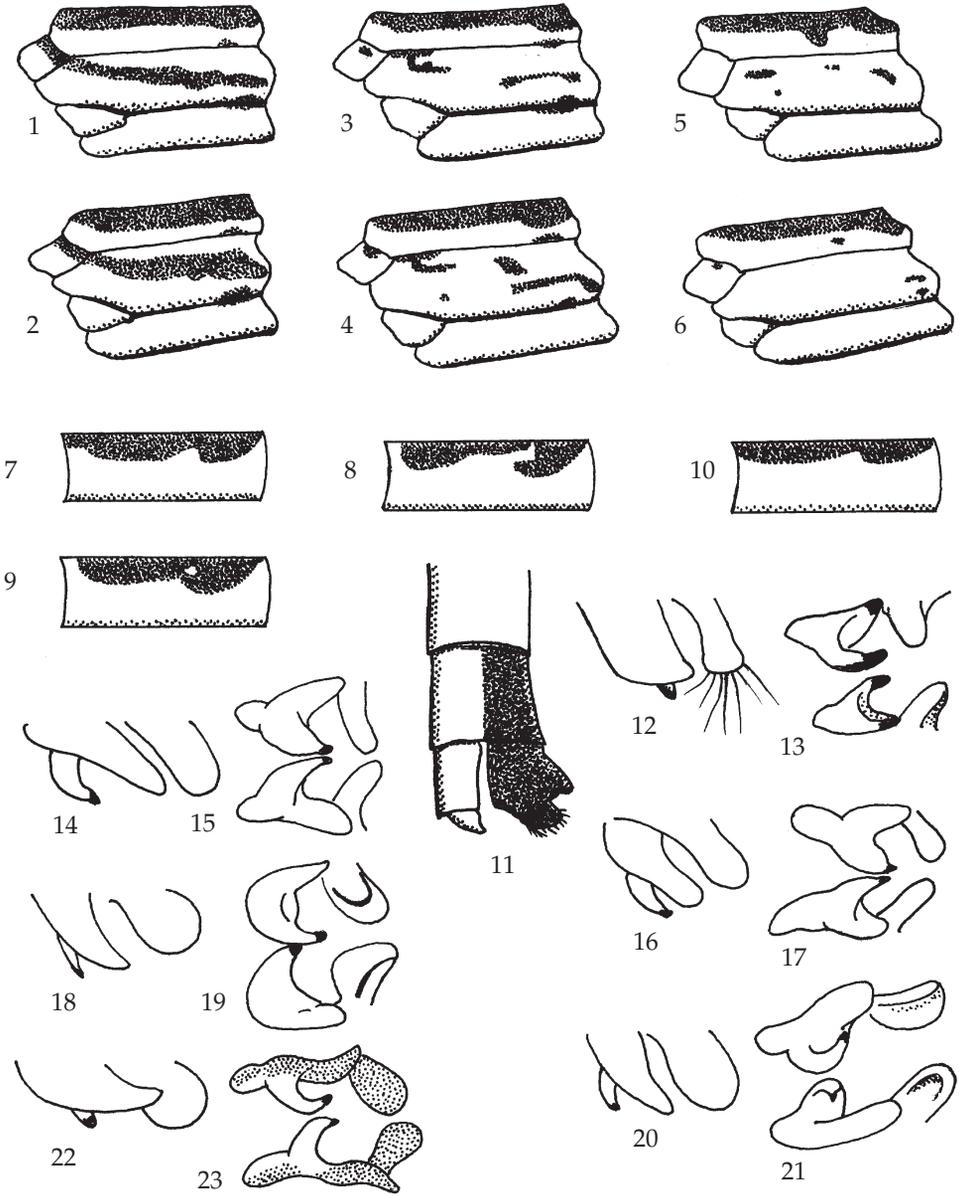
Material: 8♂♂, 4♀♀, Tajikistan: Varzob, 17-20.vii.1991; 10♂♂, 8♀♀, Dashti-Kurk, 13.vii.1991; 1♂, Turkmenistan: 40 km E Kara-Kala, 3.viii.1993; 1♂, 1♀, Uzbekistan: Chardzhou, G. von Rennenkampf.

