Insect Fauna of Korea

Volume 4, Number 1

Arthropoda: Insecta: Odonata: Zygoptera

Damselflies

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National Institute of Biological Resources
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Arthropoda: Insecta: Odonata: Zygoptera

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The Flora and Fauna of Korea logo was designed to represent six major target groups of the project including vertebrates, invertebrates, insects, algae, fungi, and bacteria. The book cover and the logo were designed by Jee-Yeon Koo.

Preface

Biological resources are important elements encompassing organisms, genetic resources, and parts of organisms which provide potential values essential for human lives. The creation of high-valued products such as new varieties of organisms, new substances, and the development of new drugs by harnessing biological resources is now widely perceived to be one of the major indices of national competitiveness.

In the wake of the “Convention of Biological Diversity”, which was adopted in 1992 in recognition of national sovereignty over indigenous biological and genetic resources, all the countries of the world are now concerting their efforts on the discovery of original materials for the bio-industry, initiating international competition in the 21st century. Competition among countries for biological resources is now entering an intense phase following the adoption of the ABS (Access to genetic resources and Benefit-Sharing) international regime in Nagoya in 2010. For this reason, the National Institute of Biological Resources of the Korean Ministry of Environment recognizes the preservation and management of the biological resources in Korea for the bio-industry as a first priority project for the future, and has begun publication of *Flora and Fauna of Korea* for the systematic preservation and efficient management of our biological resources.

Korea has been acclaimed as a country with a high level of biological diversity, the total number of described species in Korea to date being about 37,000. Beginning in 2006, the National Institute of Biological Resources embarked on the publication of *Flora and Fauna of Korea* which, containing comprehensive and diverse information on our invaluable native species, has become the standard textbook of native species. The systematic survey of diverse taxa in all parts of Korea led by a group of professionals in the field of taxonomy over the past four years has finally come to fruition and culminated in the appearance of 16 monographs in the 2010 volumes of *Flora and Fauna of Korea* encompassing 1,037 species in 158 families belonging to 9 phyla, along with further volumes of *Flora and Fauna of Korea* encompassing 1,163 species in 112 families belonging to 7 phyla due to appear this year.

This is the first volume of *Flora and Fauna of Korea* in which a taxon of organisms of the Korean Peninsula is extensively treated at the level of species. *Flora and Fauna of Korea* will contribute to raising the standard of Korean taxonomy and improve pride in the management of our biological resources through enhanced understanding of the true nature of our native species. In addition, I am confident that the ongoing publication of *Flora and Fauna of Korea* will significantly contribute to paving the way for sustainable, wise use of biological resources.

I would like to express my sincerest gratitude to Professor Yeon Jae Bae, Korea University, who is responsible for writing this publication of *Flora and Fauna of Korea*. This series will play a pivotal role in the census of native Korean species, which are estimated to number 100,000. By promoting innovative and taxonomic research for the identification of the totality of native Korean species and by

continuously publishing such results in *Flora and Fauna of Korea*, I sincerely hope that a valuable foundation will be laid for the sustainable use of our national biological resources through the extensive research, development and for their profitable use by a prosperous bio-industry in the creation of high-valued products such as natural products, medicines, cosmetics and essential supplements in our country.

Chong-chun Kim, Ph. D.
President
NIBR

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      - *Mnais pruinosa* Selys, 1853
  - Family Coenagrionidae Kirby, 1890
    - Genus *Aciagrion* Selys, 1891
      - *Aciagrion migratum* (Selys), 1876
    - Genus *Ceriagrion* Selys, 1876
      - *Ceriagrion auranticum* Fraser, 1922
      - *Ceriagrion melanurum* Selys, 1876
      - *Ceriagrion nipponicum* Asahina, 1967
    - Genus *Coenagrion* Kirby, 1890
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Introduction

The suborder Zygoptera (order Odonata), known as damselflies, is an aquatic insect group commonly found in riparian areas and wetlands. The larvae inhabit ponds and the edges of streams among macrophytes. Damselflies, like dragonflies (Anisoptera), are predacious as larvae and adults but are less active. The adults fly close to the water surface.

The adults of Zygoptera can be easily distinguished from the suborder Anisoptera, by the general body shape and wing morphology. Body shape of Zygoptera adults is typically small and slender. The forewings and hindwings are similar in terms of shape, size and venation whereas the hindwings of Anisoptera are postero-basally expanded. Crossveins of the wings are particularly well developed in the Zygopteran family Calopterigydae. The larvae are characterized by a slender body shape and three plate-like gill lamellae on the terminal abdominal segment.

Approximately 2,500 species of Zygoptera in 22 families are included among the 5,000 or so species of world Odonata fauna belonging to 33 families (Allen et al., 1984). Thirty-five species of Zygoptera belonging to 15 genera and four families have been recorded on the Korean Peninsula with four species only reported from North Korea. The Korean Zygopteran fauna are generally known only from the adult stage, with only 10 species known from both adult and larval stages.

Okamoto (1924) recorded two species of Zygoptera, *Ceriagrion melanurum* and *Calopteryx atrata*, from Korea for the first time. Since then, Doi (1932, 1933, 1935, 1937, 1943), Haku (1937), Kamijo (1933, 1937), Asahina (1939a, 1939b, 1939c, 1989), Miyazaki (1986), and Eda (1986) investigated Korean Odonata fauna including the Zygoptera. Doi (1937) presented a key to the Korean Odonata adults. Eda (1986) reported Odonata fauna of the Pyongyang area in North Korea, including one new distribution record for Korea.

Cho (1958, 1969) comprehensively reviewed 23 species of Korean Odonata, belonging to four families, and provided descriptions with illustrations. Kong (1988) studied the larvae of South Korean Odonata including 10 species of Zygoptera. Asahina (1989) reviewed 27 Zygoptera species including 3 unrecorded species to Korea. Lee (1996) published a catalogue of Korean Odonata with his own collection localities and taxonomic and distributional remarks. Bae (1998) published an atlas of "Insects' life in Korea" including Odonata. Kim (1998) published a Korean Odonata atlas with taxonomic and ecological notes and described a new species, *Lestes hanllimensis*. Lee (2001) published a monograph "The dragonflies of Korean Peninsula (Odonata)" and Lee (2006) revised his previous monograph. Yum and Bae (2007) redescribed the nymph of *Copera tokyoensis* using Korean material. Jung (2007) published a Korean Odonata atlas with morphological diagnoses and ecological and distributional notes. Yum et al. (2010) excluded *Calopteryx cornelia* Selys, *Agriocnemis pygmaea* Rambur, *Platycnemis foliacea sasakii* Asahina, and *Lestes hanllimensis* Kim from the Korean Odonata fauna.

The purpose of this study is to review the Korean Zygoptera based on material, distributional, and literature data available up to the present.

Acknowledgement

This study is based on contributions by my former graduate student, Ms. J.W. Yum (MS thesis, 2000) and a subsequent review paper (Yum, Lee and Bae, 2010). If necessary, parts of the texts or keys in this monograph were reproduced or modified from other descriptive papers (see Materials

and Methods). Line-drawings in this study were completed by Ms. H.J. Jang under my guidance. Color photos of adult damselflies were photographed by Ms. E.M. Kim. Graduate student H.Y. Lee assisted in editing this manuscript. Taxonomic descriptions in this paper are coauthored by J.W. Yum and myself.

Materials and Methods

The damselfly material used in this study has been collected throughout South Korea since the 1970s by the author, co-workers, and students. The material was previously deposited at Korea University and the Aquatic Insect Collection of Seoul Women's University (SWU: 1994-2008) and is currently housed in the Entomological Museum of Korea University (KU). Voucher specimens of Zygoptera collected via national surveys or projects of the Ministry of Environment of Korea, and deposited in KU and the Institute of Biological Resources in Incheon, Korea, were also examined. Adult material was collected by sweep nets. Larval material was collected using hand nets and preserved in 80% ethanol.

The higher classification of Zygoptera and general morphological terminology follows Fraser (1957) and Allen et al. (1984). Families follow current phylogenetic classification, and genera and species are arranged alphabetically. Synonymy is based on the "World Catalogue of Odonata (Steinmann, 1997)" with incorporation of recent Korean catalogues such as Lee (2001, 2006). Key references used for the identification of Zygoptera taxa are as follows: Kirby (1890), Okamoto (1924), Okumura and Ishimura (1938), Needham (1930), Chujo (1931), Asahina (1933, 1934, 1956, 1969, 1989), Wu (1935), Barnard (1936), Kinoshita and Asahina (1937), Isimura (1938), Kobayashi (1940), Corbet (1953), Usinger (1963), Ishida (1969, 2005), Johnson and Westfall (1970), Kiauta (1972), Carfi (1974), Cannings and Stuart (1977), Ito et al. (1977), Lien (1980), Garchini (1983), Asahina (1984, 1987), Lieftinck (1984), Ishida and Ishida (1985, 2005), Ishida et al. (1988), Yoon and Kong (1988), Hong (1991), Tusda (1991), ESK and KSAE (1994), Lee (1996, 2001, 2002, 2006), Okudaira et al. (2001), Dumont (2004), Yum and Bae (2007), and Tennessen (2008).

Diagnoses of higher taxa and species, synonyms, type and reference information, Korean locality records, distributions, and taxonomic remarks are provided. Keys to known male adults and larvae are provided. All measurements are in millimeters (mm).

Descriptions and diagnoses of families, genera, and species were largely adopted from those of McCafferty (1981), Yum (2000), Sylsby (2001), and Okudaira et al. (2001) with minor modifications. Adult keys were modified from Cho (1969), Ishida et al. (1988), and Yum (2000); larval keys were based on Popova (1953), Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Yum (2000). Korean records of each species are based on specimen examined by the authors as well as the Korean locality data in the above references, cited mainly from Cho (1958), Yoon and Kong (1988), Asahina (1989), and Lee (2001). Limited number of voucher specimens used for the illustrations and descriptions are listed in the "SPECIMEN EXAMINED" section although majority of specimens housed at KU and other institutions have been examined.

The abbreviations used in this study are as follows: A (adult), M (male adult), F (female adult), and L (larva); CB (Chungcheongbuk-do), CN (Chungcheongnam-do), GB (Gyeongsangbuk-do), GN (Gyeongsangnam-do), GG (Gyeonggi-do and Seoul), GW (Gangwon-do), HB (Hamgyeongbuk-do), HN (Hamgyeongnam-do), HH (Hwanghae-do), JB (Jeollabuk-do), JN (Jeollanam-do), JJ (Jeju-do), PB (Pyeonganbuk-do), PN (Pyeongannam-do), PY (Pyeongyang), and YG (Yanggang-do); Mt. (Mountain), St. (Stream), R. (River), and Br. (Bridge).

Taxonomic Notes

Suborder Zygoptera

Sil-jam-ja-ri-a-mok (실잠자리아목)

The body of Zygoptera adults is generally small and slender. Head is spindle-shaped in dorsal view and compound eyes are globular and well-separated. Forewings and hindwings are homogeneous. The abdomen is slender and cylindrical. Ovipositor is complete in females and possesses 2 superior and 2 inferior appendages in males.

The larvae are easily distinguished by a slender body and cylindrical abdomen and possess 3 plate-like gill lamellae on the terminal abdominal segment.

Key to the families of adult suborder Zygoptera

1. Antenodal crossveins numerous; wings not stalked; quadrangle with several crossveins ····· Calopterygidae
− Only 2 antenodal crossveins present; wings stalked at base; quadrangle without crossveins ···· 2
2. Wing veins R_3 and Rs arising nearer arculus than nodus ····· Lestidae
− Wing veins R_3 and Rs arising nearer nodus than arculus ····· 3
3. Head ca. 3.2 x as long as wide ····· Platycnemididae
− Head ca. 2.2 x as long as wide ····· Coenagrinidae

Key to the families of larval suborder Zygoptera

1. First antennal segment greatly elongate, as long as combined length of remaining segments; prementum with deep, open median cleft; lateral caudal lamellae triangular in cross section ····· Calopterygidae
− First antennal segment not so elongate, less than combined length of remaining segments; prementum without a median cleft; lateral caudal lamellae flat to round in cross section ····· 2
2. Prementum distinctly petiolate (stalked) and spoon-shaped; narrow proximal part as long as or longer than expanded distal part; prementum with deep close median cleft ····· Lestidae
− Prementum not distinctly petiolate, more or less triangular or subquadrate in shape; prementum without median cleft ····· 3
3. Prementum with 2 dorsal premental setae; lamella as long as body, with many tracheae ····· Platycnemididae
− Prementum without 2 dorsal premantal setae (usually with one or more than 2 setae); lamella shorter than body, with reduced number of tracheae (or tracheae uncertain) ····· Coenagrinidae

Family Calopterygidae Selys, 1853

Mul-jam-ja-ri-gwa (물잠자리과)

Calopterygidae Selys, 1853: Synopsis des Calopterygines: 6.

The adult body of Calopterygidae is slender and relatively large. Adult body color is green, blue-green, bronze, or reddish brown with metallic reflectivity. The wings of adults are usually variously pigmented or colorless, not strongly narrowed at base, possessing several antenodal crossveins. Superior appendages are longer than inferior appendages, club-shaped, and curved inward like pincers.

The larval body is relatively long and slender in shape and matured larvae are approximately 25–50 mm long excluding caudal lamellae. The first segment of the antennae is longer than the combined length of the remaining antennae. The median lobe of labium is produced distally and deeply cleft. The lateral lamellae are longer than the middle lamella.

They are most commonly found at the edges of streams, with slow flowing water, where aquatic macrophytes and riparian vegetation is well developed. The family has representatives throughout the world in both tropical and temperate regions, but they are absent from Australia and New Zealand. The family contains approximately 160 species in 16 genera and 3 subfamilies.

Five species of Calopterygidae, *Calopteryx atrata* Selys, *Calopteryx cornelia* Selys, *Calopteryx japonica* Selys, *Matrona basilaris* Salys, and *Mnais pruinosa* Selys have been recorded in Korea (Jung, 2007). *Matrona basilaris* Salys is recorded only from North Korea (Hong, 1991) and *Calopteryx cornelia* Selys is inappropriately known in Korea (Jung, 2010).

Key to the genera and species of adult family Calopterygidae

1. Wings with pterostigmas; proximal part of wings hyaline ····· *Mnais, M. pruinosa*
− Wings of male without pterostigmas; proximal part of wings not hyaline ····· *Calopteryx*, 2
2. Inferior appendages of male thin, long, and curved inward; wings of female without pterostigmas ····· *C. atrata*
− Inferior appendages of male thick, short, and not curved; wings of female with white pterostigmas ····· *C. japonica*

Key to the genera and species of larval family Coenagrionidae

1. Antennal segment 1 shorter than width of head; lamellae egg-like ····· *Mnais, M. pruinosa*
− Antennal segment 1 longer than width of head; lamellae long sword-like ····· *Calopteryx*, 2
2. Antennal segment 3 longer than antennal segment 2 ····· *C. japonica*
− Antennal segment 3 shorter than antennal segment 2 ····· *C. atrata*

Genus *Calopteryx* Burmeister, 1839

Mul-jam-ja-ri-sok (물잠자리속)

Calopteryx Burmeister, 1839: Handb. Ent., 2: 825.

Type species: *Libellula virgo* Linnaeus, 1758.

Adult: Adult body relatively large. Wings black with dense venation, without stigma in male, sometimes with a false stigmatic marking (lacking denfinite bounding veins) in female; midbasal space without crossveins; radial and median veins approximate beyond arculus but may or may not close basal radial space externally. Interpolated sectors between principal veins at wing margin independent and not appearing as branches of principal veins. Legs very long and spiny. Superior appendages longer than inferior appendages, club-shaped, and curved inward like pincers.

Larva: Larval body long and slender. Antennal segment 1 longer than width of head or combined length of other segments. Prementum cleft nearly halfway to its base. Abdomen long, slender and semicylindrical (dorsal and lateral spines absent). Abdominal segments have conspicuous lateral carinae. Caudal lamellae very long; lateral lamellae very long, sword-shaped and conspicuously chitinized and middle axis of external margin distinctly ridged and triangular in cross-section; median lamella short and flattened.

DISTRIBUTION: Cosmopolitan.

1. *Calopteryx atrata* Selys, 1858 (Figs. 1, 2, Pl. 1)

Geom-eun-mul-jam-ja-ri (검은물잠자리)

Caloptpteryx (*Calopteryx*) *atrata* Selys, 1853: Synopsis des Calopterygines: 16 [Type material: M; Type locality: China; Type deposition: Rijksmus. Nat. Hist., Leiden]; Selys and Hagen, 1854: Monogr. Cal.: 48; Schmidt, 1931: Konowia, 10: 177; Asahina, 1955: Ent. Medd., 27(3): 130.

Caloptpteryx (*Calopteryx*) *smaragdina* Selys, 1853: Synopsis des Calopterygines: 16 [Type material: M; Type locality: India; Type deposition: British Museum (Nat. Hist.), London]; Selys and Hagen, 1854: Monogr. Cal.: 51; Kirby, 1890: Syn. Cat. Neur.-Odon., London: 99.

Calopteryx atrata Selys: Ris, 1916: Odonata Suppl. Ent., 5: 5, (Korea).

Vestalis tristis Navas, 1932: Mus. Heude Notes Ent. Chinoise, 8: 8 [Type material: (not given); Type locality: China]; Chao, 1962: Acta Ent. Sinica, Suppl., 11: 27.

Vestalaria smaragdina May, 1935: Senckenbergiana, 17: 207.

Calopteryx atratum Chao, 1962: Acta Ent. Sinica, Suppl., 11: 27.

Agrion (*Calopteryx*) *atrata*: Ju, 1969: List Kor. Ins. Pyeongyang: 6, (Korea).

Male adult: (Pl. 1) Wings greenish black, without pterostigmas; proximal part of wings not hyaline. Abdomen metallic green. Superior appendages black, curved inward and downward, with a few spurs. Inferior appendages thin, long, and curved inward.

Female adult: General morphology and color pattern similar to male, but wings of female without pterostigmas.

Larva: Body (Fig. 1) length 25−29 mm; median lamella length 12 mm; lateral lamellae length 16−18 mm. General body color brown. Head brown. Antennae light brown, longer than head length, 7-segemented; segment 3 longer than segment 2. Compound eyes black. Ocelli 3, colorless. Labium (Fig. 2A) long; prementum cleft nearly halfway to its base; inner median prementum cleft with 2 premental seatae; palal lobe (Fig. 2B) with 2 palpal setae, a movable hook, a thrice truncated lobe and a terminal hook. Thorax brown with 2 dark brown stripes up to head. Legs brownish yellow, with short setae; femur with two brown bends. Abdomen brown. Lamellae brown, with 2 undistinct light brown stripes.

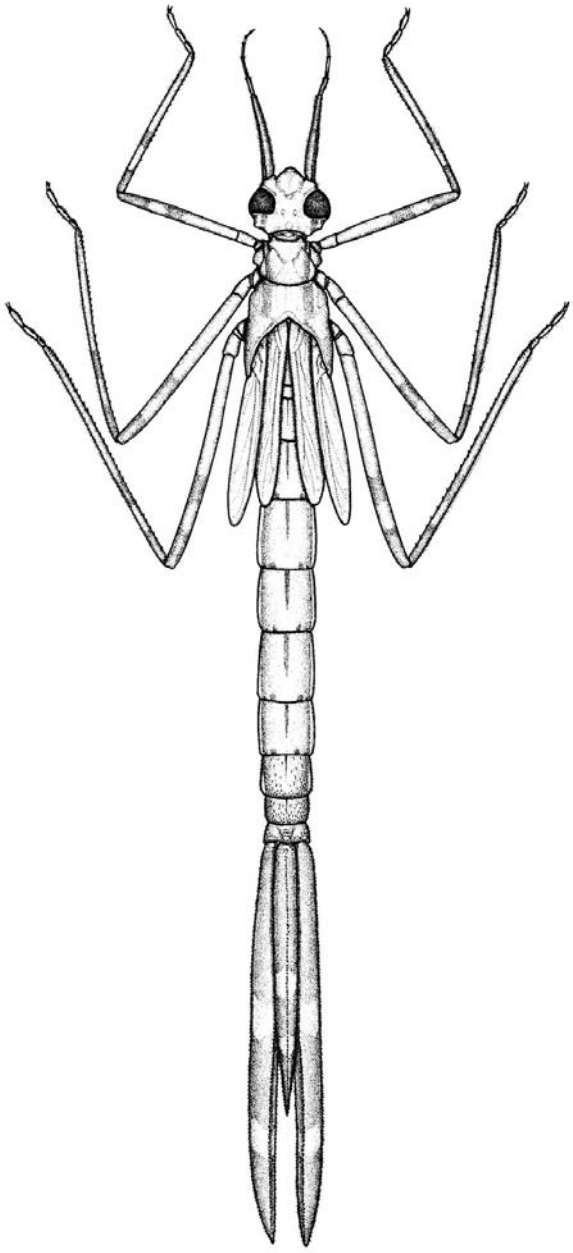

Fig. 1. *Calopteryx atrata*, dorsal larva.

DISTRIBUTION: Korea, Japan, China, India.

KOREAN RECORDS: GG: Seoul, Mt. Bogae, Mt. Soyo, Mt. Myeongji, Gapyeong, Namyangju, Mt. Hwaya, Mt. Samseong, Gaeseong, Pocheon, Guri, Anyang. GW: Yanggu, Inje, Mt. Obong, Chuncheon. CB: Okcheon, Danyang. CN: Daejeon, Mt. Gyeryong. Buyeo, Geumsan. JB: Mt. Naejang, Jeonju, Gochang, Namwon, Gimje, Wanju. JN: Mt. Baekyang, Mt. Duryun, Hampyeong, Gokseong, Suncheon, Goheung, Jindo, Gwangju, Imsil, Jeonju. GB: Daegu, Sangju, Seodo, Jangcheon, Gunwi. GN: Busan, Geochang, Changnyeong, Upo-neup, Mt. Jiri, Gimhae, Sacheon, Miryang, Namhae, Jinhae. JJ: Seogwipo, Namjeju, Andeog-gyegog. PN: Pyeongyang, Gangdong. HH:

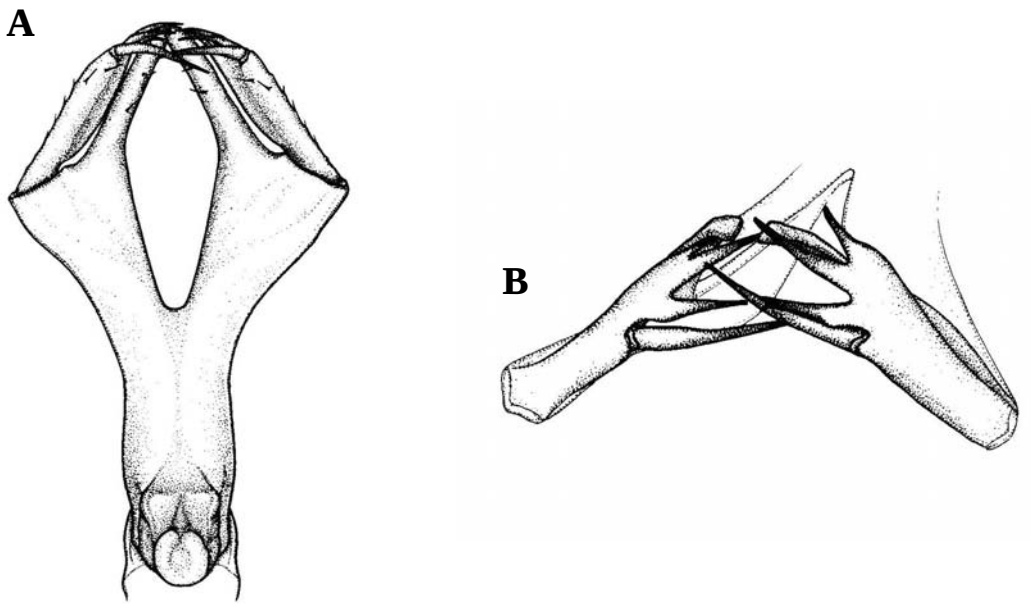

Fig. 2. *Calopteryx atrata*, labium. A. ventral; B. palpal lobe.

