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Limoniinae crane flies (Diptera: Limoniidae) new to Korea

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Korean species of *Achyrolimonia* Alexander, 1965, *Discobola* Osten Sacken, 1865, *Elephantomyia* Osten Sacken, 1860, *Geranomyia* Haliday 1833, *Helius* Lepeletier and Serville, 1828 (in Latreille *et al*., 1833), *Libnotes* Westwood, 1876 and *Trentepohlia* Bigot, 1854 crane flies (Diptera: Limoniidae) are taxonomically revised. Genera *Elephantomyia* and *Trentepohlia*, subgenus *Libnotes* (*Afrolimonia*) Alexander, 1965, species *Achyrolimonia basispina* (Alexander, 1924), *Geranomyia multipuncta* Alexander, 1922, *Helius* (*Helius*) *nipponensis* (Alexander, 1913), *Libnotes* (*Libnotes*) *amatrix* (Alexander, 1922), *L.* (*L.*) *longistigma* Alexander, 1921, and *L.* (*L.*) *puella* Alexander, 1925 are new records for the Korean peninsula. Genera *Discobola* Osten Sacken, 1865, *Geranomyia* Haliday, 1833 and *Libnotes* Westwood, 1876 are new records for South Korea. Identification keys, redescriptions and illustrations of all species and both sexes, if they were found in Korea, are presented.

Keywords: *Achyrolimonia*, *Discobola*, *Elephantomyia*, *Geranomyia*, *Helius*, *Libnotes*, North Korea, South Korea, *Trentepohlia*

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Introduction

The investigation of Limoniinae (Diptera: Limoniidae) crane flies on the Korean Peninsula was started by the authors of this publication in 2012. Since then specimens are collected each season in different localities, at different times and using different methods throughout the country. The aim of the study is to document, redescribe, illustrate and prepare keys for all Korean species. This publication is continuation of our previous works on Limoniinae crane flies from the Korean Peninsula (Podenas and Byun, 2013; 2014a; 2014b; Podenas *et al*., 2014; 2015). It covers crane flies belonging to genera *Achyrolimonia* Alexander, 1965, *Discobola* Osten Sacken, 1865, *Elephantomyia* Osten Sacken, 1860, *Geranomyia* Haliday 1833, *Helius* Lepeletier and Serville, 1828, *Libnotes* Westwood, 1876 and *Trentepohlia* Bigot, 1854. Genera *Elephantomyia*, *Trentepohlia* and subgenus *Libnotes* (*Afrolimonia*) Alexander, 1965 are new records for the Korean peninsula. Genera *Discobola* Osten Sacken, 1865, *Geranomyia* Haliday, 1833 and *Libnotes* Westwood, 1876 are new records for South Korea.

Despite many of these species were described previously, most of them were known only from type specimens and one of the sexes remained unknown. Some species were known only from original descriptions and no illustrations were available. Males of *Geranomyia neavocetta* (Alexander, 1938) and *Trentepohlia* (*Trentepohlia*) *septentrionalis* Alexander, 1921, females of *Discobola margarita* Alexander, 1924, *Geranomyia multipuncta* Alexander, 1922, *Trentepohlia* (*Mongoma*) *pennipes* (Osten Sacken, 1888) are described and illustrated for the first time. Terminalia for both sexes of *Libnotes* (*Libnotes*) *basistrigata* (Alexander, 1934) and *L.* (*L.*) *puella* Alexander, 1925, ovipositors of *Helius* (*Helius*) *nipponensis* (Alexander, 1913), *Libnotes* (*Libnotes*) *amatrix* (Alexander, 1922), *L.* (*L.*) *longistigma* Alexander, 1921, *L.* (*L.*) *nohirai* Alexander, 1918 are illustrated for the first time.

Materials and Methods

Crane fly specimens for this paper (Table 1), collected in northern Korea in 1933 by J. Masaki, in 1937-

Table 1. Collecting sites in Korea.