Hundreds of mostly freshly emerged specimens have been seen resting on grasses near a marsh in Dashti-Kurk. In Varzob, tens of specimens (partly fresh ones) have been noticed resting on grasses and bushes. Since the specimens from Varzob (but not from Kopet-Dag) lack most 'usual' markings, they may be assigned to the subspecies *decoloratum* Selys, 1884 (cf. Jödicke, 1994). The black line against the vertex or eye-margin is absent. The lateral sutures of the thorax have no or almost no black markings. The femora and tibiae are yellowish with almost no dark markings. The specimens from Kopet-Dag (40 km E. Kara-Kala) seems to belong to the nominate subspecies. Certain specimens from Varzob are almost completely pale yellow. All specimens from Dashti-Kurk are teneral and are also almost completely yellowish. It thus seems that young specimens of *S. vulgatum* from Tajikistan concern a very pale form, and that they grow gradually darker. See also figs 20-21.

38. *Sympetrum sinaiticum* Dumont, 1977

Material: 4♂♂, 3♀♀, Tajikistan: Kondara, 20.vi.-19.vii.1991; 1♂, Varzob, 20.vii.1991; 2♂♂, 2♀♀, Turkmenistan: 40 km E Kara-Kala, 3.vi.-12.viii.1993.

In Kondara, the specimens has been caught on mountain slopes (often resting on



Figs. 1-10, variation in colour patterns on thorax and resp. second abdominal segment (side views) of three *Sympetma* species. 1-2 and 7, *S. fusca*, Tajikistan and Turkmenistan; 3-4 and 8-9, *S. gobica*, Tajikistan, Kondara; 5-6 and 10, *S. paedisca*, Turkmenistan, nr. Kara-Kala. Fig. 11, apex (a bit distorted) of a male specimen of an unidentified *Ischnura* species, Tajikistan, Varzob. Figs. 12-23, schematic view of male genitalia of *Sympetrum* species, resp. side view (left row) and bottom view (right row). 12-13, *S. fonscolombii*, Tajikistan, Kondara; 14-15, *S. meridionale*, Turkmenistan, Tedzhen; 16-17, *S. sanguineum*, Tajikistan, Dashti-Kurk; 18-19, *S. striolatum*, Turkmenistan, nr. Kara-Kala; 20-21, *S. vulgatum*, Tajikistan, Varzob; 22-23, unidentified subspecies of *S. sinaiticum*, Tajikistan, Kondara.

small trees), and in Varzob the specimens have been found on a grass field with small trees near a marsh. The specimens were compared with the types of subspecies *arenicolor* Jödicke, 1994 and *deserti* Jödicke, 1994. The material here published is close to the types of subspec. *arenicolor*, but differs slightly. A complicating factor is that blackish markings on the thorax become greyish with age and are then indistinct. In the new material from Kondara, Varzob and environment of Kara-Kala the thoracic markings are not so much reduced (cf. Jödicke, 1994: 246, figs 13-17) on a pale greenish ground colour, the appendices inferiores seemingly reach slightly farther along the superiores (as in *deserti*) (cf. Jödicke, 1994: 248, figs 24-27). The genital structures of the new material (see figs 22-23) most closely resemble those of *arenicolor*, but the general colour patterns seemingly do not correspond well. There thus may be more variation in colour pattern than Jödicke (1994) noted for *arenicolor*, but it may also concern another (new) subspecies. Comparison with more and fresher material from Uzbekistan and Kazakhstan is needed for a better understanding of the subspecies in Central Asia. Abd. 24 mm. and Hw. 26-27 mm.

### Biogeographic notes

Among the series of *Sympetrum vulgatum* and *Sympetrum striolatum* there are paler subspecies in Tajikistan than in the Kopet-Dag (env. Kara-Kala). This may be due to different refugia during glacial periods in Bactria (viz. Central Asia with parts of neighbouring countries) (cf. Schoorl, 1990: 270-271). The desert regions between Transcaspia and Tajikistan may have been afterwards a barrier for certain species. The Kopet-Dag mountain chain, which is not so high but a desert, have seemingly not formed a serious barrier for dispersal of dragonflies (cf. Schmidt, 1954), e.g. for *Calopteryx orientalis* subspec. *shachrudica*. For biogeographic units in Central Asia see e.g. Puplesis (1994). It may be that the paler subspecies had to survive in oases in steppes and/or deserts (during Glacial Periods), and had a different type of vegetation than the refugia with forest. The teneral specimens of *S. vulgatum* tended to hide in marshy grass vegetation (both in Varzob and Dashti-Kurk), and these are paler, while the older specimens rested on bushes and flew also above the forest (in Varzob and Kondara), and these older ones are also distinctly darker. It would be of interest to investigate material from Afghanistan, which probably has had a separate refugium (cf. Schoorl, 1990: 270-271) with different habitats.