Jaeryeong.

SPECIMEN EXAMINED: GG: 2N [Gapyeong Jojong-cheon Imcho-gyo (Br.), 4.vii.1993].

REMARKS: Dumont et al. (2005) erected a new genus *Atrocalopteryx* to include the type species *Calopterix atrata* Selys mainly based on a ribosomal DNA sequence analysis and some minor morphological differences such as the absence of pterostigma in both sexes and the detachment of R2 and IR_3 together from R_{4+5}.

2. *Calopteryx japonica* Selys, 1869

Mul-jam-ja-ri (물잠자리)

Calopteryx japonica Selys, 1869: Synopsis des Calopterygines, Add., 2: 3 [Type material: M; Type locality: Japan; Type deposition: Selys' collection]; Doi, 1932: J. Chosen Nat. Hist. Soc., 14: 69, (Mt. Baekyang, Mt. Samseong, Mt. Unmun, Mt. Soyo).
Calopteryx virgo japonica Selys, 1890: C. R. Soc. Ent. Belg., 4(8): 118, (Corea).
Agrion japonica Kirby, 1890: Syn. Cat. Neur.-Odon., London: 99.
Calopteryx virgo japonica Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 797.
Calopteryx virgo (Linnaeus): Doi, 1937: Akitu, 1(1): 19, (Guam-sa Jeonbug, Mt. Baekyang, Yucheon, Mt. Samseong, Mt. Soyo); Lee, 2006: 7.
Agrion cornelis Selys: Ju, 1969: List Kor. Ins. Pyeongyang: 6, (Korea).
Agrion virgo (Linnaeus): Ju, 1969: List Kor. Ins. Pyeongyang: 6, (Korea).

Male adult: Body color bluish green with conspicuous metallic reflectivity. Wings greenish black, without pterostigmas; proximal part of wings not hyaline. Superior appendages curved inward,

with many spurs. Inferior appendages thick, short, and not curved.

Female adult: General morphology and color pattern similar to male, but wings of female with white pterostigmas.

Larva: Body length 26−31 mm; median lamella length 8−11 mm, lateral lamellae length 14−16 mm. General body color brown or greenish brown. Head color brown. Antennae light brown, longer than head length, 7-segemented; segment 2 longer than segment 3. Compound eyes black. Ocelli 3, colorless. Labium long; prementum cleft nearly halfway to its base; inner median prementum cleft with 2 premental seatae; palal lobe with 2 palpal setae, a movable hook, a thrice truncated lobe and a terminal hook. Thorax brown, with 2 dark brown stripes up to head. Legs brownish yellow, with short setae; femur with two brown bends. Abdomen brown. Lamellae brown, with 2 distinct light brown stripes.

Distribution: Korea, Japan, Eastern Siberia, Central and Northern China.

Korean records: GG: Mt. soyo, Gaeseong, Suwon, Mt. Gwanggyo, Namyangju, Mt. Ungil, Mt. Samseong, Gwangju, Mt. Chunggye, Gwacheon, Mt. Myeongji, Mt. Unak, Gapyeong, Guri, Yangpyeong, Mt. Hwaya. GW: Mt. Odae, Mt. Palbong, Chuncheon, Mt. Bangtae, Yeongweol, Jeongseon. CB: Danyang, Jincheon, Jecheon, Mt. Weolak, Mt. Juheul, Chungju. CN: Daejeon, Mt. Gyeryong, Cheongyang. JB: Jinan. JN: Mt. Jiri, Mt. Baekyang, Hampyeong, Gangjin. GB: Mt. Sambang, Mt. Unmun, Mt. Gaya, Gimcheon, Goryeong. GN: Miryang, Changwon, Jinhae, Sancheon, Gimhae.

Specimen examined: CB: 2N [Danyang-gun Maepo-eup Pyeongdong-ri Pyeongdonggyo (Br.)].

Remarks: Korean population of this species has been recorded under the names of *Calopteryx japonica* Selys, *Calopteryx virgo* (Linnaeus), or a subspecies of *Calopteryx virgo* (Linnaeus), *Calopteryx virgo japonica* Jacobson and Bianki. Lee (2006) listed this species as *Calopteryx virgo* (Linnaeus) based on examinations of specimens from Siberia and Ulan-Altai. Comperison of reference specimens from Europe and Japan as well as other distributional ranges is necessary to correctly determine this species.

Genus *Matrona* Selys, 1853

Geom-eun-nal-gae-mul-jam-ja-ri-sok (검은날개물잠자리속)

Calopteryx (*Matrona*) Selys, 1853: *Synopsis des* Calopterygines: 17.

Type species: *Matrona basilaris* Selys, 1853.

Adult: Adult body relatively large. Wings black with dense venation, without stigma in male. Adult of *Matrona* is similar to *Calopteryx* but can be distinguished by the presence of crossvein in R+M.

Larva: Larval body long and slender. Caudal lamellae very long; lateral lamellae very long, sword-shaped. Larva of *Matrona* is similar to *Calopteryx* and no fundamental morphological characters are present to distinguish these two genera.

Distribution: Northeast Asia (Korea, China, Japan), Vietnam, Burma, India, Taiwan.

3. *Matrona basilaris* (Selys), 1853

Geom-eun-nal-gae-mul-jam-ja-ri (검은날개물잠자리)

Calopteryx (*Matrona*) *basilaris* Selys, 1853: Synopsis des Calopterygines: 17 [Type material: M; Type locality: China; Type deposition: Förster's collection]; Selys and Hagen, 1854: Monogr. Cal.: 53.
Neurobasis (*Matrona*) basilaris: Förster, 1897: Ann. Soc. Ent. Belg., 41: 208.
Matrona basilaris: Jacobson & Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 800, (Tibet, Shanghai, Burma); Hong, 1991: Biology, 4:54, (Shinpyeong, Mt. Suyang).

DISTRIBUTION: North Korea, China, Vietnam, Burma, India.
KOREAN RECORDS: HH: Shinpyeong, Mt. Suyang.
REMARKS: This species was recorded from North Korea by Hong (1991), but no material is available to verify this identification. Adult description: see Ishida et al. (1988); larval description: see Ishida and Ishida (1985, 2005) and Ishida et al. (1988).

Genus *Mnais* Selys, 1853

Dam-saek-mul-jam-ja-ri-sok (담색물잠자리속)

Mnais Selys, 1853: Synopsis des Calopterygines: 20.
Type species: *Mnais pruinosa* Selys, 1853.

Adult: Body color metallic green with golden tinted wings. Mature males display a partial or overall dense bluish pruinescence. Legs long and slender, without spines. Wing midbasal space without crossveins; basal radial space closed by a fusion of veins R and M near middle fork, and traversed by several crossveins; stigma well developed, sharp angled at proximal end, rounded posteriorly, and without a brace vein; intercalary sectors between principal veins not attached and not appearing as branches.
Larva: Body slender and long. Antennal segment 1 shorter than width of head. Lamellae egg-like.

DISTRIBUTION: Northeast Asia (Korea, China, Japan), Burma, Laos, Taiwan.
REMARKS: This genus includes 16 species distributed throughout the Japanese Archipelago, Taiwan, central and southern China, and mainland Southeast Asia. Most species show a wide range of morphological variations depending on geographical distribution. One species, *Mnais pruinosa* Selys, was recorded in Jeju Island by Doi (1933), but no material is available to verify its distribution.

4. *Mnais pruinosa* Selys, 1853

Dam-saek-mul-jam-ja-ri (담색물잠자리)

Echo (*Mnais*) *pruinosa* Selys, 1853: Synopsis des Calopterygines: 20 [Type material: M; Type locality: Japan; Type deposition: Rijksmus. Nat. Hist., Leiden]; Selys and Hagen, 1854: Monogr. Cal.: 65;

Kirby, 1890: Syn. Cat. Neur.-Odon., London: 101; Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 7.
Mnais strigata Selys: Doi, 1933: J. Chosen Nat. Hist. Soc., 15: 94, (Is. Jeju-do).
Mnais sp.: Asahina, 1989: Gekkan-Mushi, 220: 15, (Is. Jeju-do).
Mnais pruinosa Selys: Lee, 1996: Bull. KACN, 15: 85, (Is. Jeju-do); Lee, 2006: 8.

DISTRIBUTION: Korea, Japan.
KOREAN RECORDS: JJ: Is. Jeju-do.
REMARKS: Doi (1933) recorded the adults of *Mnais pruinosa* Selys from Jeju-do (Island), Korea. Lee (1996) considered Doi's (1933) record is an errornous report or it may be a temporary vitor. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

Family Coenagrionidae Kirby, 1890

Sil-jam-ja-ri-gwa (실잠자리과)

Coenagrionidae Kirby, 1890: Syn. Cat. Neur. -Odon. London: 119.

The adult body of Coenagrionidae is relatively small. Body coloration is bright with various intricate markings. Males are brightly colored blue, yellow or red. Head has postocular spots which are distinctive in this family. The wings are narrowly constricted basally. Vein M_3 originates closer to the nodus than to the arculus.

The larval body is relatively short and matured larvae are approximately 13–25 mm long excluding caudal lamellae. The antennal segments are the same in length. Labium lacks a long and stalk-like base. Median lobe of labium is somewhat produced distally but never cleft. Caudal lamellae are variously shaped but often broad, leaflike and pointed at the tip.

The larvae are most common in the vegetative margins of lakes and wetlands. Some species are found in streams clinging to rocks and vegetation. This family is widespread throughout the world and contains more than 1,000 species in 89 genera and 6 subfamilies. The following taxa occur in Korea: *Aciagrion* (1 species), *Ceriagrion* (3 species), *Coenagrion* (5 species), *Enallagma* (2 species), *Ischnura* (3 species), *Mortonagrion* (1 species), *Nehalennia* (1 species), and *Paracercion* (6 species).

Key to the genera and species of adult family Coenagrionidae

1. Body color metallic green ····· *Nehalennia*, *N. speciosa*
– Body color not metallic green ····· 2
2. Body color yellow or red ····· *Ceriagrion*, 3
– Body color not yellow or red ····· 4
3. Body color of male generally yellow; abdominal tergite VII–X of male black; distal margin of abdominal tergite X wide V-shape; superior appendages almost trapezoid in dorsal view; body color of female green; supra-anal plate rounded in lateral view ····· *C. melanurum*
– Body color of male generally red; abdominal tergite VII–X of male not black; distal margin of abdominal tergite X V-shape; superior appendages triangular in dorsal view; body color of female light red; supra-anal plate rectangular in lateral view ····· *C. nipponicum*

4. R_3 in forewings near fourth postnodal crossvein, in hindwings near second or third postnodal crossvein ····· 5
− R_3 in forewing near fifth postnodal crossvein or beyond, in hindwing fourth or beyond; abdominal tergite X of male not raised and bifid ····· 8
5. Head of male with curved postocular lines; pterostigma color of forewings in male same as hindwings; abdominal tergite X of male not raised and bifid; abdominal sternite VIII of female without vulvar spine; thorax of female without pattern ····· *Mortonagrion*, *M. selenion*
− Head of male without curved postocular lines; pterostigma color of forewings in male different from hindwings; abdominal tergite X of male raised and bifid; abdominal sternite VIII of female with vulvar spine; thorax of female with pattern ····· *Ischnura*, 6
6. Abdominal tergite IX of male blue; inferior appendages of male short ····· *I. asiatica*
− Abdominal tergite VIII of male blue; inferior appendages of male long ····· 7
7. Middle of distal margin in prothorax elongated and rectangular-shaped; superior appendages with a long, sharp and incurved process; abdominal tergite II of female black ····· *I. elegans*
− Middle of distal margin in prothorax elongated slightly; superior appendages with a long, sharp and straight process; half of abdominal tergite II of female black distally ····· *I. senegalensis*
8. Blue line of mid-occiput connected with postocular spots in male; forewing pterostigma larger than hindwings ····· *Aciagrion*, *A. migratum*
− Blue line of mid-occiput not connected with postocular spots; forewing pterostigma similar in size to hindwings ····· 9
9. Male inferior appendages triangular in lateral view with sharp and upcurved apex; abdominal sternite VIII of female with vulvar spine ····· *Enallagma*, *E. cyathigerum*
− Male inferior appendages not triangular in lateral view; abdominal sternite VIII of female without vulvar spine ····· 10
10. Half of abdominal tergite III−VII blue in male ····· *Coenagrion* spp.
− Half of abdominal tergite III−VII not blue in male ····· *Paracercion*, 11
11. Middle of distal margin of occiput without blue line; thorax of male black with trace of blue line sometimes; superior appendages wholy black ····· *P. calamorum*
− Middle of distal margin of occiput with blue line; thorax of male black with blue line; superior appendages partly black ····· 12
12. Head pattern simple; postocular spots small; inner part of superior appendages broad; distal margin of occiput of female {-shaped; each side greatly protruded ····· *P. v-nigrum*
− Head pattern complex; postocular spots large; distal margin of occiput of female {-shaped; each side smooth ····· 13
13. Distal margin of occiput with blue line; superior appendages of male long ····· *P. plagiosum*
− Middle of distal margin of occiput with blue line; superior appendages of male short ····· ····· *P. hieroglyphicum*

Key to the genera and species of larval family Coenagrionidae

1. Distal margin of occipital lobe rectangular ····· *Mortonagrion*, *M. selenion*
− Distal margin of occiputal lobe round ····· 2
2. Prementum with 1 seta on each side; maximum width of lamella / length of lamella below 3 ···· ····· 3
− Prementum with 3−7 setae on each side; maximum width of lamella / length of lamella over 3 ···· ····· 5

3. Body size of last larval stage relatively large (15–19 mm); palpal lobe with 7–8 setae ····· ····· *Ceriagrion*, 4
– Body size of last larval stage relatively small (ca. 8 mm); palpal lobe with 6 setae ····· ····· *Nehalennia*, *N. speciosa*
4. Lamellae with many brown tracheae and dark brown spots laterally, with a short and pointed tip apically ····· *C. melanurum*
– Lamellae with a few brown tracheae and dark brown spots laterally, with a short and pointed tip apically ····· *C. nipponicum*
5. Lamellae with three brown markings; lateral carinae of abdominal tergite with a brown marking ····· *Paracercion*, 6
– Lamellae without three brown markings; lateral carinae of abdominal tergite without a brown marking ····· 8
6. Head length over 40 mm ····· *C. plagiosum*
– Head length below 40 mm ····· 7
7. Cerci long and thin; distal part of lamellae broad but apex of lamellae sharp ····· ····· *C. calamorum*
– Cerci short and thick; distal part of lamellae narrow but apex of lamellae blunt ····· ····· *C. hieroglyphicum*
8. Lamellae with distinct nodus line ····· *Coenagrion*, 9
– Lamellae without nodus line ····· 13
9. Lamellae length very short, 4.0 mm ····· *C. concinnum*
– Lamellae length over 4.5 mm ····· 10
10. Nodus line of lamellae distinct ····· 11
– Nodus line of lamellae indistinct ····· 12
11. Compound eyes relatively small; distal part pale, with few tracheae ····· *C. lanceolatum*
– Compound eyes relatively large; distal part with many tracheae ····· *C. hastulatum*
12. Anterior part of compound eye with spurs; lateral margin of occiput lobe linear ····· ····· *C. ecornutum*
– Posterior part of compound eye with spurs; lateral margin of occiput lobe round ····· *C. hylas*
13. Antennae with 6-segmented; lamellae with 2 brown markings ····· *Enallagma*, *E. cyathigerum*
– Antennae with 7-segmented; lamellae without 2 brown markings ····· *Ischnura*, 14
14. Occiputal lobe with many spines; prothorax not octagonal shaped ····· 15
– Occiput lobe with few spines; prothorax octagonal shaped ····· *I. elegans*
15. Cerci relatively small and rectangular ····· *I. senegalensis*
– Cerci relatively large and triangular ····· *I. asiatica*

Genus *Aciagrion* Selys, 1891

Jak-eun-sil-jam-ja-ri-sok (작은실잠자리속)

Aciagrion Selys, 1891: Ann. Mus. Civ. Stor. Nat. Genova, 30: 509.
Type species: *Agrion* (*Pseudagrion*) *hisopa* Selys, 1876.

Adult: Body medium-sized and extremely slender; middle segments of abdomen very long; basal

and terminal segments of abdomen very short; abdominal segments VIII–X about as long as segment VII. Head with postocular spots. Wings very narrow; quadrangle very pointed to outer ends; veins M_3-Rs closely approximated at base; first crossveins between M_3-Rs exceedingly short. Legs short and weak. Female with midventral spine at apex of segment VIII.

Larva: Body long and slender. Head pentagonal with occipital lobes covered with minute spines. Antennae long and slender, mounted on slightly elevated bases. Prementum slender; lateral lobe has narrow cleft, slender external lobe, and short movable hook. Wing sheaths narrow. Legs slender; femora and tibiae have minute spines aligned along internal margins. Abdomen with lateral carinae on segments I–VIII. Caudal lamellae slender, willow leaf-like (nodus and nodal line absent); apices very acute.

DISTRIBUTION: Cosmopolitan.

5. *Aciagrion migratum* (Selys), 1876

Jak-eun-sil-jam-ja-ri (작은실잠자리)

Agrion (*Pseudagrion*) *migratum* Selys, 1876: Synopsis des Agrionines, Add., 5: 217. [Type material: M; Type locality: Japan; Type deposition: Selys' collection]; Kirby, 1890: Syn. Cat. Neur.-Odon., London: 153; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 830.
Aciagrion sp.: Doi, 1943: Ent. World, 11(110): 170, (Cheongdo).
Aciagrion migratum Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 64.
Aciagrion migratum Selys: Asahina, 1989: Gekkan-Mushi, 220: 9, (Korea).

Male adult: Body length 35.2 mm; forewings 21.3 mm; hindwings 20.1 mm. Head black. Antennae dark brown. Middle of occiput black with blue line, connected with paired blue postocular spots. Frons blue with black part in distal margin. Clypeus black with two pale spots. Prothorax black with pale margin. Thoracic dorsal carinae blue; upper part of mesepisternum black; lower part of mesepisternum blue; mesepleural sulcus black; apices of metepistenum black. Wings hyaline; pterostigmas of forewings brown; pterostigmas of hindwings brown; pterostigmas of forewing larger than hindwings. Abdomen long, thin; abdominal tergite I–VII black; tergite VIII-X blue; middle of tergite X black; distal part of tergite X raised. Abdominal sternites I–X pale. Superior appendages dark brown, straight in dorsal view with a process posteriorly; process black, curved downward. Inferior appendages pale, short, bent upward.

Female adult: General body color similar to male. In vernal form, body is dim yellowish green. Black markings on vernal forms are more distinct than on hibernated forms.

DISTRIBUTION: Korea, Japan, China (mainlad), Taiwan.

KOREAN RECORDS: GB: Cheongdo. JJ: Namjeju.

SPECIMEN EXAMINED: JJ: 1M [Namjeju-gun Pyoseon-myeon Suryeongsan (Mt.) Mulyeongari, 21.x. 1999].

REMARKS: Doi (1943) recorded this species as *Aciagrion* sp. from Cheongdo, Gyeongsangbuk-do, and Asahina (1989) later determined the specimen as *Aciagrion migratum* Selys. Larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

Genus *Ceriagrion* Selys, 1876

No-ran-sil-jam-ja-ri-sok (노란실잠자리속)

Ceriagrion Selys, 1876: Synopsis des Agrionines, Add., 5: 235.
Type species: *Agrion* (*Pyrrhosoma*) *cerinorubellum* Brauer, 1865.

Adult: Body yellowish or reddish, moderate in size and with very little differentiation of color pattern. Legs pale with black spines. Wings hyaline and stalked at base to, or almost to, anal crossing. Stigma covering one cell in rear. Abdomen rather stout; superior appendages of male rather short and thick; apex of segment X deeply notched on dorsal side.

Larva: Body small to medium-sized, thick. Head with large globular eyes prominent antero-laterally, and with rounded occipital lobes. Antennae long and filiform. Prementum pentagonal, relatively broader; mental setae paired. Lateral lobe large and robust; external lobe broad, with straight apex having minute spines; lateral setae 7. Wing sheaths broad; legs long and thick. Abdomen short, with inconspicuous lateral carinae on segments II–V; lateral and posterior margins fringed with minute spines. Caudal lamellae short and broad, with a distinct nodal line and divided into two portions, with numerous tracheae.

DISTRIBUTION: Cosmopolitan excluding the Nearctic and Neotropical regions.

6. *Ceriagrion auranticum* Fraser, 1922

Sae-no-ran-sil-jam-ja-ri (새노란실잠자리)

Ceriagrion auranticum Fraser, 1922: J. Nat. Hist. Soc. Siam, 4: 236 [Type material: M; Type locality: Bangkok; Type deposition]; Lee, 2001: Dragon. Kor. Penin.: 48, (Jeollabuk-do, Jeollanam-do, Is. Jeju); Lee, 2006: 17.

DISTRIBUTION: Korea, Japan, Central China.
KOREAN RECORDS: JB: Gochang. JN: Gokseong, Hampyeong, Jangseong. JJ: Namjeju.
REMARKS: Lee (2001, 2006) considered the specimens previously known as *Ceriagrion nipponicum* Asahina by Miyazaki (1986) and Asahina (1989) are *Ceriagrion auranticum* Fraser. Lee (2001) additionally recorded *Ceriagrion auranticum* Fraser from southwestern Korea (Jeolllabuk-do and Jeollanam-do). Jung (2007) considered *Ceriagrion auranticum* Fraser is distributed only in Jeju-do, whereas *Ceriagrion nipponicum* Asahina occur in central and southern Korean peninsula.

7. *Ceriagrion melanurum* Selys, 1876 (Figs. 3, 4, Pls. 2–4)

No-ran-sil-jam-ja-ri (노란실잠자리)

Agrion (*Ceriagrion*) *coromandelianum* race *melanurum* Selys, 1876: Synopsis des Agrionines, Add., 5: 239 [Type material: M; Type locality: Japan; Type deposition: Selys' collection].