Locality	Year	Method	Collector	N*	E*
N. Korea, Mt. Congo (now, Gangwon-do, Goseong-gun, Mt. Geumgangsan)	1933	Net	J. Machida	38.65713	128.10167
N. Korea, Ompo (now called Onbo, Hamgyeongbuk-do, Gyeongsung-gun)	1937-1938	Net	A. M. Yankovsky	41.51357	129.57812
N. Korea, Seren Mts. (Hamgyeongbuk-do, Gyeongsung-gun)	1937-1938	Net	A. M. Yankovsky	41.68730	129.30918
N. Korea, Kankyo Nando, Puksu Pyaksan (now, Yanggang-do, Pungseo-gun, Mt. Buksubaeksan)	1939	Net	A. M. Yankovsky	40.69985	127.71601
N. Korea, Chonsani (Yanggang-do, Daehongdan-gun)	1940	Net	A. M. Yankovsky	41.99360	128.75250
N. Korea, Pontani Paiktusan (Mt. Baekdusan)	1940	Net	A. M. Yankovsky	42.00670	128.10650
S. Korea, #14, Oho-ri, east coast (Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri)	1954	Net	G. W. Byers	38.33334	128.50000
S. Korea, #18, Central Nat'l. Forest, 18 mi. NE Seoul (Gyeonggi-do, Namyangju-si, Sudong-myeon, Naebang-ri)	1954	Net	G. W. Byers	37.74813	127.29364
S. Korea, #20, 2 mi. S Pup'yong-ni, 16 mi. NE Seoul (Gyeonggi-do, Namyangju-si, Jinjeop-eup, Jinbeol-ri)	1954	Net	G. W. Byers	37.74075	127.22069
S. Korea, #22, Central Nat'l. Forest, 18 mi. NE Seoul (Gyeonggi-do, Namyangju-si, Sudong-myeon, Naebang-ri)	1954	Net	G. W. Byers	37.74813	127.29364
S. Korea, #32, Cheju-do, Chungmun-ni [Cheonjeyeon] waterfall, 10 mi. E Mosulp'o (Jeju-do, Seowipo-si, Jungmun-dong, Cheonjeyeon falls)	1954	Net	G. W. Byers	33.25071	126.41655
S. Korea, #33, Cheju-do, Sogwi-ri [Seogwipo-si], [Cheonjiyeon] waterfall, 18 mi. E Mosulp'o (Jeju-do, Seogwipo-si, Cheonji-dong, Cheonjiyeon falls)	1954	Net	G. W. Byers	33.24707	126.55456
S. Korea, #37 and #38, Hill 1468, 16 mi. NW Chunchon (Gyeonggi-do, Gapyeong-gun, Buk-myeon, Mt. Hwaak-san)	1954	Net	G. W. Byers	38.00000	127.50000
Korea	1959	Trap	Davis		
S. Korea, Pusan (Busan-si, Yeongje-gu)	1959	Trap	Davis	35.17834	129.07116
S. Korea, Gangwon-do, Pyeongchang-gun, Yongpyeong-myeon, Nodong-ri, Mt. Gyebangsan	2008	Malaise trap	J.D. Yeo *et al.*	37.69775	128.47627
S. Korea, Gyeongsangbuk-do, Cheongdo-gun, Unmun-myeon, Sinwon-ri, Mt. Ulmunsan	2009	Malaise trap	J. D. Yeo, J. D. Yoon	35.6532778	129.0256111
S. Korea, Ulsan, Ulju-gun, Sangbuk-myeon, Deokhyeon-ri, Mt. Gajisan	2009	Malaise trap	J. D. Yeo	35.62150	129.04722
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Jangjeon-ri, Mt. Gariwangsan	2009	Malaise trap	W. Y. Choi	37.48778	128.54528
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Topdong-ri, Odaesan National Park	2012	Malaise trap, flight interception trap	S.-J. Park, I.-J. Hur	37.72722	128.55222
S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley	2012	Net	S. Podenas	35.26137	127.60302
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Woljeongsa, Odaesan National Park	2012	Net	S. Podenas	37.73920	128.59398
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan National Park	2012	Net	S. Podenas	37.74767	128.57962
S. Korea, Gangwon-do, Samcheog, Wondeok-eup, Wolcheon-ri	2012	Net	S. Podenas	37.14899	129.35933
S. Korea, Yeosu environs, Manheung-dong, Manseong-ri Black Sand Beach	2012	Net	S. Podenas	34.78094	127.74765
S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol valley	2012	Net	S. Podenas	35.26586	127.58090
S. Korea, Gyeonsangnam-do, Goseong-gun, Guman-myeon, Masan-Shi	2012	Net	C. L. Young	35.07756	128.36700
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan NP, St. 1	2013	Malaise trap	Park S.-J., Oh S.-B.	37.71822	128.54175

Table 1. Continued.

Locality	Year	Method	Collector	N*	E*
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan NP, St. 2	2013	Malaise trap	S.-J. Park, S.-B. Oh	37.76583	128.57727
S. Korea, Gyeongsangnam-do, Hadong-gun, Hwagae-myeon, Beomwang-ri	2013	Net	S. Podenas, H.-W. Byun	35.27655	127.61796
S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naedong-ri	2013	Net	S. Podenas	35.26580	127.58128
S. Korea, Jeollabuk-do, Namwon-si, Sannae-myeon, Ipseok-ri	2013	Net	S. Podenas	35.41021	127.64735
S. Korea, Gyeongsangnam-do, Hamyang-gun, Macheon-myeon, Samjeong-ri	2013	Net	S. Podenas	35.36713	127.65228
S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri	2014	Net	S. Kim	38.02982	127.44310
S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Hwaak-ri	2014	Net	S. Kim, S. Podenas	37.99363	127.52102
S. Korea, Gangwon-do, Chuncheon-si, Dongsan-myeon, Bongmyeong-ri, KNU experimental forest	2014	Net	S. Podenas, S. Kim	37.77906	127.81564
S. Korea, Gangwon-do, Hongcheon-gun, Nae-myeon, Yuljeon-ri	2014	Net	S. Kim, S. Podenas	37.73849	128.34566
S. Korea, Gangwon-do, Hwacheon-gun, Sanae-myeon, Gwangdeok-ri	2014	Net	S. Podenas	38.09749	127.44653
S. Korea, Gangwon-do, Pyeongchang-gun, Yongpyeong-myeon, Nodong-ri	2014	Net	S. Kim, S. Podenas	37.70303	128.48302
S. Korea, Gangwon-do, Pyeongchang-gun, Daegwallyeong-myeon, Byeongnae-ri, Odaesan NP	2014	Net	S. Kim, S. Podenas	37.74414	128.61679
S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Jangjeon-ri (Moss valley)	2014	Net	S. Kim, S. Podenas	37.47153	128.54305
S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley	2013-2014	At light	S. Podenas	35.26590	127.58096
S. Korea, Jeollabuk-do, Buan-gun, Byeosan-myeon, Daehang-ri, Byeonsanbando National Park, Jiksocheon	2014	Net	S. Podenas	35.67249	126.56445
S. Korea, Gyeongsangnam-do, Masanhappo-gu, Jindong-myeon, Dagu-ri	2014	Net	S. Podenas	35.113086	128.530671
S. Korea, Jeollabuk-do, Buan-gun, Byeosan-myeon, Seokpo-ri, Byeonsanbando National Park, Jikso falls	2014	Net	S. Podenas	35.62675	126.57020
S. Korea, Jeollabuk-do, Buan-gun, Boan-myeon, Udong-ri, Byeonsanbando National Park, Seonggye falls	2014	Net	S. Podenas	35.62864-35.62896	126.63441-126.63461
S. Korea, Gyeongsangnam-do, Changwon-si, Jindong-myeon, Yusan-ri, environs of Masan	2014	Net	S. Podenas	35.12904	128.57147
S. Korea, Gyeongsangnam-do, Geoje-si, Nambu-myeon, Dapo-ri	2014	Net	S. Podenas	34.71542	128.62286
S. Korea, Gyeongsangnam-do, Geoje-si, Nambu-myeon, Toppo-ri	2014	Net	S. Podenas	34.75844	128.61429
S. Korea, Gyeongsangnam-do, Geoje-si, Dongbu-myeon, Osong-ri	2014	Net	S. Podenas	34.77900	128.57968
S. Korea, Gyeongsangnam-do, Changwon-si, Masanhappo-gu, Jindong-myeon, Dagu-ri	2014	Net	S. Podenas	35.11149	128.53142
S. Korea, Gyeongsangnam-do, Changwon-si, Masanhappo-gu, Jindong-myeon, Dagu-ri	2014	Net	S. Podenas	35.11309	128.53067

*Coordinates for old collecting sites are approximate.