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## References

- Bartenev, A., 1913. Sur une collection de libellules de Boukhara (Turkestan). (Pseudoneuroptera, Odonata).— Ent. Obozr. VIII (1): 176-189.
- Belyshev, B.F., 1958. On the fauna of Odonata of Central Asia.— Fragm. faun. 8 (5): 97-109.
- Belyshev, B.F., 1960. Phenology of dragonflies flight (Odonata) in the Altai Steppes.— Rus. ent. U.R.S.S. 39 (2): 395-403.
- Belyshev, B.F., 1961. Notes on the fauna of Odonata of Eastern Kazakhstan.— Fragm. faun. 9 (4): 27-41.
- Borisov, S.N., 1983. [New species of Odonata of genus *Sympetrum* Newman (Odonata, Libellulidae) from Tajikistan].— Izv. Akad. Nauk tadzhik. SSR (Otd. biol. Nauk) 1983 (2): 68-70.
- Borisov, S.N., 1985. [The artificial irrigation system as inhabitation of dragonflies larvae (Insecta, Odonata) in the vales of Tajikistan].— Dokl. Akad. Nauk tadzhik. SSR 28 (9): 541-543.
- Borisov, S.N., 1986. Populations of some dragonfly species in southwest Tadzhikistan valleys.— Vest. Zool. 1986 (2): 38-42.
- Borisov, S.N., 1987. [On the ecology of two similar dragonfly species in Tajikistan].— Ekologiya. Sverdlovsk. 1987 (1): 85-87.
- Borisov, S.N. & Karitonov, A. Yu., 1986. [Odonate fauna (Insecta, Odonata) of Tajikistan].— Izv. Akad. Nauk tadzhik. SSR (Otd. biol. Nauk) 1986 (1): 46-49.
- Brauer, F., 1880. Verzeichniss der von Fedtschenko in Turkestan gesammelten Odonaten.— Verh. zool.-bot. Ges. Wien 30: 229-232.
- Dumont, H.J. & S.N. Borisov, 1993. Three, not two species in the genus *Sympecma* (Odonata: Lestidae).— Bull. Anns Soc. r. belge Ent. 129: 31-40.
- Foerster, F., 1900. Libellen, gesammelt im Jahre 1898 in Central-Asien von Dr. J. Holderer.— Wien. ent. Ztg. 19: 253-267, T. III.
- Jödicke, R., 1994. Subspecific division of *Sympetrum sinaiticum* Dumont, 1977, and the identity of *S. vulgatum decoloratum* (Selys, 1884) (Anisoptera: Libellulidae).— Odonatologica 23 (3): 239-253.
- Kimmins, D.E., 1950. The 3rd Danish Expedition to Central Asia. Zoological Results 4. Odonata, Ephemeroptera and Neuroptera (Insecta) from Afghanistan.— Vidensk. Meddr dansk naturh. Foren. 112: 235-241.
- Puplesis, R., 1994. The Nepticulidae of Eastern Europe and Asia: western, central and eastern parts: 1-291 + figs 1-840.— Leiden.
- Puschign, R., 1911. Libellen aus Südostrussland.— Verh. zool.-bot. Ges. Wien 56: 429-459.
- Ris, F., 1897. Note sur quelques odonates de l'Asie Centrale.— Extrait des Anns Soc. ent. Belg. XLI: 42-50.
- Schmidt, E., 1954. Ergebnisse der Oesterreichischen Iran-Expedition 1949/50. Die Libellen Irans.-Sber. öst. Akad. Wiss., Abt. I, 163. Bd. Heft 4 und 5.
- Schoorl, J.W., 1990. A phylogenetic study on Cossidae (Lepidoptera: Ditrysia) based on external adult morphology.— Zool. Verh. Leiden 263: 1-295.
- Selys-Longchamps, M. de, 1887. Odonates de l'Asie Mineure et révision de ceux des notes parties de la faune dite européenne.— Anns Soc. ent. Belg. 31: 1-49.

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