

A collection of Odonata from North Korea, with first record of *Ischnura elegans* (Odonata: Coenagrionidae)

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Abstract. A collection of 658 Odonata adults, exuviae, and larvae from North Korea comprising 43 species is presented. *Ischnura elegans* is a new record for North Korea.

Further key words. Dragonfly, damselfly, Anisoptera, Zygoptera, adults, larvae, exuviae

Introduction

Detailed information about the Odonata of the Korean Peninsula is limited and especially the North Korean fauna is poorly known. Publications by ASAHINA (1989a, 1989b, 1989c, 1990a, 1990b), KIM (1998) and more recently by LEE (2001), YUM et al. (2010), BAE (2011), BAE & LEE (2012), and JUNG (2012) provide a usable overview but with emphasis on South Korea. The checklist of JUNG (2012) included 123 species for the Korean Peninsula. According to SAWABE et al. (2004) *Sympetrum frequens* (Selys, 1883) however should be deleted from the Korean list due to synonymy with *Sympetrum depressiusculum* (Selys, 1841); on the other hand according to FLECK et al. (2013) *Epiophlebia sinensis* Li & Nel, 2011 should be added.

Material and methods

Specimens were predominantly collected by the second author (JF) who visited North Korea from August 1987 to August 1990 with the aim of studying the avifauna of this country. Together with the Zoological Institute of the Academy of Science in Pyongyang he visited eight of the nine provinces, including several localities which were not accessible for foreign visitors before (FIEBIG 1993, 1995). During these trips odonates also could be collected. This collection, supplemented with specimens collected by Hans-Joachim Paepke, Ri Dok Mun, and Gottfried Mauersberger, is arranged and presented here. Geographic coordinates and altitude above sea level as given in the list of collecting sites are approximations added later and sites within the area of the capital Pyongyang (locality 1) specified in the list are not indicated individually on the map (Fig. 1).

List of collecting sites

(1) Pyongyang area (39.0392°N, 125.7625°E), 10 m a.s.l. (1a) Taedongang River (39.0415°N, 125.7722°E), 10 m a.s.l. (1b) Mangyongdae (38.9978°N, 125.6570°E),

30 m a.s.l. **(1c)** Moranbong Park (39.0489°N, 125.7543°E), 50 m a.s.l. **(1d)** Ryon-gak Mountain (39.0362°N, 125.6186°E), 235 m a.s.l. **(1e)** Taesongsan Mountain (39.0789°N, 125.8514°E), 260 m a.s.l. **(1f)** Botanical Garden (39.0687°N, 125.8207°E), 35 m a.s.l. **(1g)** Tomb of King Tongmyong (38.8945°N, 125.9226°E), 60 m a.s.l. **(2)** Pyongan-namdo (South Pyongan), Taesongho (38.9092°N, 125.4481°E), 28 m a.s.l. **(3)** Pyongan-namdo (South Pyongan), Nampo (38.7523°N, 125.3247°E), 26 m a.s.l. **(3a)** Waudo, artificial pond (38.7143°N, 125.3422°E), 30 m a.s.l. **(4)** Pyongan-namdo (South Pyongan), Sokamho near Seogam (39.2511°N, 125.7023°E), 50 m a.s.l. **(5)** Pyongan-namdo (South Pyongan), Paeksongri (39.3167°N, 125.8833°E), 45 m a.s.l. **(6)** Pyongan-namdo (South Pyongan), Kaechon (39.7027°N, 125.8927°E), 48 m a.s.l. **(7)** Pyongan-pukto (North Pyongan), Myohyangsan (40.0371°N, 126.1778°E), 100 m a.s.l. **(8)** Pyongan-pukto (North