1940 by A. Yankovsky and in South Korea in 1959 by Davis, as well as specimens from Japan and China, were obtained from the collections of the Smithsonian Institution of the United States National Museum (USNM), Washington DC, USA. Crane flies collected in South Korea in 1954 by Dr. G. W. Byers were obtained from the Kansas University (KU), USA. Specimens, collected after 2008 in South Korea by different researchers including authors, are from the collections of the National Institute of Biological Resources (NIBR), Kangwon National University (KNU), South Korea. These specimens are deposited at NIBR. Specimens from Lithuania are kept at the Zoological Museum of Vilnius University (VU), Lithuania.

Adult crane flies were collected by insect net, with Malaise traps, with flight interception traps, or by light. Some specimens were preserved dry in envelopes in the field and were mounted on their side on a paper point with legs generally surrounding the insect pin at the laboratory. Other specimens were preserved in 96% ethanol. Later specimens were slide mounted, genitalia of males and ovipositors of females were cleared overnight in approximately 10 percent KOH and preserved in microvials filled with glycerol on separate pins. Adult specimens were studied with Olympus SZX10 dissecting microscope. Photographs were taken with digital camera (Canon EOS 70D) attached on the dissecting microscope.

Terminology of adult morphological features generally follows that of McAlpine *et al*. (1981).

General distribution of species is given according to Oosterbroek (2015).

Check list of Korean Limoniinae crane flies belonging to genera *Achyrolimonia*, *Discobola*, *Elephantomyia*, *Geranomyia*, *Helius*, *Libnotes* and *Trentepohlia*

Achyrolimonia basispina (Alexander, 1924).
Achyrolimonia neonebulosa (Alexander, 1924).
Discobola annulata (Linnaeus, 1758).
Discobola margarita Alexander, 1924.
Elephantomyia (*Elephantomyia*) edwardsi Lackschewitz, 1932.
Geranomyia gifuensis Alexander, 1921.
Geranomyia multipuncta Alexander, 1922.
Geranomyia neavocetta (Alexander, 1938).
Helius (*Helius*) *gracillimus* Alexander, 1938.
Helius (*Helius*) *nipponensis* (Alexander, 1913).
Helius (*Helius*) *obliteratus* (Alexander, 1920b).
Helius (*Helius*) *polionotus* Alexander, 1938.
Libnotes (*Afrolimonia*) *ladogensis* (Lackschewitz, 1940) (in Lackschewitz and Pagast, 1940).
Libnotes (*Libnotes*) *amatrix* (Alexander, 1922).
Libnotes (*Libnotes*) *basistrigiata* (Alexander, 1934).
Libnotes (*Libnotes*) *longistigma* Alexander, 1921.
Libnotes (*Libnotes*) *nohirai* Alexander, 1918.
Libnotes (*Libnotes*) *puella* Alexander, 1925.
Trentepohlia (*Mongoma*) *pennipes* (Osten Sacken, 1888).
Trentepohlia (*Trentepohlia*) *septemtrionalis* Alexander, 1921.

***Achyrolimonia* Alexander, 1965**
(characteristic in Podenas and Byun, 2014a)

Key to Korean species of the genus *Achyrolimonia* Alexander, 1965

− Wing (Fig. 1A) with distal margin of discal cell (*D*) angulated: basal deflection of M_3 situated distinctly before cross-vein *m-m*. Wing distinctly darkened with very dark and distinct spots. Inner gonostylus of male genitalia oval, bearing long and narrow rostral prolongation armed with single subbasal spine (Fig. 1C)····· ····· *Achyrolimonia basispina* (Alexander, 1924)
− Wing with distal margin of discal cell (*D*) symmetrical: basal deflection of M_3 situated at same level as cross-vein *m-m*. Wing yellowish with brownish spots. Inner gonostylus of male genitalia consists of two lobes, rostral prolongation wide and unarmed····· ·····*Achyrolimonia neonebulosa* (Alexander, 1924)

***Achyrolimonia basispina* (Alexander, 1924)**
Limonia basispina Alexander, 1924: 554.
Limonia (*Limonia*) *basispina*: Alexander, 1954: 282.
Dicranomyia (*Achyrolimonia*) *basispina*: Savchenko and Krivolutskaya, 1976: 131; Savchenko, 1983: 125.
Achyrolimonia basispina: Oosterbroek, 2015.

General coloration dark brown. Body length of male 8.1 mm. Wing length of male 9.7 mm.

Head dark brown, posteriorly covered with long scarce and erect setae. Eyes large, nearly reaching each other on ventral side of head. Vertex narrow, anterior part silvery white. Length of male antennae 1.9 mm. Antenna (Fig. 1B) entirely black, reaching to about wing base, if bent backwards. Scape nearly cylindrical, pedicel approximately four fifths of scape's length, slightly widening distally. Flagellum 13-segmented, but apical segment is very small and fused with preceding segment, thus flagellum looks 12-segmented. Flagellomeres with short distal pedicels. Basal flagellomere just slightly longer than wider, second flagellomere slightly wider than longer, succeeding segments getting longer, distal flagellomeres cylindrical. Verticils dark brown, 1.7 times as long as respective segments, just on basal and apical segments somewhat shorter. Short, erect, brownish pubescence denser and longer on ventral side of flagellum. Rostrum very short, yellowish brown. Palpus black, very short, two basal and apical segments strongly reduced,