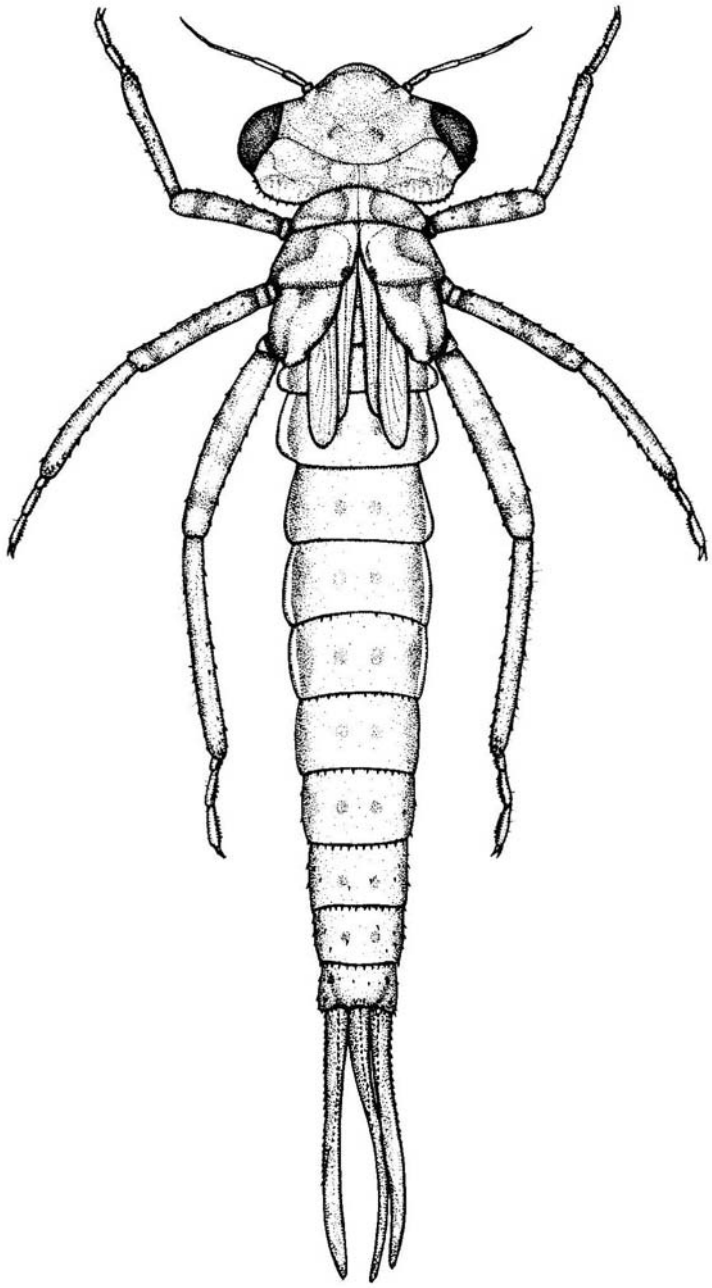

Fig. 3. *Ceriagrion melanurum*, dorsal larva.

Ceriagrion melanurum (Selys): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 154; Laidlaw, 1919: Rec. Indian Mus., 16: 191; Sjostedt, 1933: Ark. Zool., Uppsala, 25A(5): 20; Okamoto, 1924: Bull. Agr. Exp. Stn. Gov. Gen. Chosen, 1(2): 52, (Quelpart Is.=Jeju-Is.).

Male adult (Pls. 2, 4): Body medium-sized and thick. Body color bright yellow with bright green vertex and synthorax. Abdomen yellow, with black dorsal stripe on segments VII–X. Apices of superior appendages blunt and with a black sharp process in lower part. Inferior appendages pale,

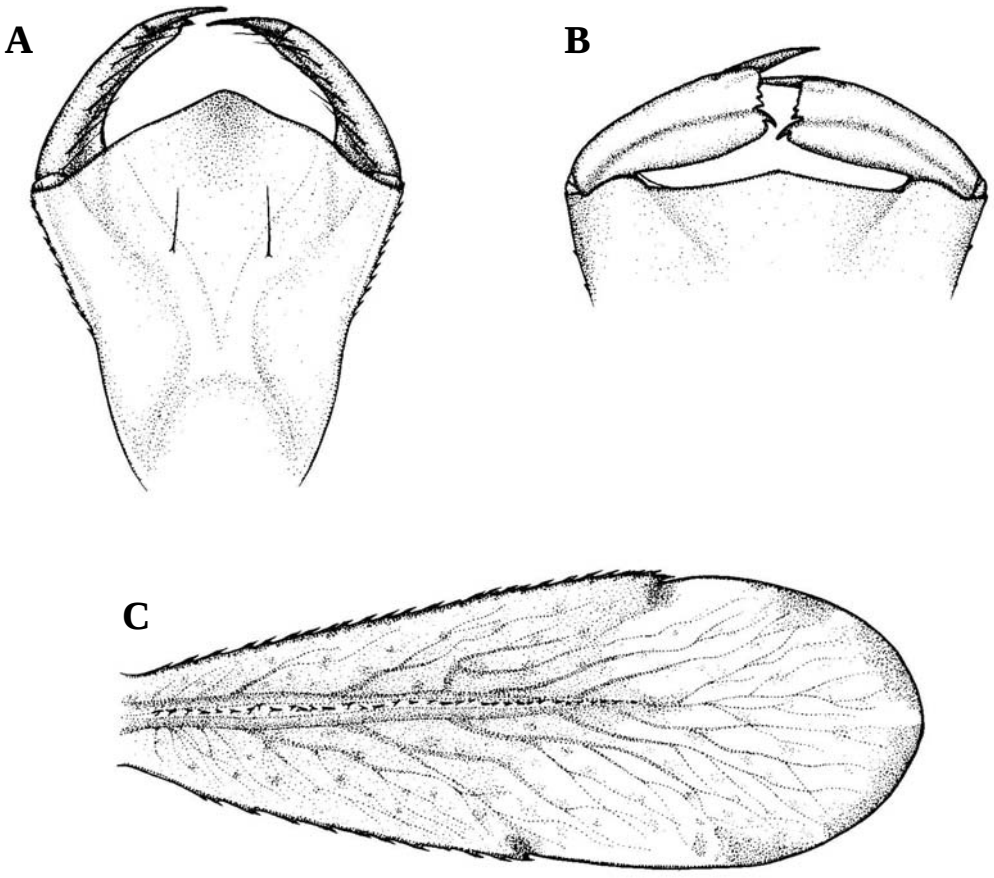

Fig. 4. *Ceriagrion melanurum*. A. ventral labium; B. palpal lobe; C. lamella.

long and curved upward. Apicies of inferior appendage black and sharp.

Female adult (Pl. 3): Body somewhat green. Abdominal tergite X narrow; supra-anal plates rounded in lateral view; valves of ovipositors thick.

Larva (Fig. 3): General body color brown. Head brown, relatively large. Antennae yellowish brown with 7 segments; compound eyes black. Ocelli absent; distance between lateral ocelli long. Distal margin of postocular lobe flat. Prementum (Fig. 4A) brown with 1 seta. Palpal lobe (Fig. 4B) with a movable hook, truncate lobe, and terminal hook; movable hook with 7 setae; truncate lobe with dentations. Prothorax brown, flat; distal margin flat. Wing pads over abdominal tergite IV. Legs brownish yellow with setae; distal part of femora with a brown band. Abdomen brown. Abdominal tergite II–IX with two dark brown spots. Cerci triangular. Lamellae (Fig. 4C) pale with many brown tracheae; lateral margin of lamellae with dark brown spots; median part dark brown; distal margin tapered abruptly; apex with a short, sharply pointed tip.

Distribution: Korea, Japan, China (Szechuen, Fukien), Taiwan, Sumatra.

Korean records: GG: Toegyewon, Seodaemun, Is. Ganghwa, Incheon, Namyangju, Mt. Cheonma, Suwon, Anseong. GW: Inje, Yangyang. CN: Daejeon, Boryeong. JB: Gunsan, Jeongeub, Gochang. JN: Is. Wando, Mokpo, Gokseong. GB: Gimcheon, Woegwan, Ulju, Gyeongsan, Chupung-ryeong, Pohang. GN: Mt. Jiri, Jinju. JJ: Bukjeju, Seogwipo. PN: Pyeongyang. HN: Bocheon.

SPECIMEN EXAMINED: CN: 1M (Boryeong-si Boryeongdam, 20.vii.1999). JN: 14N (Gokseong-gun Gokseong-eup Weolbong-ri, 6.viii.1999).

REMARKS: Larva of *C. melanurum* is charactered by lamellae which are abruptly tapered in distal margin and possess apexes with a short, sharply pointed tip.

8. *Ceriagrion nipponicum* Asahina, 1967

Yeon-bun-hong-sil-jam-ja-ri (연분홍실잠자리)

Ceriagrion nipponicum Asahina, 1967: Jap. J. Zool., 15: 302 [Type material: M; Type locality: Japan]; Davies and Tobin, 1984: The Dragonflies of the World, Utrecht 1: 81; Miyazaki, 1986: Tombo, 29(3, 4): 67, (Sanworri=Sanweol-ri); Asahina, 1989: 10.

Male adult: General body color light red. Head green with a black oblique line between compound eyes and lateral ocelli. Antennae dark brown; scape and pedicel pale. Compound eyes green. Ocelli dark brown. Thorax green. Wings hyaline with yellow pterostigmas; pterostigmas of forewings not overlapped with pterostigmas of hindwings. Legs yellow with black, short spines in two rows; inner spines of femora very short. Abdominal tergite light red without a line; distal margin of abdominal tergite X wide V-shape without setae. Superior appendages brown, triangular; lower part of apex with a black process. Inferior appendages pale, divided into two parts; inner part pale, short, rectangular-shaped; outer part pale, pointed, curved upward; apex of outer parts black.

Female adult: General body color light red. Head green with a black oblique line between compound eyes and lateral ocelli. Antennae dark brown; scape and pedicel pale. Compound eyes green. Ocelli dark brown. Thorax green. Distal margin of prothorax curved upward slightly. Wings hyaline with yellow pterostigmas; pterostigmas of forewings not overlapped with pterostigmas of hindwings. Legs yellow with black, short spines in two rows; inner spines of femora very short. Abdoninal tergite light red without patterns; dorsal part of abdominal tergite X narrow; ventral part of abdominal tergite X wide. Anal appendages long. Supra-anal plate rectangular in lateral view. Valve of ovipositors thin.

Larva: General body color brown. Head brown, big. Antennae yellowish brown with 7 segments. Compound eyes black. Ocelli dark brown; distance between lateral ocelli long. Distal margin of postocular lobe flat. Prementum brown with 1 seta. Palpal lobe with 7 setae, with a movable hook, a truncate lobe and terminal hook; truncate lobe with dentations. Prothorax brown, flat; distal margin flat. Wing pads over half of abdominal tergite IV. Legs brownish yellow with setae; distal part of femora with a brown band. Abdomen brown. Abdominal tergite II−IX with two dark brown spots. Cerci triangular. Lamellae pale with many brown tracheae. Lateral margin of lamellae with dark brown spots, median part of lamellae dark brown. Lamellae tapered slowly in distal part; apicies of lamella with a long, sharply pointed tip.

DISTRIBUTION: Korea, Japan, China (Central).

KOREAN RECORDS: JB: Gochang. JN: Gokseong, Hampyeong, Gwangsan. JJ: Bukjeju, Namjeju.

SPECIMEN EXAMINED: JN: 6M, 3F (Gokseong-gun Gokseong-eup Jangseon-ri, 6.viii.1999); 10N (Hampyeong-gun Hampyeong-eup Daedeok-ri Baekgok, 6.vi.2000).

Genus *Coenagrion* Kirby, 1890

Sil-jam-ja-ri-sok (실잠자리속)

Coenagrion Kirby, 1890: Syn. Cat. Neur. Odon. London: 148.
Type species: *Libellula puella* Linneaus, 1758.

Adult: Adult body black and blue, small to moderate in body size. Female without mid-ventral apical spine on abdominal segment VIII. Inferior appendages of male hardly longer, usually shorter, than superiors. Wings not petioled at anal crossing. Stigma longer than broad, usually somewhat rounded at junction of outer and rear margins.

Larva: Body medium-sized, long, and slender. Head relatively large and transversely pentagonal. Prementum longitudinally scalene pentagonal; mental setae 3 to 5. Lateral lobe thick and stout; lateral setae 5 or 6; movable hook short and thick. Wing sheaths long, and narrow, with straight external margins. Abdomen with a pair of inconspicuous lateral carinae on segments I−VIII. Caudal lamellae slender and willow leaf-shaped; nodal line usually present; apices rounded or dully pointed; tracheae numerous; bronchia inconspicuous.

Distribution: Cosmopolitan.

9. *Coenagrion concinuum* (Johansson), 1859 (Pls. 5−8)

Cham-sil-jam-ja-ri (참실잠자리)

Agrion concinnum Johansson, 1859: Odon. Suede, 7: 106. [Type material: M; Type locality: Sweden; Type deposition: unknown]; Kirby, 1890: Syn. Cat. Neur.-Odon., London: 148; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 819; Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 59; Asahina, 1989: Gekkan-Mushi, 220: 12, (Ganggye, Taereung, Bukgyesu, Daetaeg).
Agrion convalescens Bartenef: Asahina, 1939: Kontyu, 13(5, 6): 198, (Kokai=Ganggye); Cho, 1958: 355, (Bukgyesu, Daetag, Jungam, Taereung).
Coenagrion convalescens (Bartenef): Amateur Ent. Soc. Korea, 1986: Corentoman, 2(3, 4): 10, (Korea); Kim, 1998: 60.
Coenagrion johanssoni (Wallengren): Tsuda, 1991: Dist. List World Odonata, Osaka: 29, (Korea); Lee, 1996: 79 [catalogue, distribution: GG]; Jung, 2007: 176.
Coenagrion concinnum (Johansson): Lee, 2001: Dragon. Kor. Penin.: 33, (Korea); Lee, 2006: 14.

Male adult (Pl. 5, 7, 8): General body color blue with black stripes. Abdominal segments II−VII with distinct black stripes; segments VIII−IX blue; segment X black.

Female adult (Pl. 6, 7, 8): General body color blue with black stripes. Abdominal segments II−VII with distinct black stripes; segments VIII−IX with blue round marking.

Larva: General body color brown. Head brown with two pared, oblique, dark brown lines; middle of distal margin rounded slight. Antennae brown with 7-segment. Compound eyes black. Ocelli absent. Prementum yellowish brown with 4 setae. Palpal lobe with 5 setae; truncate lobe with 4 tooth. Thorax brown. Prothorax flat. Wing pads beyond half of abdomen segment III.

Legs yellowish brown; femora with two brown band basally and distally. Abdomen brown with yellow carina; carina without spine. Middle of abdominal tergite II–IX with a yellow stripe, with dark brown markings on each side of stripe. Cerci short. Lamellae yellowish brown, tapered with relatively a few but distinct branches, with distinct nodal line in about 2/3 part of lamellae; border of proximal part dark brown; border of distal part with many pale, long hairs; apex sharp.

DISTRIBUTION: Korea, China, Russia, Siberia, Scandinavia (exept Denmark).

KOREAN RECORDS: CB: Danyang. GN: Gimhae, Jinhae. JB: Mt. Naejang, Gimje, Wanju. JN: Goheung, Imsil.

SPECIMEN EXAMINED: GG: 4L [Gwangreung Jugeumsan Palya-ri, 13.iii.1999], GN: 2L [Sancheong-gun Sicheon-myeon Jirisan (Mt.) Wangdeungjae, 6.x.1999].

REMARKS: *Agrion concinnum* Johansson, 1859, was a junior homonym of *Agrion concinnum* Rambur, 1842, which was recombined as *Agria concinna* (Rambur) by Selys in 1865. As the senior homonym *Agrion concinnum* Rambur was recombined, the name *Agrion concinnum* Johansson was automatically revalidated. *Agrion concinnum* Johansson, 1859, was later recombined as *Coenagrion concinnum* (Johansson) by Kirby in 1890. *Agrion johanssoni* Wallengren, 1894 [=*Coenagrion johanssoni* (Wallengren)], is a junior synonym of *Coenagrion concinnum* (Johansson), 1859 (Steinmann, 1997).

10. *Coenagrion ecornutum* (Selys), 1872

Si-gol-sil-jam-ja-ri (시골실잠자리)

Agrion ecornutum Selys, 1872: Ann. Soc. Ent. Belg., 15: 22 [Type material: M; Type locality: Amur; Type deposition: Selys' collection]; Selys, 1876: Synopsis des Agrionines, Add., 5: 168; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 824; Schmidt, 1938: Sit. Acad. Wiss. Wine, 1(147): 146, (Korea);.Asahina, 1958: Insecta Matsum., 22: 64.

Coenagrion exornatum [misprint] (Selys): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 150.

Coenagrion ecornutum (Selys): Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 59; Hamada and Inoue, 1985: Dragonflies Jap., 2: 162, (Korea).

DISTRIBUTION: Korea, Japan, Northeast China, East Russia, Siberia, Amur, Sakhalin.

KOREAN RECORDS: GG: Namyangju, Mt. Cheonma. GW: Chuncheon. PB: Ganggye. HB: Cheongjin. HN: Bocheon, Onsupyeong, Unheung.

REMARKS: This species is distributed in northern area of Northeast Asia. Adult description: See Ishida et al. (1988) and Okudaira et al. (2001); Larval description: See Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

11. *Coenagrion hastulatum* (Charpentier), 1825

Buk-bang-cheong-tti-sil-jam-ja-ri (북방청띠실잠자리)

Argion hastulatum Charpentier, 1825: Hor. Ent., Paris: 20. [Type material: M; Type locality: Lapland; Type deposition: unknown]; Selys, 1876: Synopsis des Agrionines, Add., 5: 150; Jacobson and

Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 820; Nielsen, 1940: Mem. Soc. Ent. Ital., 19: 241; Belyshev, 1961: Fragm. Faun. Warszawa, 9(4): 40; Asahina, 1989: Gekkan-Mushi, 220: 11, (Daetaeg).

Coenagion hastulatum (Charpentier): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 149; Fraser, 1956: R. Ent. Soc. Lond., 1(10): 29; Steinmann, 1984: Fauna Hung., 160: 22; Lee, 1996, Bull. KACN, 15: 80, (Daetaeg).

DISTRIBUTION: Europe (Russia, Italy, Austria, Belgium, Switzerland, Czechoslovakia, German, Denmark, Spain, Finland, France, United Kingdom, Hungary, Luxembourg, Netherlands, Norway, Poland, Romania, Sweden, Turkey).

KOREAN RECORDS: HB: Daetaek.

REMARKS: This species was reported by Asahina (1989) from Daetaek, Hamgyeongbuk-do, but no more collecting data are available.

12. *Coenagrion hylas* (Trybom), 1889

Keun-sil-jam-ja-ri (큰실잠자리)

Agrion hylas Trybom, 1889: Bih. Svensk. Vet. Akad. Handl., 15(4): 12 [Type material: M; Type locality: Jenisei; Type deposition: Nat. Riksmus., Stockholm]; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 819; Doi, 1943: Ent. World, 11(110): 170, (Buksan); Cho, 1958: 356, (Buksan); Lieftinck, 1964: Tijdschr. Ent., 107: 159.

Agrion ? *freyi* Bilek, 1955: Nachr. Bay. Ent., 3(10): 98 [Type material: F; Type locality: Zwingsee; Type deposition: Zool. Samml. Bayer. Staat. Munchen]; Bilek, 1956: Nachr. Bay. Ent., 4(9): 1; Lieftinck, 1964: Tijdschr. Ent., 107: 159.

Coenagrion hylas ussurense Belyshev, 1956: The Dragonflies of Siberia, 3: 196 [Type material: M; Type locality: Russia; Type deposition: unknown]; Steinmann, 1984: Fauna Hung., 160: 25.

Coenagrion hylas (Trybom): Amateur Ent. Soc. Korea, 1986: Corentoman, 2(2, 3): 10 (Korea).

DISTRIBUTION: Japan, China (Manchuria), Sakhalin, Siberia, Mongolia, Western Asia, Germany (Alps).

KOREAN RECORDS: HN: Buksan. GG: Mt. Deokam.

REMARKS: This species is distributed in the northern areas of Northeast Asia including northern Japan, Manchuria, Sakhalin, Siberia, and Mongolia. Doi (1943) reported this species from Mt. Buksan, Hamgyeongnam-do, North Korea, and Lee (1996) reported this from Deokamsan (Mt.), Gyeonggi-do. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

13. *Coenagrion lanceolatum* (Selys), 1872

Buk-bang-sil-jam-ja-ri (북방실잠자리)

Agrion lanceolatum Selys, 1872: Ann. Soc. Ent. Belg., 15: 43 [Type material: M; Type locality: Amur; Type deposition: Selys' collection]; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 824;

Doi, 1943: Ent. World, 11(110): 170, (Jungam).

Coenagrion lanceolatum (Selys): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 150; Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 60; Hamade and Inoue, 1985: Dragonflies Jap., 2: 162, (Korea).

DISTRIBUTION: Korea, Japan, China (Manchuria), Sakhalin, Eastern Siberia, Central Asia.

KOREAN RECORDS: GG: Seongnam, Namyangju. GW: Mt. Seolak, Chuncheon. PB: Jungam. HB: Daetaeg. HN: Bocheon, Naegok, Onsupyeong.

REMARKS: This species was reported by Doi (1943) and Asahina (1989) from Jungam, Pyeonganbuk-do and Daetaek, Hamgyeongbuk-do, North Korea. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

Genus *Enallagma* Charpentier, 1840

Al-lak-sil-jam-ja-ri-sok (알락실잠자리속)

Enallagma Charpentier, 1840: Libell. Europ. Lipsiae: 21.

Type species: *Agrion cyathigerum* Charpentier, 1840.

Adult: Body medium-sized and rather stout. Adult body black with blue rings. Female blue and green. Postocular spots present in both sexes. Ventral abdominal segment VIII of female with a strong mid-ventral apical spine. Stigma similarly colored in fore and hind wings of male. Wings not stalked as far as anal crossing. Superior appendages of males shorter than inferior appendages. Females have a conspicuous vulvar spine on abdominal segment VIII.

Larva: Body medium-sized, elongate, and slender. Eyes laterially situated and globularly prominent. Occiput rounded and slightly prominent. Prementum elongate and pentagonal; end hook sharply pointed.

DISTRIBUTION: Cosmopolitan exclucing Australia.

14. *Enallagma cyathigerum* (Charpentier), 1840

Al-lak-sil-jam-ja-ri (알락실잠자리)

Agrion cyathigerum Charpentier, 1840: Monogr. Libell. Europ. Lipsiae: 163 [Type material: M; Type locality: Silesia; Type deposition: Mus. Nation. Hist. Nat., Paris]; Asahina, 1939: Kontyu, 13(5, 6): 198, (Santien=Samjiyeon).

Agrion charpentieri Selys, 1840: Monogr. Libell. Eur. Paris: 214 [Type material: M; Type locality: France. Type deposition: Mus. Nation. Hist. Nat., Paris]; Selys, 1876: Synopsis des Agrionines, Add., 5: 86.