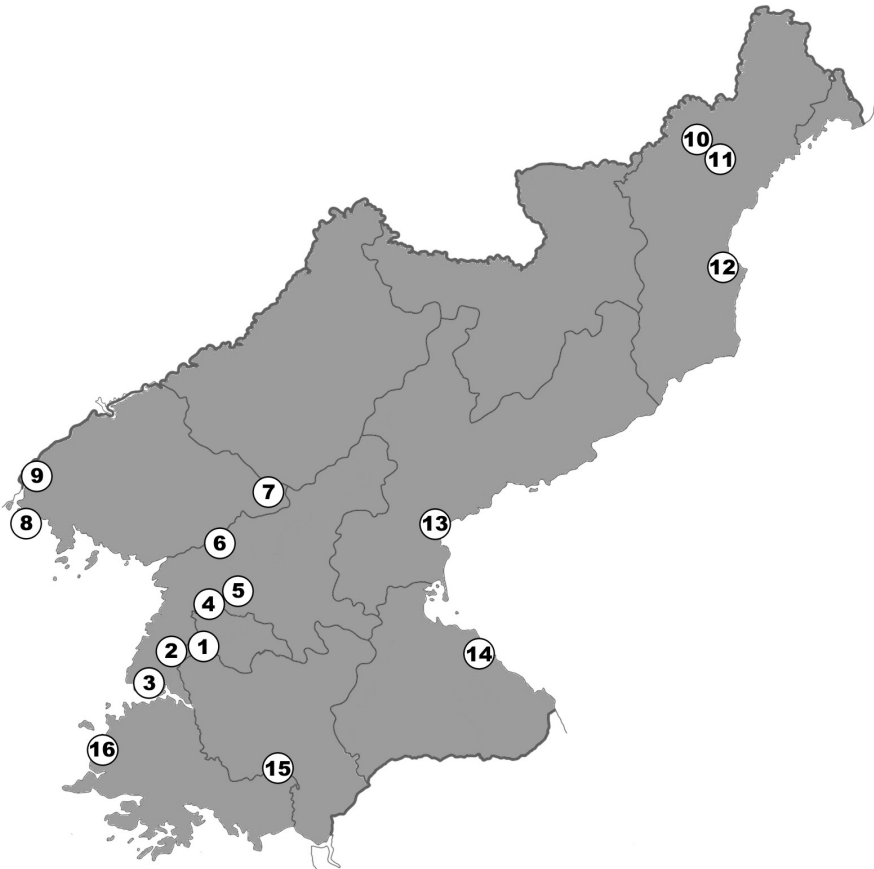


Fig. 1. Map of North Korea, with geographic locations of the collecting sites.

Pyongan), Tasa Island (39.7953°N, 124.4181°E), 20 m a.s.l. **(9)** Pyongan-pukto (North Pyongan), Sinuiju (40.0823°N, 124.4489°E), 30 m a.s.l. **(10)** Hamgyong-pukto (North Hamgyong), Sincham-ri north of Chongjin (42.1118°N, 129.4168°E), 690 m a.s.l. **(11)** Hamgyong-pukto (North Hamgyong), Mayang Reservoir north of Chongjin (42.0705°N, 129.5096°E), 757 m a.s.l. **(12)** Hamgyong-pukto (North Hamgyong), Orangchon River (41.4072°N, 129.7403°E), 1 m a.s.l. **(13)** Hamgyong-namdo (South Hamgyong), Lake Kwangpo east of Chongpyong (39.7840°N, 127.4555°E), 1 m a.s.l. **(14)** Kangwondo (Kangwon), Sijungho (39.0111°N, 127.8310°E), 2 m a.s.l. **(15)** Hwanghae-pukto (North Hwanghae), Pongtanni (38.2122°N, 126.3289°E), 31 m a.s.l. **(16)** Hwanghae-namdo (South Hwanghae), Kwail (38.3929°N, 124.9727°E), 177 m a.s.l.

Results

The collection is probably the most comprehensive and valuable of its kind in Europe, containing 558 imagines (133 Zygoptera, 425 Anisoptera), 91 exuviae (only Anisoptera), and nine larvae (only Anisoptera) of 43 species (twelve Zygoptera, 39 Anisoptera) from 16 North Korean sampling sites. *Ischnura elegans* is a new record for North Korea. If not stated otherwise specimens are imagines and were collected by the second author (JF). Except for a few duplicates to be stored at the Museum Wiesbaden (MWNH) the collection will be deposited at the Museum für Naturkunde Berlin (ZMB).