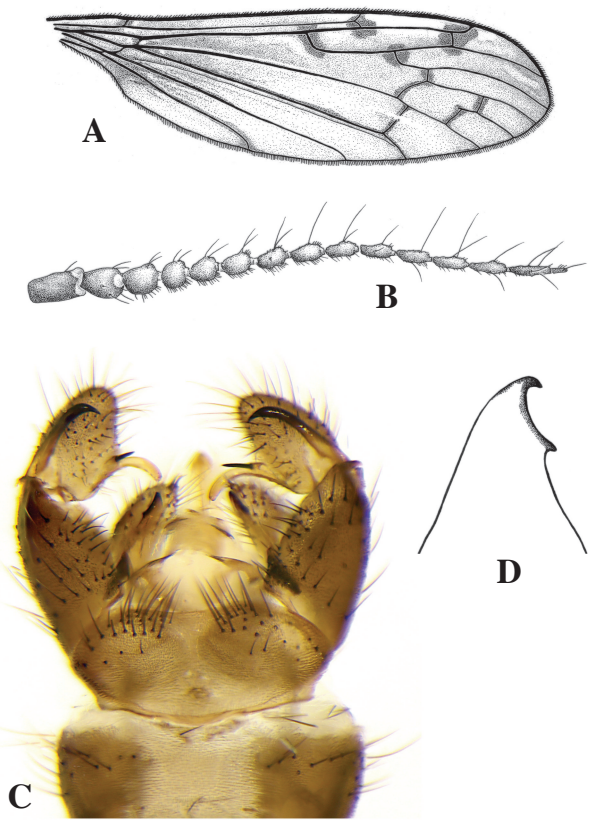

Fig. 1. *Achyrolimonia basispina* male. A. wing. B. antenna. C. genitalia, dorsal view. D. paramere.

only third segment well developed. Few long bristles at base and at apex of palpus. Mouth parts whitish, labella with short erect dark brown setae.

Pronotum large, polished, pale ochreous brown medially, the lateral margins a little darker. Ground color of mesonotal prescutum dark brown. The prescutal stripes conspicuous, pale reddish brown. Dorsal prescutal stripe wide, longitudinally divided by narrow median line, which is more conspicuous frontally and less distinct posteriorly. Scutal lobe reddish brown with the mesal and lateral edges dark brown and yellow line between them. Scutellum dark brown, just frontal edge yellowish. Mediotergite dark brown with two oval yellow spots on posterior part. Pleura dark brown with paler brown spots. Membrane between frontal spiracle and wing base whitish. Anepisternum darkened dorsally, yellowish ventrally. Katepisternum generally yellowish, with twelve short brown setae on dorsal part. Setose part slightly darkened. Anepimeron dark brown with yellow dorsal margin. Laterotergite grayish brown. Posterior spiracle ventrally rimmed by dark brown margin. Wing (Fig. 1A) distinctly darkened, brownish to grayish; costal area and wing base brownish yellow; wing base beyond basal crossveins and wing apex distinctly darkened; conspicuous dark brown spots at origin and fork of *Rs*, tip of *Sc*, tip of R_1 and around R_2, along cord and outer end of discal cell. Less distinct brownish areas surround humeral, cubital and second anal veins. Light yellow window extends between dark spots at base of *Rs* and tip of R_1, it slightly extends posterior to R_1. Two small light spots, one right before dark spot at origin of *Rs*, the other is right beyond dark spot at R_1. Veins dark brown. Venation: Sc_1 long, reaching beyond middle of *Rs* but far not reaching *Rs* fork, Sc_2 close to Sc_1 tip. R_2 nearly twice its length from R_1 tip. *Rs* long, and distinctly arched, but not spurred in Korean specimen, angulated and spurred in specimens from Japan. R_3 and R_4 long and parallel to each other and both slightly arched. Cross-vein r-m beyond base of discal cell. Discal cell large, irregular, about twice as long as wide. Basal deflection of CuA_1 distinctly beyond branching point of *M*. Both anal veins long and slightly curved at end. Anal angle medium-sized, comparatively narrow, nearly parallel-sided. Length of male halter 1.4 mm. Halter dark brown, stem obscure yellow at base, knob blackened. Coxae ochreous with brown bases. Frontal coxa darker than remaining coxae. Posterior coxa light yellow with just extreme base brown. Trochanters yellow with dark brown distal rim. Femur pale brownish yellow, dorsal part darker than ventral, distal part faintly darkened, but very apex yellow. Tibiae uniformly brownish yellow, very base narrowly yellow. Tarsus same color as tibia, just two distal tarsomeres dark brown. Legs covered with short, semi-erect brown setae. Male femur I: 6.9 mm, II: 7.9 mm, III: 8.0 mm, tibiae I: 8.0 mm, II: 7.3 mm, III: 7.6 mm, tarsus I: 8.0 mm, II: 6.5 mm, III: 6.0 mm long. Claw with single subbasal spine.

Abdominal tergites and sternites dark brown, posterior margins distinctly light gray. Lateral margins very narrowly rimmed with light gray. Membrane between tergites and sternites gray. Dorsal and ventral sides of abdomen covered with short erect sparse brown setae. Male terminalia (Fig. 1C) more reddish than remainder of abdomen. Ninth tergite simple, transverse, with shallow wide emargination on posterior margin. Gonocoxite wider at base narrower at apex, with large setose ventromesal lobe. Outer gonostylus strongly chitinized, blackened at apex and gently curved to the acute tip. Inner gonostylus oval, fleshy, with long arched rostral appendage, that bears straight and powerful subbasal spine. Distal part of rostral appendage bearing few apical setae. Paramere (Fig. 1D) wide and flat, distal margin blackened, the very tip elongate and hook shaped and bearing small subapical tubercle. Penis simple, long and straight.

Elevation range in Korea. Species was collected at about 230 m altitude.

Period of activity. Single male was captured at the end of August in Korea.

Habitat. Deciduous forest at river side. Larvae are dev-

eloping in mushrooms and rotten wood of asp and alder (Savchenko, 1983).

General distribution. Species is known from Japan, Kunashir islands, continental part of Far East of Russia and China (Sichuan) (Alexander, 1924; 1954; Savchenko and Krivolutskaya, 1976; Savchenko, 1983).

Examined materials (Fig. 10A): 1♂ (preserved in ethanol), S. Korea, Gangwon-do, Chuncheon-si, Dongsan-myeon, Bongmyeong-ri, KNU experimental forest, N37.77906, E127.81564, alt. 233 m, 2014.08.22, S. Podenas, S. Kim.