Agrion pulchrum Hagen, 1840: Syn. Libell. Eur.: 80 [Type material: F]; Selys, 1876: Synopsis des

Agrionines, Add., 5: 86.

Agrion annexum Hagen, 1861: Syn. Neur. N. Amer., Washington: 87 [Type material: M; Type locality: Sitka; Type deposition: Mus. Naturk., Berlin]; Selys, 1876: Synopsis des Agrionines, Add., 5: 86.

Agrion (*Enallagma*) *cyathigerum* Charpentier: Selys, 1876: Synopsis des Agrionines, Add., 5: 86

Enallagma cyathigerum (Charpentier): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 145; Muttkowski, 1910: Bull. Publ. Mus. Milwaukee, 1(1): 57; Laidlaw, 1919: Laidlaw, Rec. Indian Mus.,16: 183; Nielsen, 1940: Mem. Soc. Ent. Ital., 19: 240; Akramovski, 1948: Zool. Zborn., Moscow, 5: 153; Morera, 1950: Inst. Esp. Ent., Madrid: 90; Santock at al., 1955: Agra Univ. J. Res., 4, suppl.: 748; Fraser, 1956: R. Ent. Soc. London, 1(10): 32; Steinmann, 1984: Fauna Hung., 160: 35.

Enallagma annexum Kirby, 1890: Syn. Cat. Neur.-Odon., London: 146.

Enallagma cyathigerum cyathigerum (Charpentier): Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp: 817; Tsuda, 1991: Dist. List World Odonata, Osaka: 31, (Korea).

Agrion annexum Muttkowski, 1910: Bull. Publ. Mus. Milwaukee, 1(1): 57.

Enallagma cyathigerum f. *nigriprothorax* Le Roi, 1914: Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 68.

Enallagma cyathigerum var. *rotundatum* Bartenef, 1929: Zool. Anz., 85: 63, (Male from Caucasus).

Enallagma cyathigerum (Charpentier) subsp.: Asahina, 1989: Gekkan-Mushi, 220: 12, (Samjiyeon, Daetaek).

DISTRIBUTION: Asia (North Korea, Russia, Northern China), Europe (Italy, Eurasia, Austria, Belgium, Burgaria, Switzerland, Czechoslovakia, German, Denmark, Algeria, Spain, Finland, France, United Kingdom, Hungary, Ireland, Liechtenstein, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Turkey, Yugoslavia), North America (Canada: British Columbia, Alaska, Mexico), India.

KOREAN RECORDS: HB: Samjiyeon, Daetaeg.

REMARKS: This species was first recorded by Asahina (1939) from Samjiyeon and Daetaek, Hamgyeongbuk-do in North Korea. There are no distribution records from South Korea.

15. *Enallagma deserti* Selys, 1871

Buk-al-lak-sil-jam-ja-ri (북알락실잠자리)

Agrion deserti Selys, 1871: Ann. Soc. Ent. Belg., 14: 19 [Type material: F; Type locality: Algeria; Type deposition: Selys' Collection].

Agrion (*Enallagma*) *deserti* Selys, 1876: Synopsis des Agrionines, Add., 5: 93.

Enallagma deserti (Selys): Kirby, 1890: Syn. Cat. Neur. - Odon., London: 146; Ris, 1928: Ent. Mitt., 17: 277; Ju, 1993: Rep. Mt. Baekdu, Pyeongyang: 256, (Bocheon, Onsupyeong).

Enallagma deserti deserti (Selys): Asahina, 1949: Insecta Matsum., 17: 34.

DISTRIBUTION: North Korea, widely distributed in northern temperate regions.

KOREAN RECORDS: HN: Bocheon, Onsupyeong.

REMARKS: This species was recorded from North Korea by Ju (1993).

Genus *Ischnura* Charpentier, 1840

A-si-a-sil-jam-ja-ri-sok (아시아실잠자리속)

Ischnura Charpentier, 1840: Libell. Europ. Lipsiae: 20.
Type species: Not designated.

Adult: Body small to medium-sized. Body color of males blue, with black markings; abdominal segments VIII and / or IX bright blue. Postocular pale spots present. Stigma of fore and hind wings usually differently colored in male. Considerable variety present in the form of rear lobe of prothorax in both sexes. Apex of abdominal segment X of male bifid, elevated in a sort of fork. Wings not stalked as far as anal crossing.

Larva: Body small to medium-sized. Head trapezoidal. Prementum elongate, somewhat broad; hinge extends beyond anterior margin of middle coxae; mental setae 3 to 5, with a short bristle on internal margin. Lateral lobe stout; external lobe has small sharp teeth; movable hook short and thick. Apices of wing sheaths reach posterior margin of abdominal segment IV. Legs fairly long and slender. Abdominal segments I−VIII with lateral carinae, covered with minute granules (except along mesal line). Caudal lamellae slender, willow leaf-like with prominent apices. Median lamella distinctly broader than lateral lamellae; tracheae numerous and conspicuous, but bronchia inconspicuous.

Distribution: Cosmopolitan.

16. *Ischnura asiatica* (Brauer, 1865) (Figs. 5, 6, Pls. 9−12)

A-si-a-sil-jam-ja-ri (아시아실잠자리)

Agrion (*Ischnura*) *asiaticum* Brauer, 1865: Verh. Zool. -Bot. Ges. Wien., 15: 509 [Material: M (Not given); Type locality: China; Type deposition: perhaps in Naturhist].
Agrion (*Ischnura*) *orientalis* Selys, 1876: Synopsis des Afrionines, Add., 5: 36 [Material: M; Type locality: Japan; Type deposition: in Sely' collection].
Micronympha asiatica (Brauer): Kirby, 1890: Syn. Cat. Neur. -Odon., London: 143.
Micronympha orientails (Selys): Kirby, 1890: Syn. Cat. Neur. -Odon., London: 143.
Ischnura asiatica (Brauer): Jacobson and Bianiki, 1905: Pryam. Iozhnos. Ross. Imp.: 813; Ris, 1916: Suppl. Ent. Berlin, 5: 19; Schmidt, 1931: Konowia, 10(3): 184; Sjostedt, 1933: Ark. Zool. Uppsala, 25(A)(5): 20; Asahina, 1939: Kontyu, 13(5, 6): 197 (Kokei=Ganggyeong, Kodirei=Huchiryeong, Kokai=Ganggye, Kaizyo=Gaseong).
Ischnura lobata Needham, 1930: Zool. Sinica (A), 11: 280 [Material: M; Type locality: China; Type deposition: British Museum (Nat. Hist.), London]; Schmidt, 1931: Konowia, 10(3): 184 [proposed synonymy with *asiatica* (Brauer, 1865)].
Ischnura formosana Chujo, 1931: Trans. Nat. Hist. Soc. Formosa, 21(112): 47; Schmidt, 1931: Konowia, 10(3): 184 [proposed synonymy with *asiatica* (Brauer, 1865)].
Agrion quadrigerum Selys: Doi, 1932: J. Chosen Nat. Hist. Soc., 14: 69, (Yucheon).

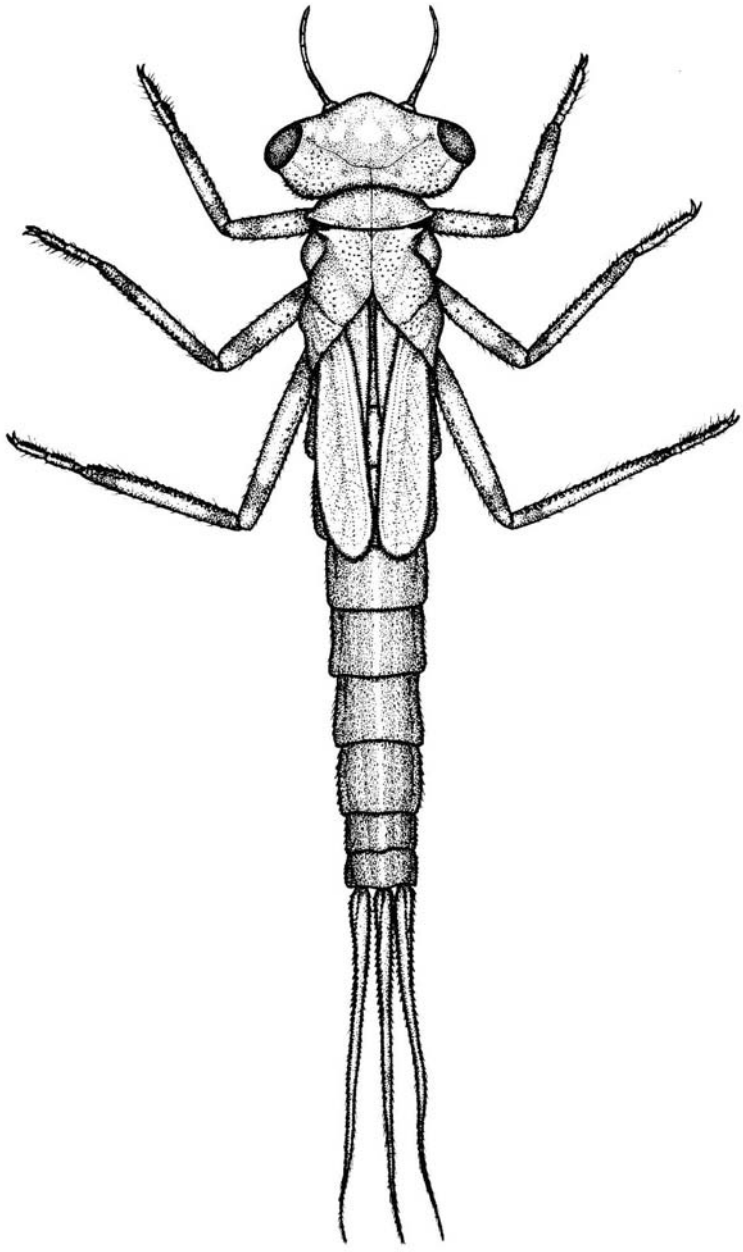

Fig. 5. *Ischnura asiatica*, dorsal larva.

Male adult (Pls. 9, 10, 12): Abdominal tergite IX blue, VIII and X black. Superior appendages possess a black process. Apex of inferior appendages is black and sharp.

Female adult (Pl. 11, 12): Distal margin of prothorax rounded; black patterns of prothorax complex. Apex of valve in ovipositors beyond abdominal sternite X.

Larva: Body (Fig. 5) length 11–13 mm; lamella length 4–5 mm. General body color brown. Head color brown with dark brown broad winding stripe between compound eyes. Antennae yellowish brown, longer than head length, 7 segmented; basal 2 and 1/4 of segment 3 brown. Compound

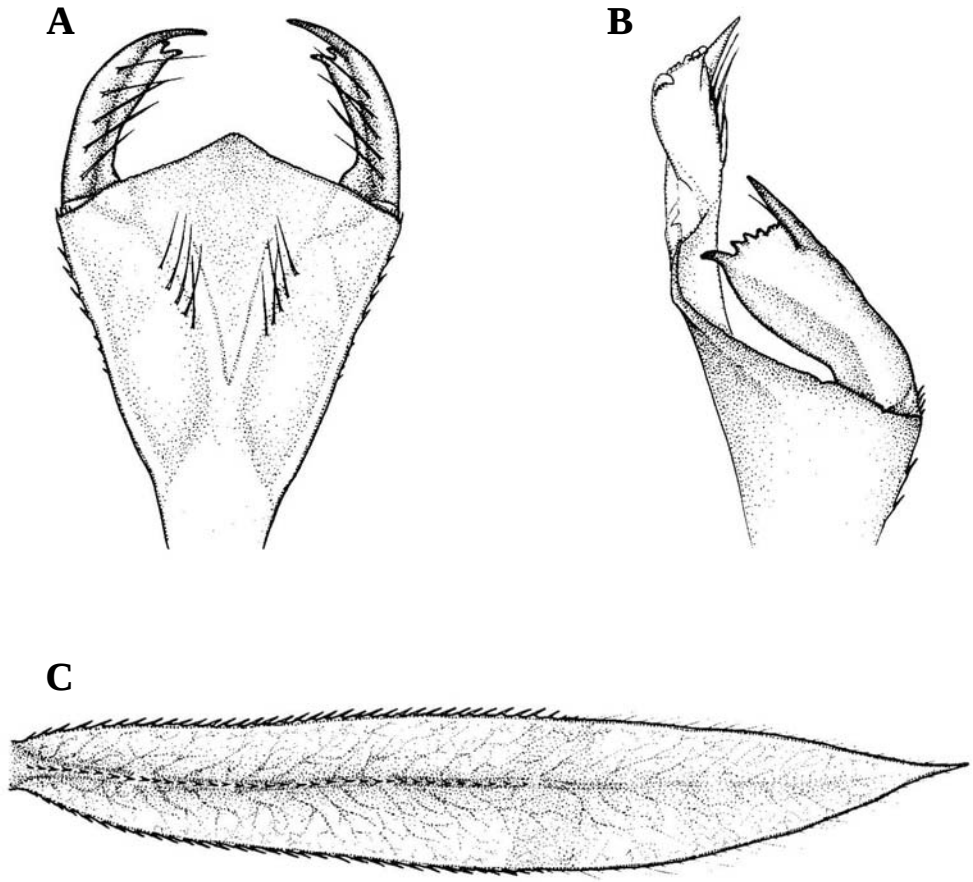

Fig. 6. *Ischnura asiatica*. A. ventral labium; B. palpal lobe; C. lamella.

eyes black. Ocelli absent. Labium (Fig. 6A) short, as wide as long; each side of prementum with 5 premental seatae; palal lobe (Fig. 6B) with 7 palpal setae, a movable hook, a truncate lobe and terminal hook; truncate lobe with 4 teeth. Thorax brown and flat. Wing pad parallel along midline. Legs brownish yellow with short setae; femur with two brown bands. Abdomen color brown; tergite I–X with white thin median longitudinal line and two light brown submedian longitudinal lines; tergites II–IX distal margins with short yellowish brown pinstripes. Cerci triangular. Lamellae (Fig. 6C) yellowish brown and elongated with many dark brown tracheas; lateral margin of basal lamellae with minute denticles; median brown horizontal line; lateral margin of distal lamellae filament-like; apex of lamellae tapering.

DISTRIBUTION: Korea, Manchuria, Japan, China (Mainland, Shanghai, Hong Kong), Taiwan, Russia (Maritime Province of Siberia).

KOREAN RECORDS: GG: Mt. Gwanak, Mt. Daemo, Mt. Dobong, Mt. Bukhan, Gangnam, Mapo, Seongbuk, Nowon, Gangdong, Gyeyang, Seogu, Mt. Hobong, Is. Baekryeong, Mt. Seolseong, Seongnam, Paju, Wangsong, Dongducheon, Mt. Soyo, Pocheon, Mt. Jugeum, Suwon, St. Gokryeong, Yeongsan, Myeongpa, Ganghwa, Gwangju, Yangpyeong, Gwacheon, Gapyeong, Uiwang, Mt. Cheonggye, Mt. Suri, Yongjusa, Guri, Uijeongbu, Pyeongtaeg, Paldang, Mt. Cheonma, Geumchon,

Neungnae, Namyangju, Yangju, Anyang, Yeoncheon, Gaeseong, Ansan, Jangheung. GW: Samcheog, Cheolwon, Hwajinpo, Gyeongpoho, Gangchon, Goseong, Donghae, Gangneung, Goyang, Yangyang, Hwacheon, Mt. Baekun, Mt. Bangtae, Mt. Daeam, Yanggu, Dongmyeon-jeosuji, Mt. Gwangdeog, Mt. Gariwang, Chuncheon, Mt. Obong, Sokcho, Daegwanryeong. CB: Cheongju, Goesan, Mt. Joryeong, Danyang, Yeongdong, Mt. Geumsu, Okcheon. CN: Mt. Seongju, Ganggyeong, Bongeunsa, Daejeon, Naju, Nonsan, Mt. Gyeryong, Is. Anmyeon, Buyeo, Bokgeum-jeosuji, Cheonan, Yesan, Hongseong, Geumsan, Seosan. JB: Jeonju, Gochang, Gunsan, Gimje, Wanju. JN: Hampyeong, Sinan, Jinri-jeosuji, Gwangsan, Gwangju, Gwangyang, Is. Daeheuksan, Suncheon, Gurye, Yeongam, Gokseong, Is. Jindo, Is. Wando, Is. Hongdo, Goheung, Mokgyo-jeosuji. GB: Seongju, Yeoungnam University, Mt. Palgong, Gimcheon, Is. Ulneung, Mungyeong, Sangju. GN: Milyang, Ulju, Gimhae, Mosan, Jinhae, Goseong, Mt. Jeogul, Uiryeong, Jinju, Gyeongsang University, Jangchongsa, Changnyeong, Upo-neup, Hadong, Mt. Aemyeon, Daebyeong-jeosuji, Mt. Mangil, Haman, Daesongri-neup, Jillal-neup, Jinju, Mt. Jeongjok, Busan, Mt. Geumo, Habu-jeosuji, Mt. Jeongsu, Sacheon, Deoksansa, St. Simcheon, Mt. Jiri, Sancheong, Seoksan, Is. Geoje, Mt. Sanseong, Geochang, Changnyeong

SPECIMEN EXAMINED: S: 2M (Seongdong-gu Seongsu-dong Seoul forest, 7.xi.2005), GG: 1F (Ganghwa-gun Gilsang-myeon Seondu-ri Seondupo-jeosuji, 6.v.2000).

REMARKS: This is the most widespread and abundant demselfly in Korea.

17. *Ischnura elegans* (Van der Linden), 1820 (Pls. 13, 14)

Buk-bang-a-si-a-sil-jam-ja-ri (북방아시아실잠자리)

Agrion elegans Van der Linden, 1823: Opusc. Scil, 4: 104 [Type material: M; Type locality: Italy: Bologna; Type deposition: Mus. Naturk., Berlin].

Agrion papilla Hansemann, 1823: Wiedem. Zool. Mag., 2(1): 156.

Agrion tuberculatum Charpentier,1825: Hor. Ent.: 21 [Type material: F; Type locality: Germany; Type deposition: Halle Museum].

Agrion ezonatum Stephens, 1836: Ill. Brit. Ent. Mand., 5: 72 [Type material: M; Type locality: England; Type deposition: British Museum (Nat.Hist.)].

Agrion rufescens Stephens, 1836: Ill. Brit. Ent. Mand., 5: 72

Agrion aglae Fonscolombe, 1838: Ann. Soc. Ent. France: 567 [Type material: M; Type locality: France; Type deposition: Mus. Nat. Hist., Paris].

Agrion hastulatum Bufmeister, 1839: Handbuch. Ent., 2: 820.

Agrion rubens Evans, 1845: Brit. Lib.:14.

Agrion (*Ischnura*) *elegans* Van der Linden: Selys, 1876: Synopsis des Agrionines, Add., 5: 33.

Agrion excels Rostock, 1885: Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 72.

Agrion exigua Rostock, 1885: Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 72.

Agrion magna Rostock, 1885: Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 73.

Ischnura elegans (Van der Linden): Selys, 1887: Ann. Soc. Ent. Belg., 31: 65; Anders, 1928: Mem. Soc. R. Ent. Egypt., 3(1): 25; Needham and Gyger, 1939: Philipp. J. Sci., 70(3): 289; Nielsen, 1940: Mem. Soc. Ent. Ital., 19: 239; Morera, 1950: Inst. Esp. Ent. Madrid: 92; Fraser, 1956: R. Ent. Soc. London, 1(10): 31; Miyazaki, 1986: Tombo, 29(3, 4): 67, (Kyongho=Gyeongho).

Micronympha elegans (Van der Linden): Kirby, 1890: Syn. Cat. Neur. -Odon., London: 142.

Ishnuta elegans f. *infuscens* Campion, 1905: Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 73.
Ischnura elegans var. *infuscans* Killington, 1924: Entomologist, 57: 278.
Ischnura elegans var. *obsoleta* Killington, 1924: Entomologist, 57: 278.
Ischnura elegans elegans (Van der Linden): Zhu, 1989: Notul. Odonatol., 3(3): 47.

Male adult (Pl. 13): Head black with paired postocular spots. Antennae black. Compound eyes purple. Ocelli yellow. Frons black. Clypeus black. Labrum blue. Prothorax black; middle of distal margin elongated in rectangular-shape. Mesepisternum black with a blue stripe in lateral margin. Upper part of mesepimeron black. Lower part of mesepimeron blue. Wings hyaline. Pterostigmas of forewings and hingwings different. Inner part of forwing pterostigmas dark brown. Outer part of pterostigmas blue. Pterostigmas of hindwings yellow. Legs with dark brown spines; outer part of femora dark brown; inner part of tibae pale; tarsus pale; claws dark brown. Abdominal slender. Abdominal tergite I−VII black. Abdominal tergite VIII blue. Abdominal tergite IX−X black. Distal margin of abdominal tergite X raised. Superior appendages short with a long, thin projection; profection not curved. Inferior appendages long with two processes; processes curved to opposite directions.

Female adult (Pl. 14): Head black with paired, blue postocular spots. Antennae black; Compound eyes purple. Ocelli yellow. Frons black. Clypeus black. Labrum blue. Prothorax black; middle of distal margin elongated in rectangular-shape, shorter than males. Mesepisternum black with blue stripe in lateral margin. Upper part of mesepimeron black. Lower part of mesepimeron blue. Wing hyaline. Pterostigmas of forewings yellow amd hindwings yellow. Legs with dark brown spines; outer part of femora dark brown; inner part of tibae pale; tarsus pale; claws dark brown. Abdomen slender. Abdominal tergite I−VII black. Abdominal tergite VIII blue. Abdominal tergite IX−X black. Distal margin of abdominal tergite X raised. Abdominal sternite VIII with a dark brown spine. Genitalia pale; ovipositors pale; styles dark brown. Anal appendages dark brown, turned outward.

Larva: General body color brown. Head color brown. Antennae pale with 7 segments. Compound eyes black. Ocelli absent. Prementum brown with 4 setae. Palpal lobe with 5 setae, a movable hook, a truncate lobe and a terminal hook; truncate lobe with 4 teeth. Prothorax brown, flat; distal margin flat. Wing pads near to distal margin of abdominal tergite III. Legs brownish yellow with short setae; femora with two brown bands proximally and distally. Abdomen brown. Abdominal tergite II−IX with two dark brown spots. Cerci triangular. Lamellae pale with many dark brown tracheae, widely separated with several pale hairs. apex of lamellae tapering.

Distribution: Asia (Korea, Japan, Northern China, India, Nepal), Europe (Russia, Italy, Austria, Belgium, Burgaria, Switzerland, Czechoslovakia, German, Denmark, Algeria, Spain, Finland, France, United Kingdom, Greece, Ireland, Liechtenstein, Luxembourg, Netherlands, Norway, Romania, Sweden).

Korean records: GG: Is. Baekryeong, Gyeyang, Gangwha, Paju, Yangju, Uijeongu. GW: Gangneung, Hwajinpo. CB: Yeongdong. CN: Taean. GB: Gyeongsan, Sangju. GN: Gimhae, Geochang. JB: Mt. Naejang, Gimje, Wanju. JN: Goheung, Imsil, Hampyeong.