List of recorded species

Family Lestidae

1. *Sympecma paedisca* (Brauer, 1877)

(1) 8♂ 11♀ ix/x-1988 **(1e)** 1♀ 18-ix-1988, 1♂ 5♀ 02-x-1988 **(4)** 1♀ 04-ix-1989
(6) 1♂ 15-vi-1990.

Family Calopterygidae

2. *Atrocalopteryx atrata* (Selys, 1853)

(7) 1♀ 29-vi-1990 **(13)** 2♂ 13-ix-1989.

3. *Calopteryx japonica* Selys, 1869

(7) 8♂ 1♀ 17-vi-1989, 1♂ 17-vi-1990, 3♂ 3♀ 29-vi-1990 **(13)** 1♂ 13-ix-1989
(15) 2♂ 3♀ 28-v-1989.

Family Coenagrionidae

4. *Coenagrion johanssoni* (Wallengren, 1894)

(15) 2♂ 28-v-1989.

5. *Ischnura asiatica* (Brauer, 1865)

(1) 26♂ 12♀ ix/x-1988 **(8)** 1♂ 1♀ 28-vii-1989.

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

(3) 1♂ 1♀ 28-vi-1990.

7. *Mortonagrion selenion* (Ris, 1916)

(1b) 1♂ 1♀ 10-vi-1990.

8. *Paracercion calamorum* (Ris, 1916)

(1) 3♂ 2♀ ix/x-1988.

9. *Paracercion hieroglyphicum* (Brauer, 1865)

(1) 5♂ 3♀ ix/x-1988 (3) 2♂ 7♀ 28-vi-1990.

10. *Paracercion melanotum* (Selys, 1876)

(2) 1♂ 1♀ 31-viii-1989 (3) 1♂ 28-vi-1990.

11. *Paracercion plagiosum* (Needham, 1930)

(1f) 2♀ 24-vi-1989 (3) 1♀ 28-vi-1990.

Family Platycnemididae**12. *Platycnemis phyllopoda* Djakonov, 1926**

(1) 3♂ 1♀ ix/x-1988 (6) 1♂ 1♀ 15-vi-1990.

Family Aeshnidae**13. *Aeshna crenata* Hagen, 1856**

(1e) 1♂ exuvia vi-1988 (1f) 2♂ exuviae 04-vi-1989.

14. *Aeshna mixta* Latreille, 1805

(1e) 1♀ 14-viii-1988 (13) 2♂ 13-ix-1989.

15. *Anax nigrofasciatus* Oguma, 1915

(1) 1♂ exuvia vi-1990 (1e) 1♀ exuvia vi-1988 (1c) 1♀ exuvia 22-vi-1989 (7) 1♂ exuvia 17-vi-1990 (15) 5♂ 1♀ exuvia 28-v-1989.

16. *Anax parthenope julius* (Brauer, 1865)

(1) 3♂ ix/x-1988 leg. G. Mauersberger, 1♂ 04-vi-1989, 1♀ 1990 leg. Ri Dok Mun, H.-J. Paepke (1b) 1♂ exuvia 10-vi-1990 (1f) 3♂ 5♀ exuviae 04-vi-1989, 5♂ 2♀ exuviae 24-vi-1989 (3) 11♂ 3♀ 31-viii-1989 (3a) 1♂ exuvia 12/17-vi-1990 leg. H.-J. Paepke (7) 1♀ exuvia 17-vi-1990 (12) 1♀ 25-ix-1989 (13) 1♀ 13-ix-1989 (16) 1♀ 08-vii-1990.

Family Gomphidae**17. *Anisogomphus maacki* (Selys, 1872)**

(7) 6♂ 5♀ exuviae 15/16-vi-1990 leg. H.-J. Paepke.

18. *Davidius lunatus* (Bartenev, 1914)

(7) 1♀ 17-vi-1989.

19. *Gomphidia confluens* Selys, 1878

(1g) 1♂ 31-vii-1988, 1♂ 11-vi-1989 (6) 1♀ exuvia 15-vi-1990 (7) 2♂ exuviae 17-vi-1990, 1♀ exuvia 01-vii-1990.

20. *Ophiogomphus obscurus* Bartenev, 1909

(10) 1♂ 2♀ 21-ix-1989.