***Discobola* Osten Sacken, 1865**

Discobola Osten Sacken, 1865: 226; Kuntze, 1920: 372, 422; Pierre, 1924: 70; Alexander, 1924: 538; Czižek, 1931: 14; Enderlein, 1936: 19; Lackschewitz and Pagast, 1942: 52; Savchenko, 1985: 44.

Limonia (*Discobola*) Alexander, 1929: 242, 1950: 194, 1965: 433, 1966: 298, 1967: 76; Edwards, 1938: 20, 23; Coe, 1950: 23; Ishida, 1957: 124; Tjeder, 1958: 144.

Trichobola Osten Sacken, 1869: 97.

Type species - *Limnobia argus* Say, 1824 (=*annulata* Linnaeus, 1758).

Medium-sized yellowish to brownish crane flies, with wing length ranging from 8.0 to 12.0 mm. Additional cross-vein in central part of cell a_1. Antenna medium long, if bent backwards, ends about at the base of wing. Flagellomeres oval with apical pedicels. Verticils approximately as long as respective flagellomeres. Pronotum distinctly elongate, narrow. Tubercular pits and pseudosutural fovea indistinct. No setae present on katepisternum. Meron very small. Tarsal claw with big subbasal and two or three additional small teeth. Comparative wing width similar to that of most Limoniinae crane flies. Wing distinctly patterned. Usually pattern consists of large concentric spots, sometimes small additional spots present in most cells. Wing venation: vein *Sc* long, Sc_1 reaching to about branching point of *Rs*, Sc_2 in most species close to the tip of Sc_1; radial sector long and distinctly arched; R_1 longitudinal, R_2 transverse and far from R_1 tip; discal cell closed, elongate; branches of *M* beyond discal cell shorter than cell itself; basal deflection of CuA_1 at or slightly beyond base of discal cell. Male genitalia not distinctly wider than abdominal segments. Ninth tergite with slightly concave posterior margin, ninth sternite small, two pairs of gonostyles, inner gonostylus large oval or rounded with distinct spineless rostral prolongation. Sometimes spines or narrow rod-shaped structures present on gonostylus itself. Outer gonostylus narrow, strongly sclerotised and arched at apex, sometimes hook-shaped. Penis simple, elongate. Ovipositor with short and narrow cercus, tip of which distinctly turned upwards. Ninth sternite distinctly elongate. Hypovalvae large and elongate.

Larva cylindrical, tapering behind, covered with short pubescence. Abdominal segments 2 to 7 each with ventral and dorsal creeping welts. Tracheal gills four in number, small, egg-shaped. Spiracular lobes of respiratory disc are reduced. Spiracular field bears two ventral sclerites. Head capsule moderate in size, just lightly reduced, wholly retracted within prothorax. Hypostoma with nine equal teeth, central tooth not protruding, deeply split behind.

Anterior end of pupa large, tapering behind. Pronotal breathing horns small, ear-shaped, flattened. Abdominal segments on basal ring with a transverse row of small hooks which are interrupted at pleura; last segment of male body blunt rounded, in female - conical and elongated. Larvae and pupae develop in rotten wood and fungi (Krivosheina and Krivosheina, 2011).

Discobola is a small genus, which includes only 28 species distributed worldwide. It is best represented in the Australasian/Oceanian Regions (13 species). Genus has also been reported from other regions, as Eastern Palaearctic (9 species), Oriental (7 species), West Palaearctic (4 species), Nearctic (3 species) and Neotropical Regions (1 species), but it is missing in Afrotropical Region (Oosterbroek, 2015).

No fossil species belonging to that genus were discovered so far (Evenhuis, 2014).

Key to Korean species of the genus *Discobola* Osten Sacken, 1865

− Dark spots of wing uniformly colored (Fig. 2A). Inner gonostylus of male genitalia with two small rostral spines situated slightly above rostral prolongation (Fig. 2C) ····· *Discobola annulata* (Linnaeus, 1758)

− Dark spots of wing with light central part and distinctly darkened margins (Fig. 2B). Inner gonostylus of male genitalia with two strong spines on posterior margin, far from rostral prolongation (Fig. 2E) ····· ····· *Discobola margarita* Alexander, 1924

***Discobola annulata* (Linnaeus, 1758)**

Tipula annulata Linnaeus, 1758: 586.

Limnobia annulata Osten Sacken, 1857: 90.

Discobola annulata Osten Sacken, 1865: 226; Kuntze, 1920: 372, 422; Pierre, 1924: 70; Alexander, 1924: 538; Lackschewitz and Pagast, 1942: 52; Savchenko, 1985: 48.

Limonia (*Discobola*) *annulata* Edwards, 1938: 24; Coe, 1950: 24; Alexander, 1966: 309; Starý, 1974: 14.

Trichobola annulata Osten Sacken, 1869: 97.

Limonia argus Say, 1824: 358.

Trochobola argus Osten Sacken, 1869: 98.

Limnobia imperialis Loew, 1851: 403.