Specimen examined: GN: 2M, 3F [Changnyeong-gun Mokpo-neup, 5.viii.1999], GG: 2N (Ganghwa-gun Gyodong-myeon Gogujeosuji, 2.vi.2006).

Remarks: *Ischnura elegans* (Van der Linden) is mainly distributed in the temperate areas of the

Palearctic region, whereas *Ischnura senegalensis* Martin is widespread in the tropical and subtropical areas of Southeast Asia, although its distributional range is much wider.

18. *Ischnura senegalensis* (Rambur), 1842 (Pls. 15, 16)

Pu-reun-a-si-a-sil-jam-ja-ri (푸른아시아실잠자리)

Agrion senegalense Rambur, 1842: Hist. Nat. Ins. Neuropt: 276 [Type material: M; Type locality: Senegal].
Agrion (*Ischnura*) *senegalense* Selys, 1876: Synopsis des Agrionines, Add., 5: 29.
Micronympha senegalensis Kirby, 1890: Syn. Cat. Neur. -Odon., London: 141.
Micronympha senegalensis Kirby, 1896: Ann. Mag. Nat. Hist., (7) 2: 244.
Ischnura senegalensis Martin, 1901: Mem. Soc. Zool. France, 14: 246; Fraser, 1924: Rec. Indian Mus., 26: 489; Ris, 1927: Zool. Meded., Leiden, 10(1): 21; Anders, 1928: Mem. Soc. R. Ent. Egyp., 3(1): 25; Schmidt, 1934; Arch. Hydrob. Suppl., 13: 339; Longfield, 1936: Trans. R. Ent. Soc. London, 85: 471; Lieftinck, 1936: Revue Suisse Zool., 43(5): 136; Needham and Gyger, 1939: Philipp. J. Sci., 70(3): 289; Fraser, 1949: Trans. R. Ent. Soc. London, 100: 138; Lieftinck, 1954: Treubia, 22 Suppl.: 74; Brinck, 1955: South African Animal Life, 2: 196; Tinhey, 1962: Publ. Cult. Comp. Diam. Angala, 59: 197.

Male adult: Head black with paired postocular spots. Antennae black. Compound eyes purple. Ocelli yellow. Frons dark black. Clypeus black. Labrum blue. Prothorax black. Distal margin of prothorax rounded. Mesepisternum black with a blue stripe in lateral margin. Upper part of mesepimeron black. Lower part of mesepimeron blue. Wings hyaline. Pterostigmas of forewings and hindwings different. Inner part of pterostigmas dark brown. Outer part of pterostigmas blue. Pterostigmas of hindwings yellow. Legs with dark brown spines; outer part of femora dark brown; inner part of tibae pale; tarsus pale; claws dark brown. Abdomen slender. Abdominal tergite I–VII black Abdominal tergite VIII blue. Abdominal tergite IX–X black. Distal margin of abdominal tergite raised. Superior appendages brown, short with a long, thick projection; projection dark brown, curved inward. Inferior appendages long, divided two parts; apex of outer part dark brown; base of outer part pale; inner part pale.

Female adult (Pls. 15, 16): Head black with paired, blue, small postocular spots. Antennae dark brown. Compound eyes brown Ocelli yellow. Proximal part of frons black. Distal part of frons blue. Clypeus black. Labrum blue. Prothorax black; distal margin rounded, slightly elongated. Mesepisternum black with a blue stripe in lateral margin. Upper part of mesepimeron black. Lower part of mesepimeron blue. Wings hyaline; pterostigmas of forewings yellow. Pterostigmas of hindwings yellow. Legs with dark brown spins; outer part of femora dark brown; inner part of tibae pale; tarsus pale; claws dark brown. Abdomen slender; abdominal tergite I–VII black. Abdominal tergite VIII blue. Abdominal tergite IX–X black. Distal margin of abdominal tergite X risen; upper part narrow; lower part broad. Abdominal sternite VIII with a dark brown spine. Anal appendages dark brown, turned outward. Supra-anal plate rounded. Genitalia pale; ovipositors pale; apex of valve over abdominal sternite X slight; styles light red.

Larva: General body color brown. Head color brown. Antennae pale with 7 segments. Compound eyes black. Ocelli absent. Prementum brown with 5 setae. Palpal lobe with 6 setae, with a

movable hook, a truncate lobe and a terminal hook; truncate lobe with 4 teeth. Prothorax brown, flat; distal margin flat. Wing pads extend slightly over abdominal tergite III. Legs brownish yellow with short setae; femora with two brown bands proximally and distally. Abdomen brown. Abdominal tergite II–IX with two dark brown spots. Cerci triangular. Lamellae pale, wide with many dark brown tracheas. Apex of lamellae tapering.

Distribution: Asia (Korea, Japan, China, Russian Far East, Taiwan, Thailand, Philippines, Vietnam, Malaysia, Indonesia, India, Pakistan), Africa.

Korean records: CN: Daejeon. JB: Wanju, Gochang, Gunsan, Jeonju. JN: Gwangyang, Mokpo, Yeocheon, Jindo, Haenam, Hampyeong. GN: Jinhae, Jinju, Geoje, Geochang, Tongyeong, Hadong. JJ: Bukjeju, Namjeju, Seogwipo, St. Dogeun. HN: Hyesan.

Specimen examined: JN: 8M, 8F (Yeocheon-gun Nam-myeon Uhak-ri Simpo, 20.vii.1993), JJ: (Jeju-si Chuja-myeon Shinyanggeuri, 26.viii.2009).

Remarks: Ju (1993) and Hong (1991) reported this species from Mt. Baekdu and Jangan-ri, respectively. This species is distributed in the tropical and subtropical areas and found only in the southern part of the Korean peninsula and Jejudo.

Genus *Mortonagrion* Fraser, 1920

Hwang-deung-saek-sil-jam-ja-ri-sok (황등색실잠자리속)

Mortonagrion Fraser, 1920: J. Bombaynat. Hist. Soc., 27: 147.

Type species: *Mortonagrion varralli* Fraser, 1920.

Adult: Body small. Mature male body color not changed; mature female body color changed from orange-yellow to green or dark green. Wings petiolate from wing bases to vicinity of 1st antenodal.

Larva: Larval body small. Head width < 3.0 mm; posterolateral margins of head greatly angulate with small tubercle. Antennae length shorter than half length of head.

Distribution: Korea, Japan, Australasian and Oriental region.

19. *Mortonagrion selenion* (Ris), 1916

Hwang-deung-saek-sil-jam-ja-ri (황등색실잠자리)

Agriocnemis selenion Ris, 1916: Suppl. Ent., Berlin, 5: 26 [Type material: M; Type locality: Japan; Type deposition: Naturhist. Riksmus., Stockholm]; Doi, 1943: Ent. World, 1(110): 169 (Taeneung, Changdong).

Mortonagrion selenion (Ris): Ris, 1930: Ark. Zool. Uppsala, 21A(31): 14; Asahina, 1950: Ico. Ins. Jap. Hokuryukan, Tokyo: 146, (Korea).

Male adult: Body color pale greenish yellow, with black markings; abdominal segments VIII–X

bright yellowish orange. Head black, with paired curved postocular lines; lines blue and rounded. Distal margin of clypeus blue. Superior appendages triangular and shorter than inferior appendages. Inferior appendages ellipse-shaped in dorsal view and curved upward.

Female adult: Body color of teneral females bright orange (markings absent); in mature females, color changed to bright green with black longitudinal stripe on dorsal surface of abdomen.

Larva: Body color bright yellowish brown or pale orange-brown, with brown markings. Prementum slightly elongate and pentagonal, with lateral margins slightly sinuate inwardly. Lateral lobe large; external lobe has 5 small teeth, the outermost fringed with 3 minute spines at apex; lateral setae 5; movable hook short and stout. Apices of slender wing sheaths beyond posterior margin of abdominal segment III. Legs slender and fragile. Abdomen slender and nearly cylindrical, and lateral carinae on segments II–VIII. Caudal lamellae willow leaf-like, with rounded apices; tracheae conspicuous and simple. Median lamella slightly longer and broader than lateral lamellae.

Distribution: Korea, Japan, Taiwan, China (central), Far East Russia.

Korean records: GG: Nowon, Dobong, Dongdaemun, Yangju, Suwon, Anyang. GW: Gangneung. HN: Hamheung.

Specimen examined: GG: 1M (Yangju-gun Jangheung-myeon Ilyeong, 12.vi.1982).

Genus *Nehalennia* Selys, 1850

Cheong-dong-sil-jam-ja-ri-sok (청동실잠자리속)

Nehalennia Selys, 1850: Revue des Odonates, Paris: 172.

Type species: *Agrion speciosum* Charpentier, 1840.

Adult: Adult body brilliant bronzy green dorsally, yellowish ventrally, similarly colored in both sexes, without pale postocular spots. Abdomen very slender; midventral apical spine absent on abdominal segment VIII of female. Wing crossveins few; stigma remarkably short.

Larva: Hind angles of head rounded; labium with a single mental seta each side and 6 laterals. Gill lamellae long and narrow with smooth margins and long tapered point, faintly spotted with brown.

Distribution: Nearctic, Neotropical, and Palearctic regions.

20. *Nehalennia speciosa* (Charpentier), 1840

Cheong-dong-sil-jam-ja-ri (청동실잠자리)

Agrion (*Ischnura*) *speciosum* Charpentier, 1840: Lebell. Europ., Lipsiae: 151 [Type locality: Germany].
Agrion sopia Selys (nec Selys, 1876), 1840: Monogr. Lebell. Europ., Paris: 213.
Agrion (*Nehalennia*) *speciosum* (Charpentier): Selys and Hagen, 1850: Revue des Odonates, Paris: 173.

Agrion (*Nehalennia*) *speciosa* (Charpentier): Selys, 1876: Synopsis des Agrionines, Add., 5: 128.
Nehalennia speciosa (Charpentier): Kirby, 1890: Syn. Cat. Neur. -Odon., London: 147; Jacobson and Bianki, 1905: Pryan. Lozhnos. Ross. Imp.: 827; Hoffmann, 1960: Archives, 27: 223; Doi, 1943: Ent. World, 11(110): 170, (Daetaeg).

DISTRIBUTION: Northeast Asia (Korea, Japan, Sakhalin, Usuri, Siberia, Kamchatka), Europe (Italy, Austria, Belgium, Burgaria, Switzerland, Czechoslovakia, German, Finland, France, Hungary, Luxembourg, Netherlands, Poland, Romania, Sweden).

KOREAN RECORDS: HB: Daetaeg.

REMARKS: This species was reported by Doi (1943) from Daetaek, Hamgyengbuk-do and by Lee (1996) from Yongneup, Gangwon-do. This species is distributed in northern Japan, Sakhalin, and Siberia. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

Genus *Paracercion* Weekers and Dumont, 2004

Deung-jul-sil-jam-ja-ri-sok (등줄실잠자리속)

Paracercion Weeders and Dumont, 2004: Odonatologica, 33(2): 181−188.
Type species: *Agrion hieroglyphicum* Brauer, 1865.

Adult: Body medium-sized to large, slender. Postocular spots present in both sexes. Antehumeral area mostly black, with antehumeral line present. Abdomen with narrow dorsal blue marking on basal margin of each segment. Superior appendages nearly as long as inferior appendages. Females without a vulvar spine on ventrum of abdominal segment VIII.

Larva: Body medium-sized to large, robust, and slender. Head relatively small. Prementum is elongate and scalene pentagonal; mental setae 3 or 4. Lateral lobe stout; end hook narrow and sharp; external lobe has 3 or 4 minute spines along anterior margin and minute serrations along internal margin. Wing sheaths short. Legs slender; forelegs short. Abdomen slender and nearly cylindrical, with lateral carinae present on segments I−IX. Caudal lamellae slender and willow leaf-like (nodal line absent); apices somewhat pointed; stout marginal serrations present on proximal half. Tracheae sparse; bronchia numerous and dense. Median lamella broader than lateral lamellae and slightly rounded at dorsal margin.

DISTRIBUTION: Palearctic.

REMARKS: Weekers and Dumont (2004) erected the genus *Paracercion* (type: *Agrion hieroglyphicum* Brauer) based on a molecular analysis. Lee (2006) moved four Korean species previously classified under *Cercion* Navas to *Paracercion*.

21. *Paracercion calamorum* (Ris), 1916 (Pls. 17, 18)

Deung-geom-eun-sil-jam-ja-ri (등검은실잠자리)

Agrion calamorum Ris, 1916: Suppl. Ent., 5: 32 [Type material: M; Type locality: China; Type deposition: Ris' collection]; Schmidt, 1931: Konowia, 10(3): 183; Doi, 1943: Ent. World, 11(110): 171, (Yucheon, Juan, Taeneung).

Cercion calamorum (Ris): Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 58; Asahina, 1950: Ico. Ins. Jap. Hokuryukan, Tokyo: 139, (Korea).

Cercion calamorum calamorum (Ris): Hamada and Inoue, 1985, Dragonflies Jap., 2: 158, (Korea).

Paracercion calamorum (Ris): Lee, 2006: 12.

Male adult (Pls. 17, 18): Head entirely black with small, paired postocular spots only. Color of dorsal thorax bronzy black without stripe. Superior appendages black and relatively long, not curved, and with an elongate projection. Inferior appendages tapering in lateral view.

Female adult (Pls. 17, 18): Distal margin of prothorax {-shaped; each rounded side greatly protruded.

Larva: Prementum with 4 setae. Palpal lobe with 5 setae; truncate projection with four serrations. Cerci relatively long and curved upward and inward. Distal part of lamellae rather narrow; apex of lamellae blunt; lateral margin of lamellae with pigmented tracheae.

DISTRIBUTION: Korea, Japan, China (Central-Northern), India.

KOREAN RECORDS: GG: Uiwang, Anseong, Guri, Incheon, Is. Baegryeong, Juan, Nowon, Namyangju, Pocheon, St. Gyeongan, Haansamni-jeosuji, Yangpyeong. GW: Hwacheon, Mt. Backun, Chuncheon, Mt. Chiak, Mt. Odae, Chulwon, Mt. Gwangdeok. CB: Okcheon, Chungju. CN: Buyeo, Yeongi, Hongseong, Is. Anmyeon, Daejeon, Yesan, Cheonan, St. Tandong. JB: Gunsan, Jeonju, Gimje, Buan, Gochang. JN: Suncheon, Gogseong, Hampyeong, Gwangju, Damyang, Gurye. GB: Is. Ulleung, Ulju. GN: Changnyeong, Goseong, Hadong, Haman, Hapcheon, Jinju, Miryang, Sacheon, Sancheong, Uiryeong. HN: Hyesan, Bocheon. JJ: Andeog-gyegog, Bukjeju, St. Dogeun.

SPECIMEN EXAMINED: JN: 5M, 5F, 3N (Gokseong-gun Gokseong-eup Wolbong-ri, 4.viii.2000).

22. *Paracercion hieroglyphicum* (Brauer), 1865 (Figs. 7, 8, Pl. 19)

Deung-jul-sil-jam-ja-ri (등줄실잠자리)

Agrion hieroglyphicum Brauer, 1865: Verh. Zool. -Bot. Ges., Wien, 15: 510 [Type material: M; Type locality: China (Hong-Kong); Type deposition: not given]; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 824; Schmidt, 1931: Konowia, 10(3): 183; Doi, 1943: Ent. World, 11(110): 171, (Is. Jeju, Is. Wan-do, Milyang, Yucheon, Daegu, Jochiwon, Chungju, vic. Seoul, Taeneung, Wonju).

Agrion (*Agrion*) *lineolatum* Selys, 1876: Synopsis des Agrionines, Add., 5: 172 [Type material: M; Type locality: Japan; Type deposition: Nation. Hist. Mus., Paris].

Coenagrion hieroglyphicum (Brauer): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 150; Ishida, 1969: Ins. Life Jap., 2: 43, (Korea).

Cercion hieroglyphicum (Brauer): Asahina, 1950: Ico. Ins. Jap. Hokuryukan, Tokyo: 139, (Korea); Asahina, 1965: Kontyu, 33(4): 495.

Paracerion hieroglyphicum (Brauer): Lee, 2006: 12.

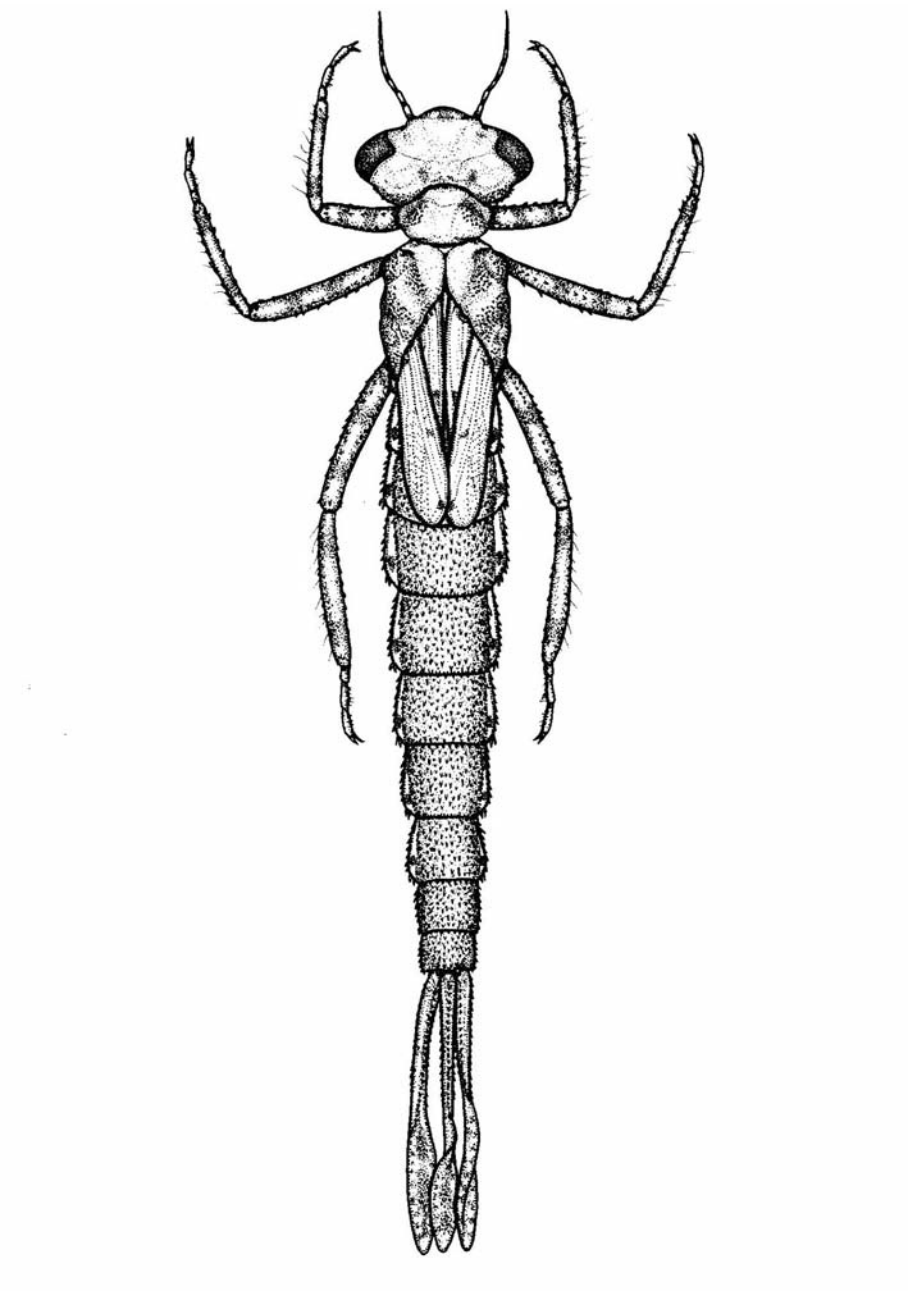

Fig. 7. *Paracercion hieroglyphicum*, dorsal larva.

Male adult (Pl. 19): Head with numerous pale patterning including a pale occipital stripe. Projection of superior appendages thin and long with blunt and black apex. Inside apices of inferior appendages pointed.

Female adult: Head pattern of female adult larger and more complicated than male adult. Distal margin of prothorax {-shape; each rounded side little swollen.

Larva (Fig. 7): Prementum (Fig. 8A) with 5 setae. Palpal lobe (Fig. 8B) with 6 setae; truncate projection with four serrations. Cerci relatively short. Distal part of lamellae (Fig. 8C) as wide as basal part; apex of lamellae pointed; lateral margins of lamellae with pigmented tracheae.

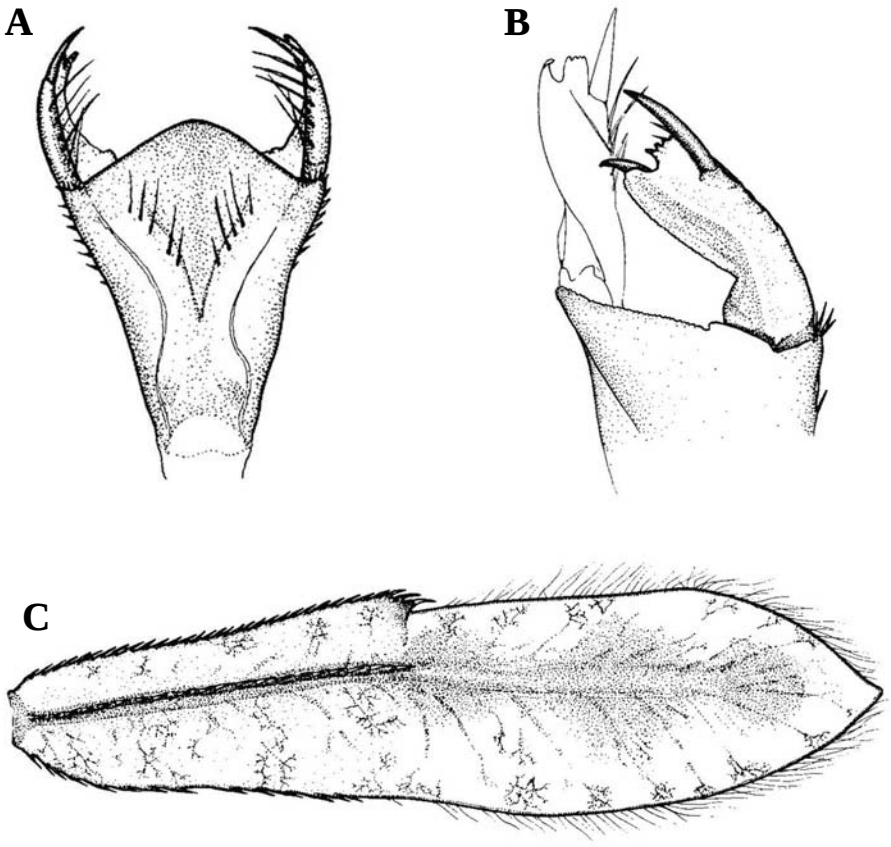

Fig. 8. *Paracercion hieroglyphicum*. A. ventral labium; B. palpal lobe; C. lamella.