21. *Sieboldius albardae* Selys, 1886

(7) 1♀ exuvia 18-vi-1989, 1♀ imago 1♀ exuvia 15-vi-1990 leg. H.-J. Paepke, 3♂
3♀ exuviae 15/16-vi-1990 leg. H.-J. Paepke, 1♂ 16-vi-1990.

22. *Sinictinogomphus clavatus* (Fabricius, 1775)

(3a) 18♂ 19♀ exuviae/larvae 12/17-vi-1990 leg. H.-J. Paepke.

23. *Stylurus annulatus* (Djakonov, 1926)

(1a) 1♀ 19-vi-1990.

Family Corduliidae**24. *Epithecina marginata* (Selys, 1883)**

(1f) 1♀ exuvia 04-vi-1989.

Family Macromiidae**25. *Epophthalmia elegans* (Brauer, 1865)**

(1f) 2♂ 04-vi-1989, 2♂ 24-vi-1989 (1e) 1♂ 01-viii-1989.

26. *Macromia* cf. *amphigena* Selys, 1871

(7) 2♀ exuviae 15/16-vi-1990 leg. H.-J. Paepke.

Family Libellulidae**27. *Crocothemis servilia* (Drury, 1773)**

(1) 1♀ 1990 leg. Ri Dok Mun.

28. *Deielia phaon* (Selys, 1883)

(1g) 1♂ 31-vii-1988, 1♂ 02-viii-1989 (8) 1♀ 27-vii-1989 (2) 1♂ 23-viii-1989
(7) 1♂ 16-vi-1990 (3) 2♂ 1♀ 28-vi-1990.

29. *Orthetrum albistylum* (Selys, 1848)

(1) 1♂ ix/x-1988 leg. G. Mauersberger, 1♂ 1990 leg. Ri Dok Mun, 1♀ 11-v-
-1990 (1b) 1♀ 10-vi-1990 (1e) 1♂ 1♀ 17-vii-1988 (1f) 9♂ 3♀ 04-vi-1989, 5♂
1♀ 24-vi-1989 (1g) 6♂ 31-vii-1988, 3♂ 11-vi-1989, 1♂ 02-viii-1989 (2) 1♂
4♀ 22-vii-1989, 6♂ 4♀ 28-vi-1990 (3) 1♂ 1♀ 31-viii-1989 (4) 1♀ 04-ix-1989
(9) 1♀ 27-vii-1989.

30. *Orthetrum lineostigma* (Selys, 1886)

(1f) 2♂ 2♀ 04-vi-1989.

31. *Orthetrum melania* (Selys, 1883)

(3) 1♀ 31-viii-1989.

32. *Pantala flavescens* (Fabricius, 1798)

(1) 4♂ 6♀ ix/x-1988 leg. G. Mauersberger, 8♂ 10♀ 26-vii-1990 (1b) 1♂ 23-
-viii-1988 (1e) 1♀ 02-x-1988 (4) 1♀ 04-ix-1989 (8) 3♂ 2♀ 26-vii-1989, 6♀
27-vii-1989 (13) 1♀ 31-viii-1989, 1♂ 13-ix-1989 (14) 3♂ 21-vii-1990 (16) 3♂
12♀ 08-vii-1990.

33. *Sympetrum baccha matutinum* Ris, 1911

(1) 1♂ ix/x-1989.