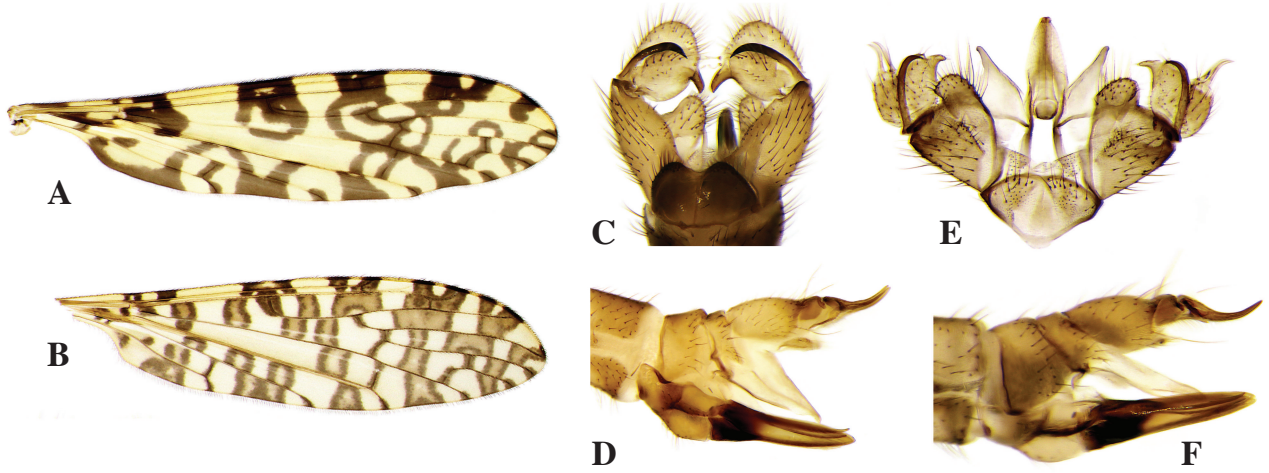

Fig. 2. *Discobola*. A. wing of *D. annulata*. B. wing of *D. margarita*. C. male genitalia of *D. annulata*, dorsal view. D. ovipositor of *D. annulata*, lateral view. E. male genitalia of *D. margarita*, dorsal view. F. ovipositor of *D. margarita*, lateral view.

General body color yellowish-greenish brown, semi-polished, covered with sparse grayish pruinosity. Body length of male 6.8-8.6 mm, female 7.2-8.3 mm. Wing length of male 9.4-11.1 mm, female 9.0-10.4 mm.

Head dark brown, covered with gray pruinosity and erect brown setae. Vertex narrow in both sexes, gray because of pruinosity. Eyes large, nearly reaching each other on ventral side of head. Length of male antennae 1.65 mm, length of female antennae 1.7 mm. Antenna brown. Scape dark brown, pedicel somewhat lighter. Flagellum 12-segmented, dark brown basally, getting somewhat lighter distally. Flagellomeres with distinct apical pedicels, which are distinctly lighter than flagellomeres themselves, yellowish. Basal flagellomeres oval, distal flagellomeres elongate, distal flagellomere longer than preceding segment. Verticils slightly longer than respective segments. Short pubescence, covering segments sparse, whitish, denser on ventral side. Rostrum brown to dark brown. Palpus brown, covered with erect brown setae. Labella same color as rostrum.

Thorax generally light brown. Pronotum yellow dorsally (greenish yellow in alive specimens) with brown lateral margin. Prescutum yellowish brown with brown median longitudinal line and wide lateral spot, which looks like extension of lateral line of pronotum. Scutal lobe brown. Pleura brownish. Wing (Fig. 2A) yellowish, especially costal area. Wing pattern composed of brown concentric spots at wing base, around both ends of radial sector, basal deflection of CuA_1, tip of A_1 and around additional cross vein in central part of cell a_1. Small dot-like spots, that are characteristic for other species, are missing. Savchenko (1985) emphasizes, that clear spotless central part of median cell is one of the most characteristic features of that species. Wing pattern slightly varies between specimens. Stigma dark brown. Veins brownish. Wing venation: vein *Sc* long, Sc_1 ending slightly beyond branching point of radial sector; Sc_2 opposite branching point of *Rs*; *Rs* long, distinctly arched at base; R_2 some distance from R_1 tip, cell r_3 long and narrow, slightly widened distally and because of that distal end of cell r_{4+5} slightly narrowed; cross-vein *r-m* short; discal cell elongate, three times as long as wide; basal deflection of CuA_1 slightly beyond base of discal cell; first anal vein nearly straight, second anal vein slightly arched at apex; additional cross-vein approximately in the middle of cell a_1, not far from tip of A_2; anal lobe long, medium wide. Halter brown with pale basal part, distal part of knob yellow or reddish yellow. Male halter 1.50-1.70 mm, that of female 1.55-1.70 mm long. Fore coxa light brown with darkened frontal face and yellowish ventral part; middle coxa light brown, ventrally yellow; posterior coxa entirely yellow. Trochanter yellow, with narrowly blackened distal margin. Femur yellow or light brown with wide, distinct, brown subapical ring, distal part beyond ring yellow. Tibia brownish yellow with narrowly darkened apex. Two basal tarsomeres yellow, three distal segments brown to dark brown. Legs covered with short, adherent, brown setae. Male femur I: 8.0-8.1 mm, III: 8.7 mm, tibiae I: 9.8-10.5 mm, III: 9.8 mm, tarsus I: 10.6 mm, III: 7.4 mm long. Female femur I: 7.1 mm long, II: 7.0-7.5 mm, III: 7.4-7.9 mm; tibiae I: 8.8 mm, II: 8.3 mm, III: 8.6 mm; tarsus II: 7.6 mm, III: 6.7 mm long. Claw brown, with single subbasal spine in both sexes.

Abdomen brownish. Basal tergite greenish yellow, remaining tergites greenish yellow at base, but yellow area gets narrower on tergites closer to distal end of abdomen. Greenish color disappears in specimens collected

long time ago. Darkened posterior margins of segments make complete rings on male abdomen. Coloration of female abdomen more variable than in male, often it has large yellow spots at basal part of sternites, sometimes yellow area covers nearly whole sternite, just posterior margin remains brown, but in other cases, yellow spots are missing and ventral part of abdomen is nearly entirely brown, except just two basal segments with yellowish basal spots. Distal segments dark brown. Female abdomen with less distinct rings, caudal segments not so dark as in male. Male genitalia (Fig. 2C) brownish yellow, except dark brown ninth tergite. Posterior margin of tergite with wide median emargination. Gonocoxite elongate with large setose ventro-mesal lobe, which is rounded at apex. Gonostyles subterminal. Outer gonostylus narrow, rod-shaped, strongly sclerotised, darkened towards apex and slightly arched. Inner gonostylus rounded with large darkened elongate rostral prolongation, situated approximately at the middle of mesal margin. Rostral spines, which look more like transparent curved rod-shaped elongations, on meso-posterior margin of gonostylus, slightly above rostral prolongation. Postero-lateral margins of paramere extended, spine-shaped. Penis simple, long and narrow. Ovipositor (Fig. 2D) brownish yellow. Cercus short with slightly upwards turned apex. Vaginal apodeme extended into long structure, that is very wide at base, turning narrow at apex. It reaches slightly beyond base of cercus in resting position. Hypovalvae large, basal part distinctly dark brown, tip reaching to about four-fifth of cercus.