DISTRIBUTION: East Asia (Korea, Japan, China, Hong Kong).

KOREAN RECORDS: GG: Nowon, Is. Yeongjong, Mt. Soyo, Namyangju, St. Gyeongan, Uiwang, Gapyeong, St. Anseong, Pocheon. GW: Wonju, Gangneung, Chuncheon, Hwajinpo. CB: Chungju. CN: Boggeum-jeosuji, Hongseong, Jochiwon, Is. Anmyeon. JN: Gogseong, Gwangju, Wando, Hampyeong, Gurye. GB: Daegu, Gyeongsan. GN: Miryang, Busan, Namhae, Jillal-neup, Sacheon, Jinju, Jangjae-soryuji, Changnyeong, Changwon, Hadong, Haman, Daesongri-neup, Hapcheon. JJ: Bukjeju. PN: Pyeongyang. HN: Hamheung, Baegam.

SPECIMEN EXAMINED: GN: 2N (Changneong-gun Upo-neup Mokpo, 12.x.2002).

23. *Paracercion melanotum* (Selys), 1876

Jak-eun-deung-jul-sil-jam-ja-ri (작은등줄실잠자리)

Agrion (*Enallagma*) *melanotum* Selys, 1876: Synopsis des Agrionines, Add., 5: 121. [Type material: M; Type locality: China; Type deposition: Selys' collection].

Coenagrion trilineatum Navas, 1933: Mus. Heude Notes Ent. Chinoise, 9: 5.

Coenagron admirationis Navas. 1933: Mus. Heude Notes Ent. Chinoise, 9: 6.

Cercion sexlineatum Selys: Lee, 2002: J. Kor. Biota, 7: 296, (Is. Jeju-do).
Cercion melanotum (Selys): Lee, 2006: Dragon. Kor. Penin.: 10.

DISTRIBUTION: Korea, China.
KOREAN RECORDS: JJ: Jeju-do.
REMARKS: This species was recorded from Jeju-do by Lee (2002) and listed later as *Cercion melanotum* (Selys) by Lee (2006). No other Korean data are available.

24. *Paracercion plagiosum* (Needham), 1930

Keun-deung-jul-sil-jam-ja-ri (큰등줄실잠자리)

Coenagrion plagiosum Needham, 1930: Zool. Sinica, (A), 11: 268 [Type locality: China; Type deposition: unknown]; Asahina, 1989: Gekkan-Mushi, 220: 11, (Mt. Jangsu).
Cercion plagiosum (Needham): Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 58; Lee, 2001: Dragon. Kor. Penin.: 31, (Baegseog-ji Gunsan-si).
Paracercion plagiosum (Needham): Lee, 2006: 13.

DISTRIBUTION: Korea, Japan (Honshu), China (Central-Northern).
KOREAN RECORDS: JB: Gunsan. HH: Mt. Jangsu.
REMARKS: This is a rare species in Korea reported only from Jangsu-san, North Korea (Asahina, 1989) and Gunsan, Jeollabuk-do (Lee, 2001). Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

25. *Paracercion sieboldii* (Selys), 1876 (Figs. 9, 10)

Wang-deung-jul-sil-jam-ja-ri (왕등줄실잠자리)

Agrion sieboldii Selys, 1876: Synopsis des Agrionines, Add., 5: 171 [Type material: F; Type locality: Japan; Type deposition: Selys' collection]; Ris, 1916: Suppl. Ent. Berlin, 5: 33; Doi, 1932: J. Chosen Nat. Hist. Soc., 14: 69 (Seoul, Ansan).
Coenagrion sieboldi (Selys): Kirby, 1890: Syn. Cat. Neur.-Odon., London: 150.
Agrion sautery Ris, 1916: Suppl. Ent. Berlin, 5: 34 [Type material: M; Type locality: Japan; Type deposition: Deutsch. Ent. Inst.].
Cercion sieboldii (Selys): Davies and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 58.
Paracercion sieboldii (Selys): Jung, 2007: Odonata of Korea: 196, (Hoengseong-gun).

Larva: General body (Fig. 9) color yellowish brown. Head color yellowish brown. Antennae yellowish brown, 7-segmented; basal 3rd segment longest. Compound eyes black. Ocelli absent. Labium (Fig. 10A) with 5 premental seatae; palal lobe (Fig. 10B) with 6 palpal setae, a movable hook and a truncate lobe. Truncate lobe with 5 teeth; basal 2 large, lateral 3 small. Thorax yellowish brown. Legs brownish yellow with short spins; femur with two brown bands. Abdomen color yellowish brown; tergite II–VIII flatly elongated with small lateral spines and brown rectangular.

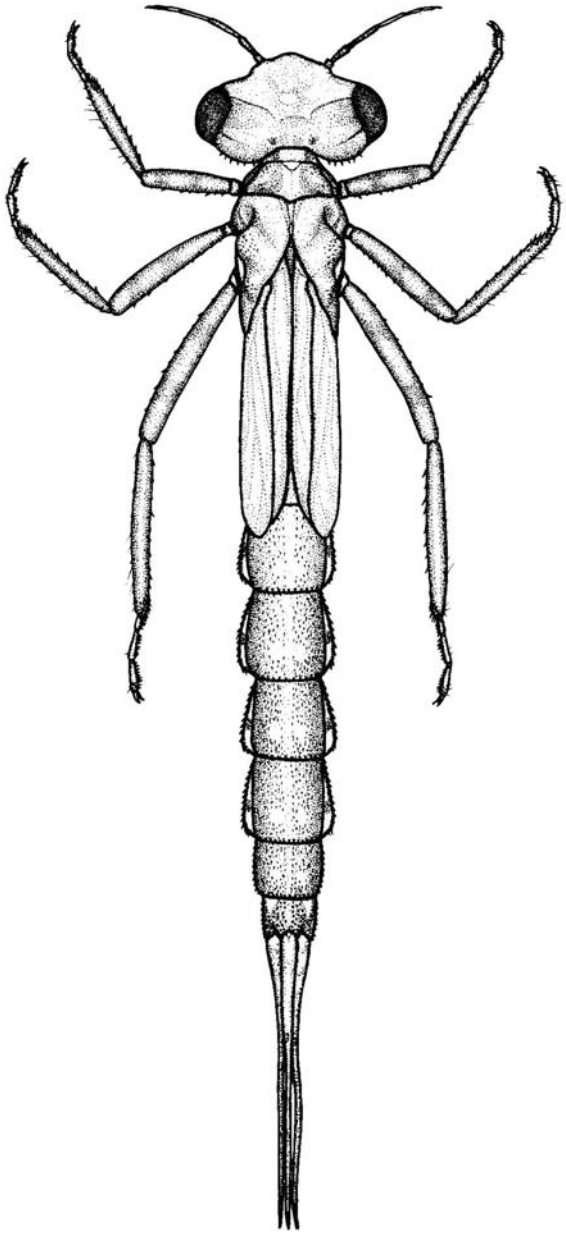

Fig. 9. *Paracercion sieboldii*, dorsal larva.

Lamellae (Fig. 10C) yellowish brown and elongated with few dark brown tracheae gathered in lateral margins. Basal lamellae with minute denticals; apex of lamellae tapering.

DISTRIBUTION: Korea, Japan, Taiwan.
KOREAN RECORDS: GG: Seoul, Ansan, Siheung. GW: Hoengseong.
SPECIMEN EXAMINED: GG: L (Siheung Joman-dong, iv.1986).
REMARKS: This species was reported from Seoul and Ansan by Doi (1932) under the name of *Agrion sieboldii*. Doi (1943), however, did not include this species in his checklist of Korean Odonata.

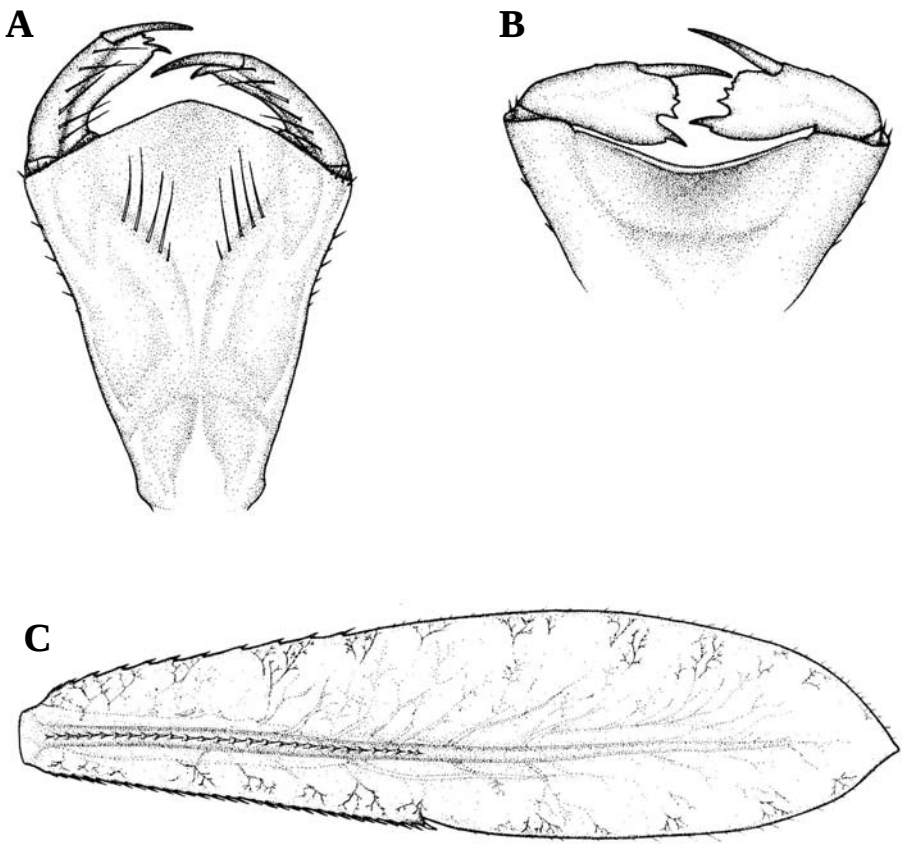

Fig. 10. *Paracercion sieboldii*. A. ventral labium; B. palpal lobe; C. lamella.

Later, Jung (2007) reported one male adult of this species from Hoengseong, Gangwon-do. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001).

26. ***Paracercion v-nigrum*** (Needham), 1930

Wang-sil-jam-ja-ri (왕실잠자리)

Coenagrion v-nigrum Needham, 1930: Zool. Sinica, (A), 11: 269 [Type material: M; Type locality: Szechwan; Type deposition: unknown].
Coenagrion barbatum Needham, 1930: Zool. Sinica, (A), 11: 270 [Type material: M; Type locality: Szechwan; Type deposition: unknown]; Asahina, 1956: Ent. Medd., 27(4−5): 219.
Agrion sieboldii Selys: Doi, 1932: J. Chosen Nat. Hist. Soc., 14: 69, (Ansan, Seoul).
Agrion v-nigrum: Doi, 1943: Ent. World, 11(110): 170, (Taeneung, Anyang, Chungju).
Cercion v-nigrum Asahina, 1956: Ent. Medd., 27(4−5): 219; Lee, 2001: Dragon. Kor. Penin.: 30, (Korea).
Leucorrhinia intermedia: Lee, 2001: Dragon. Kor. Penin.: 126, (North Korea).
Parcercion v-nigrum (Needham): Lee, 2006: 13.

Male adult: Head with little blue pattern and blue occipital stripe. Projection of superior appen-

dage thick, long and entirely black with a truncate apex. Apex of inferior appendage blunt.

Female adult: Head color black with a blue occipital stripe and paired postocular spots. Distal margin of prothorax {-shaped.

Larva: Cerci small and thin. Apex of cercus sharp.

DISTRIBUTION: Korea, China, Siberia.

KOREAN RECORDS: GG: Cheongnyangni, Ansan, Nowon, Gaeseong, Anyang, Yeoncheon, Gapyeong, Mt. Myeongji, Yangju. GW: Gangneung. CB: Chungju, Ogcheon. CN: Is. Anmyeon. JB: Gunsan. GN: Haman, Geochang, Sacheon, Jinju, Changnyeong, Upo-neup, Hapcheon, Gimhae.

SPECIMEN EXAMINED: GN: 2M [Haman-gun Upo-neup (Mar.), 5.viii.1999]; 10N (Gimhae-si Sangdong-myeon Mae-ri, 28.x.1998), GG: 2F (Yangju-gun Jangheung-myeon Ilyeong, 12.vi.1982).

Family Platycnemididae Tillyard and Fraser, 1938

Bang-ul-sil-jam-ja-ri-gwa (방울실잠자리과)

Platycnemididae Tillyard, 1938: Ausrtr. Zool., 9: 164.

The adult body of Platycnemididae is slender and medium to large in size. Body color is mostly pale yellow, with black markings. In mature males, pale areas turn blue. Head width of adult is relatively wide, approximately 3.2 times as long as wide. Wings of adult are narrowly constricted basally.

The larval body is small to medium in size. Third segment of antennae is the longest. The labium is shorter compared to other families. Median lobe of labium is neither produced nor deeply cleft. Caudal lamellae are long in comparison with body length and somewhat leaflike.

They may be found among the long grasses bordering brooks and streams. The family is distributed in the Palearctic, Oriental, and Afrotropical Regions including Madagascar and contains 2 subfamilies, 26 genera with approximately 200 species. *Copera* (2 species) and *Platycnemis* (1 species) occur in Korea.

Key to the genera and species of adult family Platycnemididae

1. Midtibiae and hindtibiae of male white and shield-shaped; prothorax swollen mesally to distally ····· *Platycnemis, P. phyllopoda*
− Midtibiae and hindtibiae of male not white or shield-shaped; prothorax not swollen ···· *Copera*, 2
2. Thorax with pale lines; abdominal tergite IX of male blue with white powder covering; abdominal tergite X of female brown with white powder covering ····· *C. annulata annulata*
− Thorax without pale line; abdominal tergite IX of male black; abdominal tergite X of female brown ····· *C. tokyoensis*

Key to the genera and species of larval family Platycnemididae

1. Body longer than 1.5 x length of lamellae ····· *Platycnemis, P. phyllopoda*
− Body shorter than 1.3 x length of lamellae ····· *Copera*, 2
2. Carina of abdominal segments VIII−IX with spines ····· *C. annulata*
− Carina of abdominal segments VIII−IX without spines ····· *C. tokyoensis*

Genus *Copera* Kirby, 1890

Ja-sil-jam-ja-ri-sok (자실잠자리속)

Copera Kirby, 1890: Syn. Cat. Neur. -Odon., London: 129.
Type species: *Platycnemis marginipes* Rambur, 1842.

Adult: Body long and slender, yellow with black markings. Pronotum lacks process at middle of posterior margin. Wings have long rectangular quadrangle; anterior side being but little longer than posterior; stigma diamond-shaped, rather heavy and covering little more than one cell. Inferior appendages much longer than superior appendages.
Larva: Body stout, robust, and conspicuously chitinized. Abdominal segment VII without lateral spines. Caudal lamellae long and relatively narrow.

DISTRIBUTION: Korea, Japan, Oriental region.

27. *Copera annulata* (Selys), 1863

Ja-sil-jam-ja-ri (자실잠자리)

Psilocnemis (*Psilocnemis*) *annulata* Selys, 1863: Synopsis des Agrionines, Add., 4: 28 [Type material: M; Type locality: Shanghai; Type deposition: Selys' Collection].
Psilocnemis (*Psilocnemis*) *ciliata* Selys, 1863: Synopsis des Agrionines, Add., 4: 29 [Type material: F; Type locality: Malacca; Type deposition: Selys' Collection].
Psilocnemis subannulata Selys, 1886; Mem. Cour. Acad. Belg., 38: 125 [Type materal: M; Type locality: India; Type deposition: Selys' Collection].
Psilocnemis annulata race *ciliate* Selys, 1886: Mem. Cour. Acad. Belg., 38: 125.
Copera annulata annulata (Selys): Kibby, 1886: Syn. Cat. Neur. -Odon., London: 129; Ris, 1916: suppl. ent. Berlin, 5:17; Ris, 1927: Zool. Meded., Leiden, 10(1): 17; Schmidt, 1931: Konowia, 10(3): 183; Lieftinck, 1934: Treubia, 14(4): 393.
Copera subannulata (Selys): Kirby, 1890: Syn. Cat. Neur. -Odon., London: 129.
Psilocnemis annulata Selys: Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 832; Ishida, 1996: Mono. Odo. Larv. Jap.: 185, (Korea).
Tseudocopera arachnoids Fraser, 1922: Mem. Dept. -Agric. India, 7: 56 [Type materal: M; Type locality: Assam; Type deposition: British Museum, London; Kimmins, 1966: Bull. Brit. Mus. Nat. Hist., 18: 179.
Copera annulata (Selys): Doi, 1943: Ent. World, 11(110): 169 (Taeneung, Changdong); Lee, 2006: 19.

DISTRIBUTION: Korea, Japan, China (Central, Western), Taiwan, India, Malaysia.
KOREAN RECORDS: GG: Nowon, Dobong, Namyangju.
REMARKS: Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

28. *Copera tokyoensis* Asahina, 1948 (Figs. 11, 12)

Keun-ja-sil-jam-ja-ri (큰자실잠자리)

Copera tokyoensis Asahina, 1948: Mushi, 18: 103 [Type materal: M, Type locality: Japan; Type deposition: Asahina's Collection]; Asahina, 1989: Gekkan-Mushi, 220: 13, (Seoul: Cheongnyangni).

Male adult: Head dark brown. Antennae dark brown. Compound eyes dark brown. Ocelli yellow. Frons dark brown. Clypeus dark brown. Labrum pale with a dark brown spot. Thorax dark brown generally; mesepisternum dark brown; mesepimeron dark brown; distal part of meta-

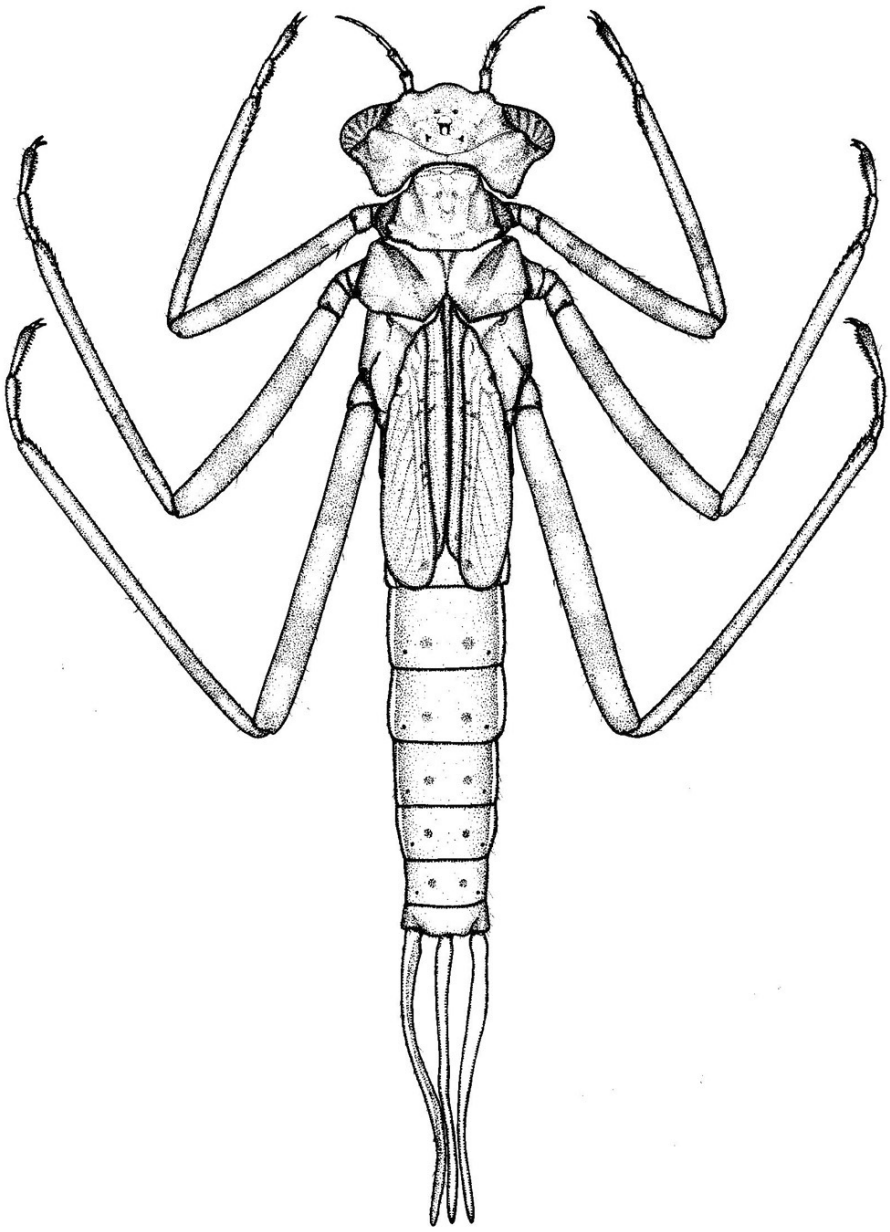

Fig. 11. *Copera tokyoensis*, dorsal larva.