34. *Sympetrum cordulegaster* (Selys, 1883)
(1) 1♂ ix/x 1989 (1d) 1♀ 29-ix-1988.
35. *Sympetrum croceolum* (Selys, 1883)
(11) 1♂ 26-ix-1989.
36. *Sympetrum darwinianum* (Selys, 1883)
(1) 4♂ 8♀ ix/x-1988 leg. G. Mauersberger, 3♀ ix/x 1989 (1d) 1♂ ix/x 1988 leg. G. Mauersberger (1e) 1♂ 1♀ 14-viii-1988, 1♂ ix/x 1988 leg. G. Mauersberger, 1♂ 1♀ 04-ix-1988, 1♂ 17-ix-1988 leg. G. Mauersberger, 1♂ 18-ix-1988, 2♀ 29-ix-1988, 1♀ 02-x-1988.
37. *Sympetrum depressiusculum* (Selys, 1841)
(1) 2♂ 1♀ ix/x-1987, 1♂ 3♀ ix/x-1989, 1♀ 20-ix-1988 leg. G. Mauersberger, 1♀ 17-ix-1988 leg. G. Mauersberger, 13♂ 17♀ ix/x-1988 leg. G. Mauersberger (1b) 1♀ ix/x-1988 leg. G. Mauersberger (1d) 4♀ 29-ix-1988 (1e) 1♂ 1♀ 14-viii-1988, 7♂ 5♀ 04-ix-1988, 2♂ 2♀ 17-ix-1988 leg. G. Mauersberger, 2♂ 1♀ 17-ix-1988, 1♀ 18-ix-1988, 2♂ 1♀ 02-x-1988 (5) 1♂ 2♀ 03-vii-1988.
38. *Sympetrum eroticum* (Selys, 1883)
(1) 6♂ 2♀ ix/x-1988 leg. G. Mauersberger, 2♂ 2♀ ix/x-1989 (1e) 1♂ ix/x-1988 leg. G. Mauersberger.
39. *Sympetrum infuscatum* (Selys, 1883)
(1) 1♂ 2♀ ix-1987, 3♂ ix/x-1988 leg. G. Mauersberger, 1♂ 20-ix-1988 leg. G. Mauersberger, 1♂ 1♀ 03-vii-1990, 1♂ 22-vii-1990, 2♂ 5♀ 10-vii-1990 (1b) 3♂ 4♀ 23-viii-1988, 1♂ 1♀ ix/x-1988 leg. G. Mauersberger (1c) 1♀ 22-vii-1989 (1d) 1♀ ix/x-1988 leg. G. Mauersberger (1e) 1♂ 2♀ 14-viii-1988, 1♀ 17-vii-1988, 1♂ 2-x-1988, 1♂ 6♀ 01-viii-1989, 1♂ 1♀ 4-ix-1988, 2♂ 2♀ 17-ix-1988 leg. G. Mauersberger (1f) 2♀ 24-vii-1989 (2) 1♂ 22-vii-1989, 4♂ 4♀ 31-viii-1989 (4) 2♂ 04-ix-1989 (5) 1♂ 2♀ 03-vii-1988 (12) 1♂ 1♀ 25-ix-1989 (16) 12♂ 8♀ 08-vii-1990.
40. *Sympetrum kunckeli* (Selys, 1884)
(1) 1♀ ix/x-1989 (1d) 4♀ ix/x-1988 leg. G. Mauersberger (1e) 1♀ 14-viii-1988, 1♀ 04-ix-1988, 1♀ 17-ix-1988 leg. G. Mauersberger, 1♀ 17-ix-1988, 1♀ 18-ix-1988.
41. *Sympetrum pedemontanum elatum* (Selys, 1872)
(1) 2♂ ix/x-1988 leg. G. Mauersberger, 1♂ ix/x-1989.
42. *Sympetrum striolatum imitoides* Bartenev, 1915
(1) 1♀ ix/x-1989 (1e) 1♂ 04-ix-1988.
43. *Sympetrum uniforme* (Selys, 1883)
(1) 4♂ 6♀ ix/x-1988 leg. G. Mauersberger (1b) 2♂ 3♀ 23-viii-1988, 1♀ ix/x-1988 leg. G. Mauersberger (1d) 1♂ 4♀ ix/x-1988 leg. G. Mauersberger (1e) 1♀ 04-ix-1988, 1♀ 17-ix-1988 leg. G. Mauersberger, 1♂ 01-viii-1989 (2) 1♂ 3♀ 22-vii-1989, 2♂ 2♀ 31-viii-1989 (4) 1♀ 04-ix-1989 (8) 3♂ 2♀ 26-vii-1989.

Discussion

Almost all species in this collection are known to occur in North Korea as well as in South Korea and the Russian Far East (EDA 1986; HONG 1991; MALIKOVA 1995; HARITONOV & MALIKOVA 1998; KIM 1998; LEE 2001; BAE 2011; BAE & LEE 2012). However, the true distribution and abundance of each species was difficult to interpret and varied depending on the author(s). Several species seem to be rare and local in the northern part of the Korean Peninsula but this might rather be due to poor knowledge of the North Korean fauna than reflecting true rareness.