Elevation range in Korea. This species is known to occur at altitudes from 800 m to over 1800 m.

Period of activity. Adults in Korea were collected from late July through middle of September.

Habitat. The species was found on steep wet slopes of small river, covered with deciduous trees and shrubs.

General distribution. The species is widely distributed in West and East Palearctic, Oriental Region, North America and Pacific islands.

Examined materials (10B): 1♀ (pinned), N. Korea, Pontani Paiktusan, altitude 6000 ft., 1940.07.23, coll. Yankovsky; 1♂ (pinned) (USNM), [S.] Korea, #37, Hill 1468, 16 mi. NW Chunchon, N38.00000, E127.50000, altitude 4300 ft., 1954.09.16, George W. Byers (KU); 1♀ (pinned), [S.] Korea, #38, Hill 1468, 16 mi. NW Chunchon, N38.00000, E127.50000, altitude 4300 ft., 1954.09.17, George W. Byers (KU); 1♂ (in ethanol), S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Hwaak-ri, N37.99363, E127.52102, alt. 810 m, 2014.08.20, coll. S. Kim and S. Podenas (NIBR).

***Discobola margarita* Alexander, 1924**

Discobola margarita Alexander, 1924: 539; Savchenko and Krivolutskaya, 1976: 128; Savchenko, 1983: 122.

General body color obscure yellow to light brown. Body semi-polished, covered with very sparse grayish pruinosity. Body length of male 5.4-7.4 mm, female 5.8-8.9 mm. Wing length of male 6.3-8.4 mm, female 6.6-8.3 mm.

Head black, covered with grayish pruinosity, which is more intense frontally. Vertex narrow in both sexes, covered with sparse erect brown setae. Eyes large, nearly reaching each other on ventral side in both sexes. Length of male antennae 1.10-1.55 mm, length of female antennae 1.30-1.85 mm. Antenna black, color of pedicel varies from light brown to black in different specimens. Flagellum 12-segmented. Flagellomeres brown with distinct yellowish apical pedicels. Basal flagellomeres oval, distal flagellomeres elongate, nearly cylindrical, apical flagellomere slightly exceeds in length preceding segment. Verticils nearly twice as long as respective segments. Short pubescence, covering segments sparse, semi-erect, whitish, denser on ventral side. Rostrum and palpus black. Palpomeres short, second segment largest, distal segment slightly exceeds in length preceding segment. Labella black.

Thorax generally yellow to light brown. Pronotum distinctly elongate, yellow dorsally with brown lateral margin. Prescutum yellow with dark brown lateral margin. Scutal lobe yellow. Scutellum obscure yellow. Metatergite obscure yellow with darkened posterior margin. Pleura yellow with a conspicuous dark brown longitudinal line. That line from dark prescutal margin separated by pale yellow area. Katepisternum yellow, slightly infuscated ventrally. Anapimeron below dark line yellow, ventral part infuscated. Wing (Fig. 2B) yellowish, especially costal area, pattern distinct composed of lots of irregular spots, having light centers and dark margins. These spots together form larger concentric spots at wing base, at base of *Rs*, both ends of discal cell, basal deflection of CuA_1, tip of A_1 and around additional cross vein in central part of cell a_1. Tips of all longitudinal veins darkened, narrow dark area surrounds base of *Rs* and all crossveins, including cord. Small dot-like spots, that are characteristic for other species, are missing. Wing pattern slightly varies between specimens. Stigma dark brown, but not distinct from remaining ocellate spots. Veins brownish, subcosta yellow. Wing venation: vein *Sc* long, Sc_1 ending beyond branching point of radial sector; Sc_2 close to Sc_1 tip and slightly beyond branching point of *Rs*; *Rs* long, distinctly arched at base; R_1 curved before wing margin, R_2 distinctly before R_1 tip, thus R_{2+3} is approximately as long as R_3; cell r_3 long and narrow, slightly widened distally and because of that distal end of cell r_{4+5} slightly arched; cross-vein *r-m* distinct; discal cell elongate, about 2.8 times as long as wide; basal deflection of CuA_1 distinctly beyond base of discal cell; first anal vein nearly straight with slightly arched distal

end, second anal vein angulated at apex; additional crossvein approximately in the middle of cell a_1, not far from tip of A_2; anal lobe long, medium wide. Stem of halter black with yellow base, knob dark brown to blackish, basal part yellow. Male halter 0.95-1.30 mm, that of female 0.90-1.25 mm long. Coxa yellow, fore and median coxa slightly infuscated. Trochanter obscure yellow, distal margin narrowly blackened. Femur obscure yellow with narrow brown subapical ring, which is missing in some specimens, very tip yellow. Tibia yellow. Tarsus yellow at base, turning dark brown distally. Legs covered with short, semi-adherent, brownish setae. Male femur I: 5.5-6.7 mm, II: 5.9-6.6 mm, III: 5.9-7.2 mm, tibiae I: 6.3-7.4 mm, II: 6.1-7.1 mm, III: 6.4-7.9 mm, tarsus I: 6.7-7.3 mm, II: 5.2-6.4 mm, III: 4.8-5.5 mm long. Female femur I: 5.4-6.0 mm long, II: 4.6-6.4 mm, III: 5.8-6.7 mm; tibiae I: 6.0-7.2 mm, II: 5.6-6.6 mm, III: 5.9-7.0 mm; tarsus I: 4.1-7.4 mm, II: 4.8-6.2 mm, III: 4.5-5.3 mm long. Claw with single spine, that is situated slightly before midlength and long whitish subbasal setae in male, but only with setae in female.