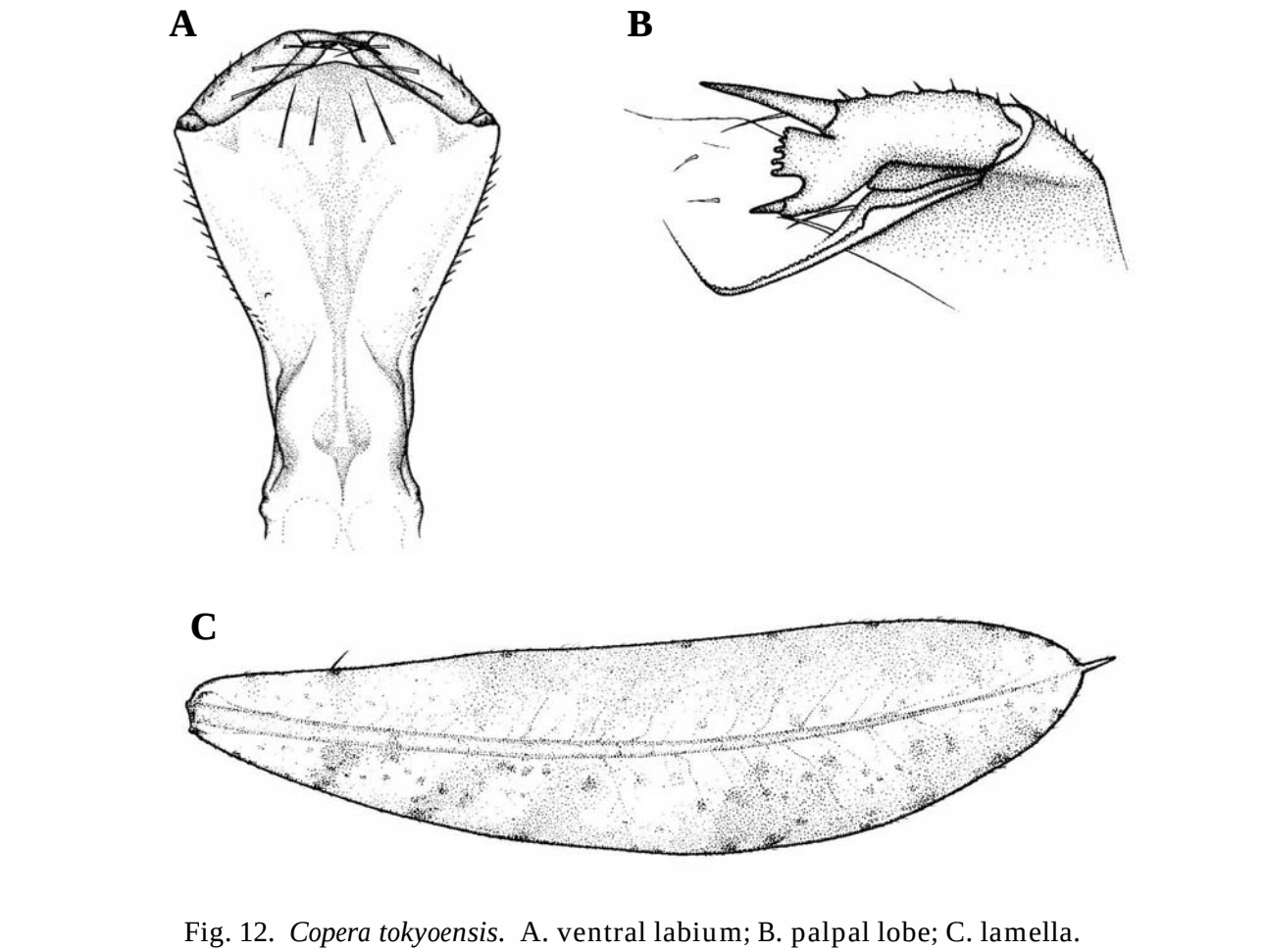

Fig. 12. *Copera tokyoensis*. A. ventral labium; B. palpal lobe; C. lamella.

pleural sulcus with a dark brown marking. Wings light brown. Prostigmas: prostigmas of forewings not overlapped with prostigmas of hindwings. Legs long with many long setae; upper part of forefemora dark brown; setae very short, dense from 3/4 length to distal margin of inner foretibiae; midtibiae and hindtibiae white, swollen. Abdomen dark brown; 3/4 length of abdominal tergite III−V with pale stripe; abdominal tergite X pale except mid part. Appendages pale; superior appendages shorter than inferior appendages, tapering; inferior appendages long, bent inward and downward; apex of inferior appendages contracted at each end.

Female adult: Head dark brown with pale pattern. Antennae dark brown. Upper part of compound eyes dark brown. Lower part of compound eyes pale. Ocelli yellow. Occiput dark brown with two small, pale postocular spots. Lower part of frons with dark brown markings. Clypeus dark brown. Labrum pale with a dark brown spot. Prothorax flat relatively; mid part of prothorax dark brown; lateral part of prothorax pale; distal margin of prothorax dark brown, convex in rectangular-shape. Mesepisternum dark brown; lateral margin of mesepisternum pale. Upper part of mesepimeron dark brown. Distal part of mesapleural sulcus pale with a dark marking. Wings light brown. Legs not swollen. Abdomen dark brown; 3/4 length of abdominal tergite III-IV with pale stripe; distal margin of abdominal tergite X raised. Genitalia pale. Anal appendages pale turned outward.

Larva: General body (Fig. 11) color brown, hairy. Body length $<$1.3 x length of lamella. Head brown. Postocular lobes protruded posteriorly with several warts. Labium (Fig. 12A) pale. Pre-

mentum with 4 setae in horizontal line. Palpal lobe (Fig. 12B) with 3 setae, movable hooks, a truncate lobe and a terminal hook. Lateral part of mesothorax with a brown process; apex of process blunt. Hindwing pads brown, extend beyond abdominal segment IV. Legs brown, long; midfemora with three dark brown stripes; hindfemora with three dark brown stripes. Abdominal segment II–IV with carina on each side; carina without setae. Cerci triangular; apex of cerci blunt. Lamellae (Fig. 12C) with long terminal filament and many dark brown spots; mid ribs of lamellae straight without branches.

DISTRIBUTION: Korea, China, Japan.
KOREAN RECORDS: GG: Cheongryang-ri, Gwangmyeong. JB: Gunsan. GN: Hapcheon.
SPECIMEN EXAMINED: GG: 1M, 1F, 1L [Gwangmyeong-si Haandong Aegineungjeosuji (Res.), 20.vi.1998].
REMARKS: This species was first reported from Cheongryang-ri, Seoul by Asahina (1989).

Genus *Platycnemis* Charpentier, 1840

Bang-ul-sil-jam-ja-ri-sok (방울실잠자리속)

Platycnemis Charpentier, 1840: Libell. Europ. Lipsiae: 21.
Type species: *Agrion lacteum* Charpentier, 1825.

Adult: Body color pale yellow, with black pigmentation present in teneral stage. In mature males, pale areas become blue or light blue. In mature females, pale areas become yellowish green. Wings with long rectangular quadrangle; pterostigmas parallelogram-shaped or slightly trapezoidal. In males, middle and hind tibiae conspicuously expanded. Abdomen short (< 35 mm); superior appendages short (slightly more than half length of inferior appendages). In females, pronotum with a flat anterior process at middle of posterior margin.
Larva: Larval body small and slender. Prementum slightly elongate, and pentagonal. Palpal setae 4. Lamella as long as body. Hinge of labium not reaching posterior margin of forecoxae. Lateral setae 4, arrange transversely in near-alignment. Legs conspicuously long; hind femora length exceeding width of head. Abdomen nearly cylindrical, with small lateral spines on segments VII–IX. Caudal lamellae long, leaf-shaped, and pointed at apices; nodes absent.

DISTRIBUTION: Afrotropical and Palearctic regions.

29. *Platycnemis phyllopoda* Djakonov, 1926 (Figs. 13, 14, Pl. 20)

Bang-ul-sil-jam-ja-ri (방울실잠자리)

Platycnemis phyllopoda Djakonov, 1926: Rev. Russ. Ent., 20:231 [Type material: M (not given); Type locality: Ussuri]; Ris, Ark. Zool. Uppsala, 21A(31): 29; Asahina, 1939c: 197, (Yusen=Yucheon; Seido=Cheongdo); Doi, 1943: 169.
Platycnemis ulmifolia Ris, 1930: Ark. Zool. Uppsala, 21A (31): 26 [Type material: M; Type locality:

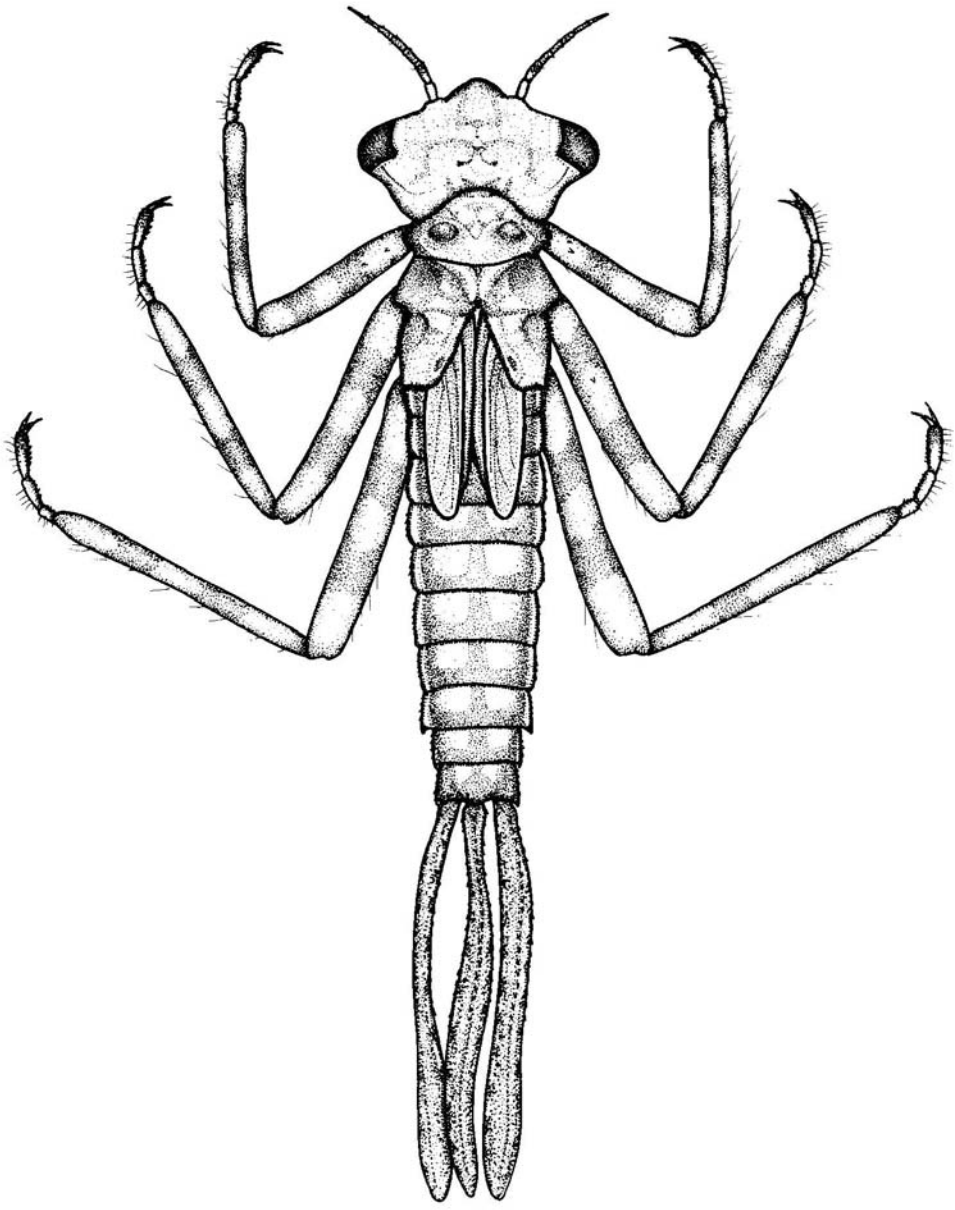

Fig. 13. *Platycnemis phyllopoda*, dorsal larva.

China; Type deposition: Naturhist. Riksmus., Stockholm].

Copera mariginipes Rambur: Doi, 1932: 69, (Seoul, Pyeongyang, Mt. Samseong, Cheongdo, Yucheon).

Platycnemis hummeli Sjostedt, 1933: Ark. Zool. Uppsala, 25A (5): 19 [Type material: M; Type locality: Szechwan; Type deposition: Naturhist. Riksmus., Stockholm].

Copera foliacea Selys: Doi, 1937: 20, (Seoul, Pyeongyang, Mt. Samseong, Cheongdo, Yucheon).

Male adult (Pl. 20): Superior appendages of *P. phyllopoda* black; apex pale and blunt; inferior appendages arched inward and downward.

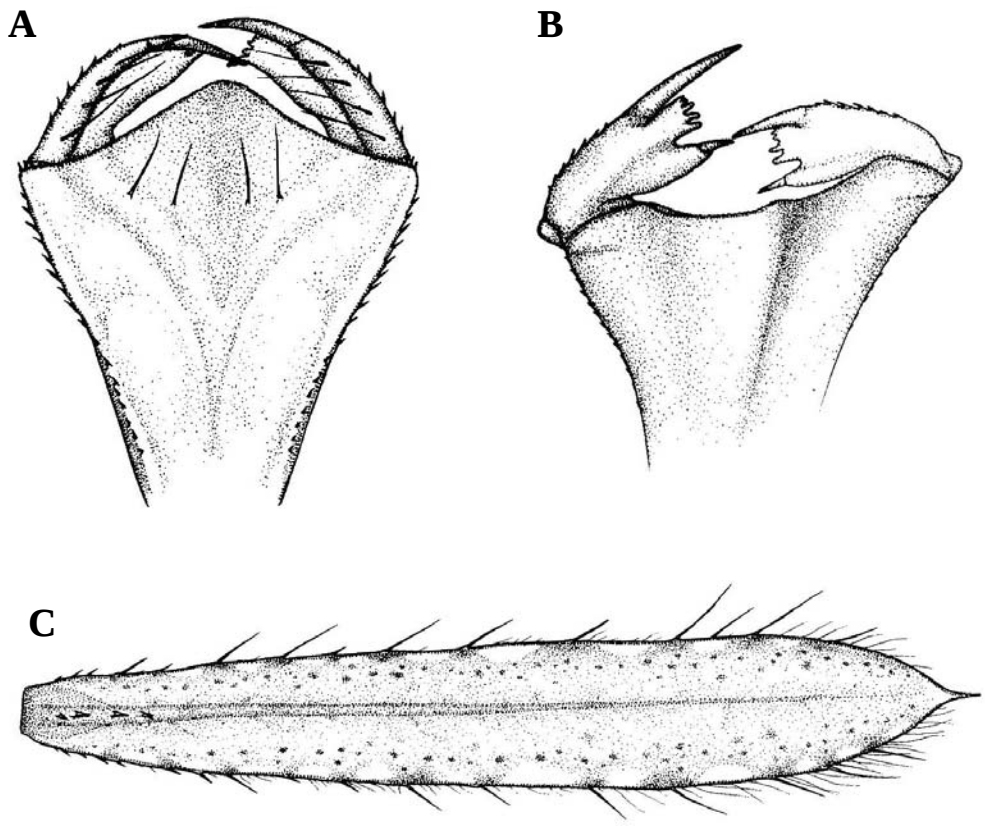

Fig. 14. *Platycnemis phyllopoda.* A. ventral labium; B. palpal lobe; C. lamella.

Female adult: Prothorax tergite greatly swollen from mesal to distal margin, with a thin process on each side.

Larva (Fig. 13): Carinae of abdominal tergite VII–IX with a lateral seta. Labium as in Fig. 14A and 14B. Lamellae (Fig. 14C) are brown and with many obscure and dark brown spots spread throughout. Distal margin blunt. Lamellae margins with many setae.

DISTRIBUTION: Korea, Japan, Manchuria, Ussuri.

KOREAN RECORDS: GG: Mt. Bukhan, Is. Weolmi, Mt. Seolseong, Anyang, Mt. Samseong, Guri, Namyangju, Yangpyeong, Yeoncheon, Gwangju, Haansamni-jeosuji, Mt. Deokam, Pocheon, Gapyeong, Suwon. GW: Mt. Chiak, Mt. Odae, Inje, Yanggu, Chuncheon, Mt. Bangtae. CB: Okcheon, Cheongju. CN: Nonsan, Daejeon, Buyeo, Mt. Gyeryong. JB: Deokjin, Gochang, Gimje, Jeonju, Buan. JN: Gokseong, Yeonggwang, Hampyeong, Gwangju. GB: Cheongdo. GN: Milyang, Busan, Haman, Geoje, Hapcheon, Mt. Jiri. JJ: Mt. Halla, Bukjeju, Namjeju, Seogwipo.

SPECIMEN EXAMINED: GN: 2N [Gimhae-Si Saengrim-myeon Najeon-ri Najeongyo (Br.), 29.x.1998], GW: 1M (Yangyang-gun Songhyeon-ri, 4.viii.1998), CN: 1F [Seosan-si Deokjicheon (St.), 20.vii.1992].

REMARKS: This species was reported in Cheongdo, Yucheon, Samseongsan (Mt.), Pyeongyang, and Seoul by Doi (1932) under the name of *Copera mariginipes* Rambur, but Doi (1937) revised the name as *Copera foliacea* Selys using the same material. Asahina (1939c) again revised the name as *Platycnemis phyllopoda* Djakonov using the same material and Doi (1943) later followed this identification. Cho (1958) repeated this identification.

Family Lestidae Needham, 1903

Cheong-sil-jam-ja-ri-gwa (청실잠자리과)

Lestidae Needham, 1903: Bull. 68 N.Y. State Mus.: 216.

The adult body of Lestidae is small to medium in size. Wings are narrowly constricted basally. Vein M3 of forewings originates closer to the arculus than to the nodus. Superior appendages of males are acutely bent inward.

The larval body at maturity is 20–29 mm excluding caudal lamellae and slender in shape. Segments of antennae are all about the same length. Labium is conspicuously long and stalklike basally. Median lobe of labium is neither produced nor deeply cleft. Caudal lamellae are somewhat leaflike, and their lateral tracheal branches are nearly at right angles to their central tracheal trunk.

They are most commonly found in small ponds, bogs, wetlands and sometimes in slow weedy streams. This family has widespread distribution throughout the world and contains 2 subfamilies, 14 genera with approximately 160 species. *Indolestes* (2 species), *Lestes* (4 species), and *Sympecma* (1 species) occur in Korea.

Key to the genera and species of adult family Lestidae

1. Body color brown or blue with black markings or lines ····· 2
− Body color metalic green, sometimes with white powder covering ····· *Lestes*, 3
2. Mesepisternm with a brown, thin oblique stripe; median part of abdominal tergite X brown; superior appendages of male incurved with blunt and thick basal teeth; distal margin of prothorax in female convex. Apicies of ovipositors blunt and with indistinct spurs from 2/3 length to apex ····· *Sympecma, S. paedisca*
− Brown pattern of mesepisternum convex with three brown markings; abdominal segment X entire pale; superior appendages with a apical tooth; distal margin of prothorax in female rounded smoothly; ovipositors of female with distinct spurs from 2/3 length to apex ····· *Indolestes, I. peregrinus*
3. Metepisternum without a metallic green marking; inferior appendages of male relatively short ···· *L. japonicus*
− Metepisternum with a metalic green marking; inferior appendages of male relatively long ····· 4
4. Metallic green marking of metepisternum reaches to metapleural sulcus; apex of superior appendages curved outward ····· *L. temporalis*
− Metallic green marking of metepisternum does not reach metapleural sulcus; superior appendages long and straight ····· *L. sponsa*

Key to the genera and species of larval family Lestidae

1. Median part of prementum extremely narrow, maximal length/minimal length in prementum above 4 ····· *Lestes*, 2
− Median part of prementum slightly narrow, maximal length/minimal length in prementum below 4 ····· 4
2. Maximal length/minimal length in prementum above 8 ····· *L. sponsa*
− Maximal length/minimal length in prementum below 6 ····· 3
3. Trucated lobe divided into two parts; inner part serrate; outer part with sharp prong ····· *L. temporalis*

– Trucated lobe divided into two parts; inner part with two sharp prongs; outer part with one sharp prong ····· *L. japponicus*

4. Maximal length / minimal length in prementum about 2.2; trucated lobe divided into two parts; inner part serrate; outer part with one sharp prong ····· *Sympecma*, *S. peadisca*

– Maximal length / minimal length in prementum about 2.9; trucated lobe divided into two parts; inner part with two sharp prongs; outer part with one sharp prong ····· *Indolestes*, *I. peregrinus*

Genus *Indolestes* Fraser, 1922

Ga-neun-sil-jam-ja-ri-sok (가는실잠자리속)

Indolestes Fraser, 1922: Mem. Dept. Agric. India, 7: 57.
Type species: *Indolestes indicus* Fraser, 1922.

Adult: Body coloration pale brown with bronze pigmentation, lacking intense metallic green coloration; In mature males, pale color is light blue instead, and in mature females, pale green. Wings conspicuously petiolate.

Larva: Body slender and relatively short. Prementum comparatively short; width of apex about 3 times that of midsection. External lobe of lateral lobe of prementum with 2 cusps; outer cusp slender and sharp; inner cusp bicuspidate. Caudal lamellae comparatively slender and bent inward.

Distribution: Oriental, Palearctic, and Australasian region.

30. *Indolestes peregrinus* (Ris), 1916 (Pls. 21–24)

Ga-neun-sil-jam-ja-ri (가는실잠자리)

Lestes gracilis peregrinus Ris, 1916: Suppl. Ent. Berlin, 5: 15 [Type material: Japan; Type locality: Japan; Type deposition: Ris' collection].
Lestes extranea Needham, 1930: Zool. Sinica, 11: 233.
Lestes gracilis extraneus Needham: Schmidt, 1931: Konowia, 10: 178.
Lestes montelli Navas, 1935: Notes Ent. Chinoise, 2: 90.
Ceylonolestes gracilis Hagen: Doi, 1943: Ent. World, 11(110): 168, (Mt. Unmun).
Ceylonolestes gracilis peregrinus (Ris): Asahina, 1948: Shin Konchu, 1(9): 340; Asahina, 1965: Odonata Ico. Ins. Jap. Hokuryukan, Tokyo, Colore Naturali Edita, 3: 218; Ishida, 1969: Ins. Life Jap., 2: 55, (Korea).
Ceylonolestes gracilis peregrina (Ris): Asahina, 1950: Odonata. Ico. Ins. Jap. Hokuryukan, Tokyo: 43, (Korea); Asahina, 1956: 55; Asahina, 1958: 55.
Ceylonolestes gracilis extraneus (Needham): Asahina, 1956: Ent. Medd., 27: 218.
Lestes (*Indolestes*) *extraneus* Needham: Lieftinck, 1960: Nova Guinea, (Zool.), 8: 141.
Lestes (*Indolestes*) *peregrinus* Ris: Lieftinck, 1960: Nova Guinea, (Zool.), 8: 141.
Indolestes extranea (Needham): Chao, 1962: I. Ibid., 11(Suppl.): 27.
Indolestes peregirnus (Ris): Hamada and Inoue, 1985: Dragonflies Jap., 2: 173, (Korea); Lee, 2006: 10.
I*ndolestes gracilis* (Hagen): Lee, 2001: Dragon. Kor. Penin., : 19, (Korea).

Male adult (Pls. 21, 23, 24): Mesepisternum with a brown convex pattern. Mesepimeron with three brown markings. Top of abdominal segment IX brown; abdominal segment X entirely pale with hollow distal margin. Superior appendages with an apical tooth, curve inward and apex touches vertically; lateral margins with dark brown spines mesally to apically. Outside of inferior appendages swollen.

Female adult (Pls. 22–24): Distal margin of prothorax smoothly rounded. Ovipositors with distinct spurs from 2/3 length to apex. Anal appendages curved inward and rather short.

Larva: Body brown, long and slender. Head brown without color pattern. Maximal length of prementum ca. 2.9 times as long as minimal length. Palpal lobes divided into three parts, inner long hook, bifid prongs, and outer long hook. Prementum usually with 5 setae. Palpal lobe with 3 setae. Lamellae with three, obscure, thin brown markings on each lateral margin. Base of lamellae slightly wide.

DISTRIBUTION: Korea, Japan, China.

KOREAN RECORDS: GG: Segeumjeong, Mt. Cheonggye, Seongbuk, Hongneung, Mt. Umyeon, Mt. Jugeum, Mt. Cheonma, Icheon, Pocheon. GW: Daegwanryeong, Mt. Chiak, Yeongwol. JB: Mt. Deokyu, Namwon, Mt. Cheonhwang. JN: Gokseong. GB: Mt. Naemyeon, Gyeongsan. GN: Mt. Yeonhwa, Mt. Odu, Masan, Mt. Waryong, Sancheong, Yangsan, Jinju, Haman, Mt. Baekun, Mt. Gaya, Hapcheon, Mt. Mangil. JJ: Namjeju.