Data presented for *Ischnura elegans* (Vander Linden, 1820) seem to be the first record for North Korea. Records of alleged *Ischnura senegalensis* (Rambur, 1842) from North Korea as stated by HONG (1991) are probably erroneous and most likely refer to *I. elegans* as according to current knowledge *I. senegalensis* only occurs in an area stretching from Jeju Island to Taean County in South Korea (Jin Whoa Yum pers. comm.). The first record of *I. elegans* from the adjacent Russian Far East was published by MALIKOVA (1995); cf. HARITONOV & MALIKOVA (1998).

According to previous authors (ASAHINA 1989c, 1990a; BAE & LEE 2012; JUNG 2012) several subspecies are said to occur on the Korean peninsula. We compared specimens with described characters of each taxon, however, infra-taxonomical classification was not always comprehensible to us. According to diagnostic traits published by BUCHHOLZ (1955) we can confirm the occurrence of *Anax parthenope julius* (Brauer, 1865), as well as *Sympetrum pedemontanum elatum* (Selys, 1872), *S. striolatum imitoides* Bartenev, 1915 and *S. bacha matutinum* Ris, 1911 according to characters published by RIS (1911) and ASAHINA (1990a). We could not confirm *Orthetrum albistylum speciosum* (Uhler, 1858) which was originally described from Japan. According to RIS (1909) this taxon is characterized by greater size, a more slender abdomen, brownish tinted wing apices and four cells instead of three at the bases of the forewing discoidal fields. However, our series from North Korea revealed continuous variation from large specimens resembling *O. albistylum speciosum* to smaller specimens resembling the nominate subspecies. Specimens of different sizes occurred together at the same localities and no further distinct morphological differences were evident. We therefore support SCHORR & PAULSON (2015) and consider *Libellula speciosa* Uhler, 1858 as synonym to *O. albistylum*.

SASAMOTO & FUTAHASHI (2013) described several subspecies of *Orthetrum melania* (Selys, 1883) of which *O. melania continentale* should occur on the Korean Peninsula. In accordance with SCHORR & PAULSON (2015) however we consider ssp. *continentale* as a synonym of *O. melania* and thus refrained from assigning our specimens from North Korea to a definite subspecies. The same applies to the karyotypic *Crocothemis servilia mariannea* Kiauta, 1983 which according to HIGASHI et al. (2001) is restricted to Japan and does not occur northwest of Tsushima Island.

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References

- ASAHINA S. 1989a. [The Odonata of Korean Peninsula, a summarized review. Part I. Introductory notes and the suborder Zygoptera]. *Gekkan-Mushi* 220: 8-15 [in Japanese]
- ASAHINA S. 1989b. [The Odonata of Korean Peninsula, a summarized review. Part II. Anisoptera 1 (Gomphidae)]. *Gekkan-Mushi* 222: 8-13 [in Japanese]
- ASAHINA S. 1989c. [The Odonata of the Korean Peninsula, a summarized review. Part III. Anisoptera 2 (Aeshnidae and Corduliidae)]. *Gekkan-Mushi* 224: 14-18 [in Japanese]
- ASAHINA S. 1990a. [The Odonata of the Korean Peninsula, a summarized review. Part IV. Anisoptera 3 (Libellulidae 1)]. *Gekkan-Mushi* 228: 16-22 [in Japanese]
- ASAHINA S. 1990b. [The Odonata of the Korean Peninsula, a summarized review. Part V. Libellulidae 2]. *Gekkan-Mushi* 231: 15-19 [in Japanese]
- BAE Y.J. 2011. Insect Fauna of Korea, Volume 4, Number 1. Arthropoda: Insecta: Odonata: Zygoptera. Damselflies. National Institute of Biological Resources, Ministry of Environment, Incheon
- BAE Y.J. & LEE H.Y. 2012. Insect Fauna of Korea, Volume 4, Number 2. Arthropoda: Insecta: Odonata: Anisoptera: Gomphidae, Aeshnidae, Cordulegastridae. Dragonflies. National Institute of Biological Resources, Ministry of Environment, Incheon
- BUCHHOLZ K.F. 1955. Morphologische Differenzierung bei der Rassenbildung von *Anax parthenope* Selys (Odonata, Aeshnidae). *Bonner zoologische Beiträge* 6: 118-131
- EDA S. 1986. A record of Odonata from Pyongyang, Korea, with description of a new subspecies of *Epopthalmia elegans*. *Tombo* 29: 60-65
- FIEBIG J. 1993. Dreijährige ornithologische Studien in Nordkorea, 1. Allgemeiner Teil und Non-Passeriformes. *Mitteilungen aus dem Zoologischen Museum Berlin* 69, Supplement: *Annalen für Ornithologie* 17: 93-146
- FIEBIG J. 1995. Dreijährige ornithologische Studien in Nordkorea, Nachtrag zum 1. Teil und 2. Teil Passeriformes. *Mitteilungen aus dem Zoologischen Museum Berlin* 71, Supplement: *Annalen für Ornithologie* 19: 43-99
- FLECK G., LI J., SCHORR M., NEL A., ZHANG X., LIN L. & GAO M. 2013. *Epio-*

- phlebia sinensis* Li & Nel 2011 in Li et al. (2012) (Odonata) newly recorded in North Korea. *International Dragonfly Fund-Report* 61: 1-4
- HARITONOV A.YU. & MALIKOVA E.I. 1998. Odonata of the Russian Far East: a summary. *Odonatologica* 27: 375-381
- HIGASHI K., LEE C.E., KAYANO H. & KAYANO A. 2001. Korea Strait delimiting distribution of distinct karyomorphs of *Crocothemis servilia* (Drury) (Anisoptera: Libellulidae). *Odonatologica* 30: 265-270
- HONG R.T. 1991. [On the species composition of Odonata in North Korea]. *Biology* (Pyeongyang) 4: 54-57 [In Korean]
- JUNG K.-S. 2012. The Dragonflies and Damselflies of Korea. Seoul [In Korean, English title]
- KIM J.-H. 1998. [The Odonata and Orthoptera of Korea in color]. Kyohak Publishing, Seoul [in Korean]
- LEE S.M. 2001. The Dragonflies of Korean Peninsula (Odonata). Jungheungsang, Seoul
- MALIKOVA E.I. 1995. Strekozy (Odonata, Insecta) Dal'nego Vostoka Rossii. [Dragonflies (Odonata, Insecta) of the Far East of Russia]. Autoreferate of the dissertation for aspiration of the scientific degree of candidate of biological sciences. Institute of Systematics and Ecology of Animals, Novosibirsk [in Russian]
- RIS F. 1909. Libellulinen monographisch bearbeitet. Vol. I. Libellulinen 1. *Collections zoologiques du Baron Edm. de Selys Longchamps. Catalogue systématique et descriptif* 9: 1-120, pl. I. Hayez, Brussels
- RIS F. 1911. Libellulinen monographisch bearbeitet. Vol. II. Libellulinen 5. *Collections zoologiques du Baron Edm. de Selys Longchamps. Catalogue systématique et descriptif* 13: 529-700, pl. V. Hayez, Brussels
- SASAMOTO A. & FUTAHASHI R. 2013. Taxonomic revision of the status of *Orthetrum triangulare* and *melania* group (Anisoptera: Libellulidae) based on molecular phylogenetic analyses and morphological comparisons, with a description of three new subspecies of *melania*. *Tombo* 55: 57-82
- SAWABE K., UÉDA T., HIGASHI K. & LEE S.-M. 2004. Genetic identity of Japanese *Sympetrum frequens* and Korean *S. depressiusculum* inferred from mitochondrial 16S rRNA sequences (Odonata: Libellulidae). *International Journal of Odonatology* 7: 517-527
- SCHORR M. & PAULSON D. 2015. World Odonata List. Online on the Internet, URL (25-xi-2015): <http://www.pugetsound.edu/academics/academic-resources/slater-museum/biodiversity-resources/dragonflies/world-odonata-list2>
- YUM J.W., LEE H.Y. & BAE Y.J. 2010. Taxonomic Review of the Korean Zygoptera (Odonata). *Entomological Research Bulletin* 26: 41-55

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