SPECIMEN EXAMINED: JJ: 1M, 2F [Namjeju-gun Pyoseon-myeon Mulyeongari Suryeongsan (Mt.), 2.x.1999], JN: 5L (Gokseong-gun Gokseong-eup Weolbong-ri, 6.viii.1999).

REMARKS: Needham (1930) described *Lestes extranea* without referring to *Lestes gracilis* peregrinus Ris known from Japan. The Chinese and Korean specimens, including those recorded by Asahina (1956, 1969), have more or less reduced markings on the body, but as there is no essential difference in morphology. It seems reasonable to include them in a single species, *Indolestes peregrinus* (Ris).

Genus *Lestes* Leach, 1815

Cheong-sil-jam-ja-ri-sok (청실잠자리속)

Lestes Leach, 1815: in Brewster's Edinb. Encycl., 9(1): 137.

Type species: *Agrion barbara* Fabricius, 1798.

Adult: Body very elongate, dorsally metallic green or green-bronze, and yellow laterally and ventrally. Wings held obliquely upward. Legs very long and slender. Wings petioled to anal crossing or close thereto; quadrangle rather narrow and sharply pointed externally; middle fork much nearer arculus than nodus; vein M2 arising two of more cells beyond sub-nodus. Superior appendages of males conspicuously bent inward like a pair of pliers.

Larva: Body very elongate and slender with broad linear lamellae abruptly pointed, raised on a short pedicel-like joint and with a midrib indistinctly segmented. Lateral lobe of labium divided into three parts with deep notches between spine-like tops and a low serrated border in the upper notch. Three lateral setae present; two of them springing from movable hook; low median lobe with a minute closed apical cleft.

DISTRIBUTION: Cosmopolitan.

31. *Lestes dryas* Kirby, 1890

Buk-cheong-sil-jam-ja-ri (북청실잠자리)

Lestes dryas Kirby, 1890: Syn. Cat. Neur. -Odon., London: 160; Cowley, 1935: Entomologist, 68: 155; Akramovski, 1948: Zool. Zborn., Moscow, 5: 148; Morera, 1950: Inst. Esp. Ent., Madrid: 78; Fraser, 1956: R. Ent. Soc. London, 1(10): 33; Asahina, 1958: Instecta Matsum., 22: 64; Hoffmann, 1960: Archives, 27: 222; Belyshev, 1961: Fragm. Faun. Warszawa, 9(4): 37; Benedek, 1962: Reichenbachia, 11(17): 185; Steinmann, 1984: Fauna Hung., 160: 41; Ju, 1993: Lep. Mt. Baekdu, Pyeongyang: 256, (Onsupyeong).
Lestes uncatus Kirby, 1890: syn. Cat. Neur. -Odon., London: 160; Cowley, 1935: Entomologist, 68: 155.
Lestes uncatus morpha *skaloni* Belyshev and Gagina, 1960: Fragm. Faun. Warszawa, 8: 173.

DISTRIBUTION: North Korea, Japan, Russia, China.
KOREAN RECORDS: HN: Onsupeong.
REMARKS: This species was recently reported from North Korea. It is known to live in ponds with emerged hydrophytes and floating-leaved hydrophytes. No other information is available. Adult description: see Ishida et al. (1988) and Okudaira et al. (2001); larval description: see Ishida and Ishida (1985, 2005), Ishida et al. (1988), and Okudaira et al. (2001).

32. *Lestes japonicus* Selys, 1883

Jom-cheong-sil-jam-ja-ri (좀청실잠자리)

Lestes (*Lestes*) *japonicus* Selys, 1883: Ann. Soc. Ent. Belg., 27: 130 [Type material: M; Type locality: Japan; Type deposition: R. Mus., Brussels].
Lestes japonica Selys: Doi, 1943: Ent. World, 11(110): 168, (Taeneung); Cho, 1958: Hum. Sci. Korea Univ., 3: 48, (Taeneung).

Male adult: Body relatively small; Body color dull metallic green dorsally. Posterior surface of occiput and humeral suture of synthorax with narrow area colored yellowish white. Pterostigma short. Superior appendages bent inward and with a basal tooth. Inferior appendages triangular and relatively short.
Female adult: Anal appendages and ovipositors pale.
Larva: Body slender and feeble; color pale brown. Mentum relatively short and broad. Trucated lobe divided into two prongs. Abdominal segment IV with a small spine. Caudal lamellae willow leaf-like, slightly curved inward at middle and provided with 3 broad black annular markings.

DISTRIBUTION: Korea, Japan, China.
KOREAN RECORDS: GG: Nowon. CN: Boryeong, Is. Anmyeon. JB: Gochang, Gunsan. GB: Gyeongsan, Yeongcheon. GN: Jinyang, Haman, Daesongri-neup, Jillal-neup. HN: Bocheon.
SPECIMEN EXAMINED: GB: 1N (Gyeongsan-si Yeongnam University, 27.vi.1986); 1M (Gyeongsan-si Yeongnam University, 22.ix.1988); 1F (Gyeongsan-si Yeongnam University, 23.x.1990).

33. *Lestes sponsa* (Hansemann), 1823 (Figs. 15, 16)

Cheong-sil-jam-ja-ri (청실잠자리)

Agrion sponsa Hansemann, 1823: Wiede. Zool. Mag., 2(1): 159 [Type material: M; Type locality: Germany].

Agrion forcipula Charpentier, 1825: Horae Ent., Paris: 6 [Type material: M; Type locality: Europe; Type deposition: Halle Museum]; Selys, 1862: Synopsis des Agrionines, Add., 2: 17.

Lestes sponsa (Hansemann): Selys, 1840: Monogr. Libell. Europ., Paris: 140; Selys and Hagen, 1850:

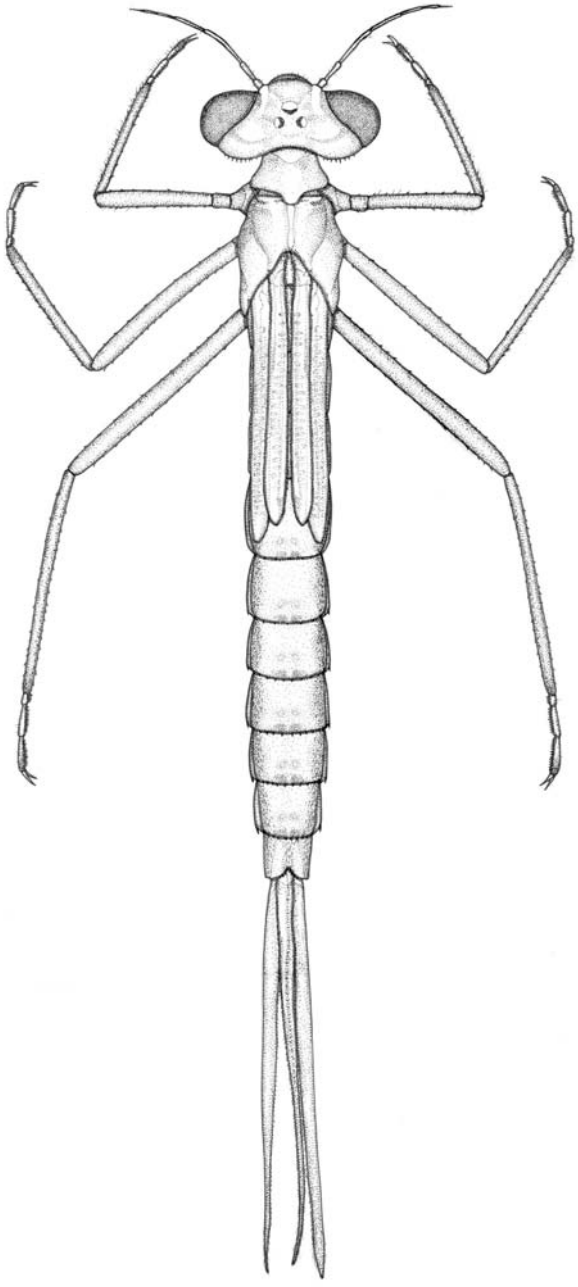

Fig. 15. *Lestes sponsa*, dorsal larva.

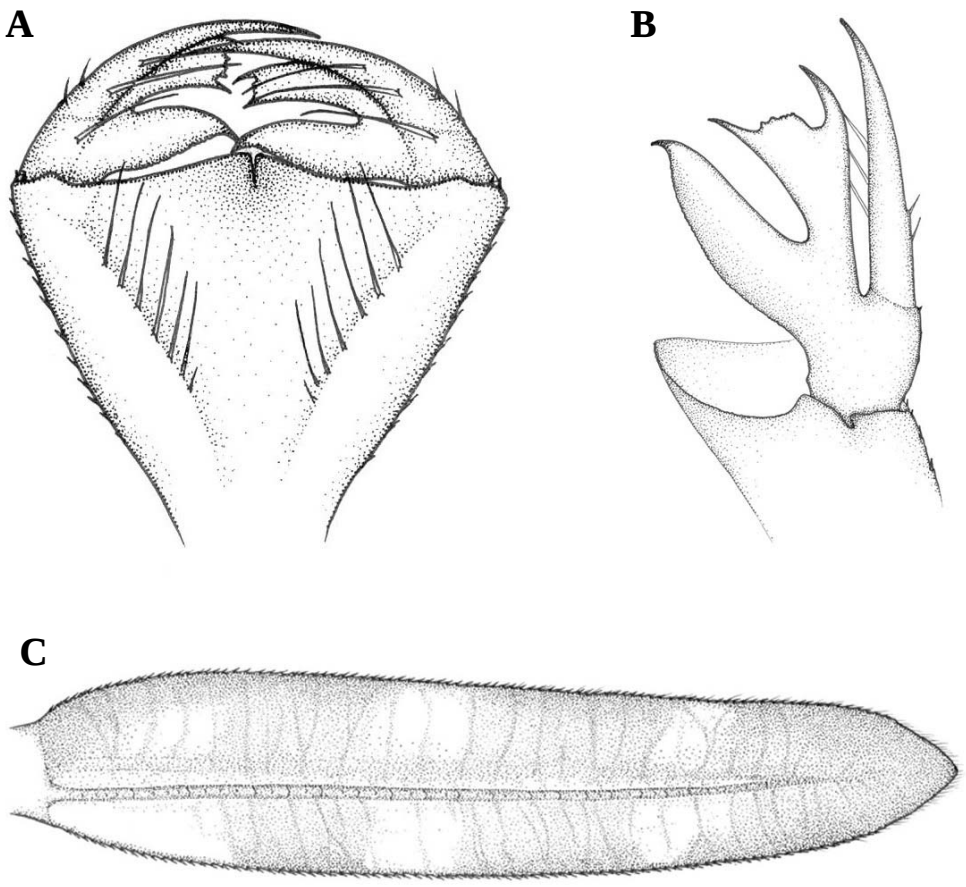

Fig. 16. *Lestes sponsa*. A. ventral labium; B. palpal lobe; C. lamella.

Revue des Odonates, Paris: 154; Kirby, 1890: Syn. Cat. Neur. Odon., London: 160; Doi, 1936: J. Chosen Nat. Hist. Soc., 21: 106, (Seoul); Nielsen, 1940: Mem. Soc. Ent. Ital., 19: 238; Akramovski, 1948: Zool. Zborn., Moscow, 5: 149; Morera, 1950: Inst. Esp. Ent., Madrid: 77; Fraser, 1956: R. Ent. Soc. London, 1(10): 33; Asahina, 1958: Insecta Matsum., 22: 65; Hoffmann, 1960: Archives, 27: 223; Benedek, 1968: Reichenbachia, 11(17): 185; Steinmann, 1984: Fauna Hung., 160: 41.

Agrion (*Anapetes*) *forcipula* Charpentier: Charpentier, 1840: Libell. Europ. Lipsiae: 24.

Agrion spectrum Kolenati, 1856: Bull. Mosc., 29(4): 501 [Type material: M; Type locality: Russia]; Selys, 1862: Synopsis des Agrionines, Add., 2: 17.

Lestes (*Lestes*) *sponsa* (Hansemann): Selys, 1862: Synopsis des Agrionines, Add., 2: 17.

Anapetes forcipula (Charpentier): Cowley, 1934: Entomologist, 67: 250.

Male adult: Body medium-sized. Body color dull metallic green dorsally. Pterostigma about 3 times as long as wide. Inferior appendages almost straight.

Female adult: Ovipositor may extend slightly beyond apex of abdominal segment X.

Larva: Body (Fig. 15) length 14−22 mm, lamella length 8.64−10 mm. General body color light brown. Head color light brown, laterally elongated. Antennae light brown, as long as head width, 7 segmented. Compound eyes black. 3 Ocelli. Labium (Fig. 16A) 3 times as long as wide. 7 pre-

metal seatae on each side of prementum: inner one shortest. Palpal setae 3: 2 in movable hook, 1 in palpal lobe (Fig. 16B). Truncate lobe denticulated with one long sharp terminal hook. Thorax light brown and thin. Wing pad parallel along midline. Legs light brown; femur with one brown band. Abdomen light brown: tergite V–IX with lateral spines. Lamellae (Fig. 16C) light brown and elongated, with 3 broad irregular brown stripes.

DISTRIBUTION: Korea, Japan, Europe (Russia, Italy, Afghanistan, Austria, Belgium, Burgaria, Switzerland, China, Czechoslovakia, German, Denmark, Algeria, Spain, Finland, France, United Kingdom, Greece, Hungary, Iran, Ireland, Liechtenstein, Luxembourg, Netherlands, Norway, Poland, Romania, Sweden, Tunisia, Turkey).

KOREAN RECORDS: GG: Seoul. HB: Samjiyeon, Gwangmo-bong, Bukgyesu, Daetaek. HN: Yeongha, Hyesan, Bocheon.

SPECIMEN EXAMINED: GB: 1N (Sungju-gun Chojeon-myeon Sungju golf club, 17.vi.2004).

34. *Lestes temporalis* Selys, 1883

Keun-cheong-sil-jam-ja-ri (큰청실잠자리)

Lestes temporalis Selys, 1883: Ann. Soc. Ent. Belg., 27: 129 [Type material: M; Type locality: Japan; Type depositon: Selys' Collection]; Jacobson and Bianki, 1905: Pryam. Lozhnos. Ross. Imp.: 808; Ris, 1916: Supple. Ent. Berlin, 5: 11; Belyshev, 1973: The Dragonflies of Siberia, 1(2): 511; Lee, 2002: J. Kor. Biota, 7: 205, (Seolak, Gyeonggi-do).

Male adult: General body color metallic green. Head metallic brown without postocular spot; antennae metallic brown; compound eyes brown; ocelli pale; frons metallic brown; clypeus metallic brown; labrum blue. Thorax metallic green; prothorax metallic green; mesepisternum metallic green; mesepimeron metallic green; metepisternum pale with a metallic green markings on distal margin. Wings hyaline; wing vein metallic green; prostigmas of forewings brown between 17th postnodus and 18th postnodus; prostigmas of hindwings brown between 14th postnodus and 15th postnodus; prostigmas of forewings overlap with prostigmas of hindwings. Abdominal tergite I–IX metallic green; abdominal tergite VIII and IX swollen; lateral part of abdominal tergite IX with two pale spots; abdominal tergite X with white powder covering. Superior appendages dark brown with distinct basal teeth on inner margin, bent inward. Inferior appendages dark brown; apex of inferior appendages curved outward.

Female adult: Abdominal segments VIII–IX expanded and fringed with black markings. Ovipositor relatively large.

Larva: Body slender and feeble; color pale brown or yellowish brown, but usually greenish yellow in live specimens. Mentum relatively broad and short; Lateral setae 3 (2 situated on movable hook). Caudal lamellae willow leaf-like, slightly curved inward at middle, and with 3 broad black belts.

DISTRIBUTION: Korea, Japan, Russia.

KOREAN RECORDS: GW: Mt. Seolak. GN: Mt. Jiri.

SPECIMEN EXAMINED: GN: 1M [Sancheong Jirisan (Mt), 15.ix.2000].

Genus *Sympecma* Burmeister, 1839

Mug-eun-sil-jam-ja-ri-sok (묵은실잠자리속)

Sympecma Burmeister, 1839: Handb. Ent., 2: 824.
Type species: *Agrion phallatum* Charpentier, 1825.

Adult: Body coloration pale brown with bronze pigmentation, lacking intense metallic green coloration. Wings conspicuously petiolate; pterostigma distinctly situated farther from apex in hindwings than in forewings.

Larva: Body slender and somewhat short. Mentum short and triangular (apex less than twice as wide as middle). Caudal lamellae long, oval, and not bent inward.

Distribution: Palearctic region.

Remarks: This genus comprises three known species which occur throughout Europe and Asia. Only one species is recorded in Korea.

35. *Sympecma paedisca* (Brauer), 1877

Muk-eun-sil-jam-ja-ri (묵은실잠자리)

Agrion paedisca Eversmann, 1836: Bull. Mosc., 9: 247 [Type material: M; Type locality: South Russia; Type deposition: unknown, perhaps undesignated in Zool. Inst. Mus. Acad. Scil, St. Petersburg].
Sympecma paedisca (Eversmann): Brauer, 1880: Verh. Zool. -Bot. Ges. Wien., 30: 231; Fudakowski, 1930: Fragm. Faun. Mus. Zool. Polon., 1: 193; Davids and Tobin, 1984: The Dragonflies of the World, Utrecht, 1: 38; Asahina, 1939: Kontyu, 13(5, 6): 197, (Ranan=Nanam, Keizantin=Hyesanjin, Kaizyo=Gaeseong, Kokai=Ganggye).
Sympecma fusca Linden: Doi, 1932: J. Chosen Nat. Hist. Soc., 14: 69, (Pyeongyang, Mt. Jeongbang, Baek-bong, Mt. Samseong, Cheongdo, Yucheon).
Sympecma paedisca paedisca (Eversmann): Hamada and Inoue, 1985: Dragonflies Jap., 2: 172 (Korea).
Sympecma striata st. Quentin: Tsuda, 1991: Dist. List World Odonata, Osaka: 64, (Korea).
Psilocnemis annulata Selys: Ishida, 1996: Mono. Odo. Larver Jap.: 172, (Korea).

Male adult: Mesepisternm with a brown, thin and oblique stripe. Median part of abdominal tergite X brown, lateral margin pale. Superior appendages curved inward, with blunt and thick basal teeth, connected at apex. Inferior appendages small.

Female adult: Distal margin of prothorax convex. Apex of ovipositors blunt; ovipositors with indistinct spurs 2/3 part to apex. Anal appendages long and not curved.

Larva: Maximal length of prementum ca. 2.2 x as long as minimal length. Palpal lobes divided into moveable, hook, a trucated lobe and a terminal hook. Trucated lobe divided into two parts; inner part with a sharp prong and outer part serrate. Prementum usually with 6 setae. Palpal lobe with 3 setae. Lamellae with 3 obscure brown bends.

Distribution: Korea, Japan, China (Northern), Russia, Mongolia, Europe (Italy, Austria, Switzerland, Czechoslovakia, German, France, Hungary, Netherlands).

KOREAN RECORDS: GG: Seodaemun, Anyang, Yangpyeong, Incheon, Geochang, Yongin, Mt. Cheonma, Paju, Mt. Chungnae, Pocheon, Gaeseong, Yangju, Namyangju, Mt. Aengmu, Mt. Myeongji, Ganghwa. GW: Inje, Yanggu, Hoengseong, Hwacheon, Mt. Seolak, Chuncheon, Yeongweol, Mt. Chiak, Mt. Daeam, Jeongseon, Mt. Odae, Hongcheon, Mt. Palbong, Baekbong. CB: Mt. Sokri, Okcheon, Cheongju. CN: Mt. Hodang. JB: Muju. JN: Jindo. GB: Dalseong, Mt. Juwang, Mt. Hwanghak, Cheongdo, Dongchun. GN: Mt. Sanseong, Milyang, Mt. Jiri, Mt. Naemyeon, Sancheong, Jinju, Hadong, Mt. Imyeong, Mt. Hwangmae. PB: Jungganjin, Ganggye. PN: Pyeongyang. HB: Juheul, Yeonsang, Nanam. HN: Bocheon, Hyesanjin. HH: Mt. Jeongbang.

SPECIMEN EXAMINED: GW: 8M, 8F [Inje-gun Buk-myeon Wontong-ri Seohodong Seohogyo (Br.), 28.vi.2000]; 1M, 1F (Yanggu-gun Haean-myeon Wolsan-ri Talmulgol, 21.vi.2000).

Zygoptera Species Excluded from the Korean Fauna

36. *Calopteryx cornelia* Selys, 1853

Il-bon-mul-jam-ja-ri (일본물잠자리)

Calopteryx cornelia Selys, 1853: Bull. Acad. R. Belg., 20 (Annexe): 15; Lee, 2001: 13; Jung, 2007: 170.
Agrion cornelis (Selys): Ju, 1969: 6.

REMARKS: This species was listed in the North Korean Odonata checklist by Ju (1969) and Lee (2001) and Jung (2007) cited the checklist. Jung (2010) exluded this species from the Korean Odonata fauna. This species is known endemic to Japan.

37. *Agriocnemis pygmaea* Rambur, 1842

Kko-ma-sil-jam-ja-ri (꼬마실잠자리)

Agriocnemis pygmaea Rambur, 1842: Histoire naturelle des insectes. Névroptéres. Roret. Paris: 278; Kim, 1998: 20, (misidentification).

REMARKS: This tiny damselfly (adult body length 9–15 mm) is distributed in the tropical and subtropical Oriental region and Australia. Its Korean distribution (Kim, 1998) has not been verified by any authors. This species was excluded from the Korean Odonata fauna by Yum et al. (2010).

38. *Platycnemis foliacea sasakii* Asahina, 1949

Bang-pae-sil-jam-ja-ri (방패실잠자리)

Platycnemis foliacea sasakii Asahina: Cho, 1969: 896; Ju, 1969: 7; Komiya, 1971: 65; Yoon and Kong, 1988: 217; Jung, 2007: 255.
Platycnemis foliacea Selys: Hong, 1991: 54; Kim, 1998: 68.

REMARKS: Cho (1969) recorded this species from Korea with description and illustration, but did not provide material or locality data. This species has often been confused with *Platycnemis phyllopoda* Djakonov (see Remarks in *Platycnemis phyllopoda* Djakonov, above), but no collecting material data have been provided by the authors. Jung (2010) excluded this species from the Korean Odonata fauna. This subspecies is known endemic to Japan.

39. *Lestes hanllimensis* Kim, 1998

Hal-lim-cheong-sil-jam-ja-ri (한림청실잠자리)

Lestes hanllimensis Kim, 1998: 80 [Holotype: Male, Jeollabuk-do, Okku, Hanllim Lake].

REMARKS: This species is not morphologically distinguished from other congeners such as *L. temporalis* Selys. This species is regarded as *nomen dubium*.

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Plates

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