Male abdomen yellowish brown, tergites with yellowish fronto-lateral spots, posterior margins of tergites narrowly dark brown. Sternites generally yellow, just posterior margins darkened. Female abdomen generally lighter than in male. Both tergites and sternites yellowish with darkened distal margin. Often basal part of female abdomen in alive and freshly collected specimens clearly green. That color fades towards distal part of abdomen. Distal segments darkened in both sexes. Male genitalia (Fig. 2E) yellowish, except brownish yellow ninth tergite. Posterior margin of ninth tergite nearly rounded, median emargination indistinct. Gonocoxite elongate, approximately 1.5 times as long as wide, with large setose ventro-mesal lobe, which is rounded at apex. Gonostyles subterminal. Outer gonostylus narrow, rod-shaped, strongly sclerotised, darkened towards apex and distally arched. Inner gonostylus rounded with elongate rostral prolongation, that bears few small setae at apex. Rostral spines, which look more like transparent slightly curved rod-shaped elongations, situated far from rostral prolongation, on the middle of posterior margin of stylus. Postero-lateral margins of paramere extended, narrow, tip obtuse. Penis simple, elongate with widened basal part. Ovipositor (Fig. 2F) light brown, polished. Cercus comparatively short, apex turned upwards, point-tipped. Hypovalvae large, wide at base, getting narrower towards apex, ending slightly before tip of cercus. Basal part of valvae distinctly darkened, blackish. Vaginal apodeme extended into long structure, that nearly reaches tip of hypovalvae in resting position.

Elevation range in Korea. This species was found at altitudes from 0 m to slightly above 800 m.

Period of activity. The species is active through July and August, possibly also in late June in South Korea.

Habitat. Wet deciduous grooves, usually on slopes to small and medium sized rivers. The species is attracted to light at night.

General distribution. The species distributed at East Palearctic and Oriental Regions. It is known from the Far East of Russia, Japan, India, Taiwan and Thailand. The species was listed in North Korea (Kim, 2013), but no specimens from North Korea were available to the authors.

Examined materials (Fig. 10C): 1♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Jangjeon-ri, Mt. Gariwangsan, N37.48778, E128.54528, 2009.06.17-07.04, coll. W. Y. Choi, Malaise trap (NIBR); 1♂, 1♀ (in ethanol), 1♂ (pinned), S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Hwaak-ri, N37.99363, E127.52102, altitude 810 m, 2014.08.20, S. Kim, S. Podenas; 1♂, 2♀♀ (in ethanol), S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Hwaak-ri, N37.98402, E127.52676, altitude 579 m, 2014.08.20, S. Kim, S. Podenas; 1♂ (pinned), S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri, N38.02982, E127.44310, altitude 560 m, 2014.08.20, S. Podenas; 1♂, 1♀ (in ethanol), S. Korea, Gangwon-do, Hwacheon-gun, Sanae-myeon, Gwangdeok-ri, N38.09749, E127.44653, altitude 582 m, 2014.08.20, S. Podenas; 8♂♂, 3♀♀ (in ethanol), S. Korea, Gangwon-do, Hongcheon-gun, Nae-myeon, Yuljeon-ri, N37.73849, E128.34566, altitude 798 m, 2014.08.21, S. Kim, S. Podenas; 5♂♂, 7♀♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Yongpyeong-myeon, Nodong-ri, N37.70303, E128.48302, altitude 802 m, 2014.08.21, S. Kim, S. Podenas; 4♂♂, 4♀♀ (pinned), S. Korea, Gangwon-do, Pyeongchang-gun, Daegwallyeong-myeon, Byeongnae-ri, Odaesan National Park, N37.74414, E128.61679, altitude 749 m, 2014.08.21, S. Kim, S. Podenas; 2♂♂, 1♀ (in ethanol), S. Korea, Gangwon-do, Chuncheon-si, Dongsan-myeon, Bongmyeong-ri, KNU experimental forest, N37.77906, E128.81564, altitude 233 m, 2014.08.22, S. Kim, S. Podenas; 2♂♂, 1♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Jangjeon-ri, (Moss valley), N37.47153, E128.54305, altitude 769 m, 2014.08.22, S. Kim, S. Podenas; 3♂♂, 9♀♀ (in ethanol), 2♂♂, 1♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26590, E127.58096, altitude 446 m, 2014.08.24, S. Podenas, with net and at light; 1♂, 1♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26590, E127.58096, altitude 446 m, 2014.08.25, S. Podenas; 1♀ (in ethanol), S. Korea, Jeollabuk-do, Buan-gun, Byeosan-myeon, Seokpo-ri, Byeonsanbando National Park, Jikso falls, N35.62675, E126.57020, altitude 141 m, 2014.08.27, S. Podenas; 1♂ (in ethanol), 2♀♀ (pinned), S. Korea, Jeollabuk-do, Buan-

gun, Boan-myeon, Udong-ri, Byeonsanbando National Park, Seonggye falls, N35.62864-35.62896, E126.63441-126.63461, altitudes 52-105 m, 2014.08.27, S. Podenas; 2♂♂, 1♀ (in ethanol), 2♂♂, 2♀♀ (pinned), S. Korea, Gyeongsangnam-do, Changwon-si, Jindong-myeon, Yusan-ri, environs of Masan, N35.12904, E128.57147, altitude 58 m, 2014.08.29, S. Podenas; 1♀ (in ethanol), 1♂, 1♀ (pinned), S. Korea, Gyeongsangnam-do, Geoje-si, Nambu-myeon, Dapo-ri, N34.71542, E128.62286, altitude 63 m, 2014.08.30, S. Podenas; 1♂ (in ethanol), S. Korea, Gyeongsangnam-do, Geoje-si, Nambu-myeon, Toppo-ri, N34.75844, E128.61429, altitude 191 m, 2014.08.30, S. Podenas; 2♀♀ (pinned), S. Korea, Gyeongsangnam-do, Geoje-si, Dongbu-myeon, Osong-ri, N34.77900, E128.57968, altitude 50 m, 2014.08.30, S. Podenas; 1♂ (in ethanol), S. Korea, Gyeongsangnam-do, Changwon-si, Masanhappo-gu, Jindong-myeon, Dagu-ri, N35.11149, E128.53142, altitude 11 m, 2014.08.31, S. Podenas; 5♂♂, 3♀♀ (in ethanol), S. Korea, Gyeongsangnam-do, Changwon-si, Masanhappo-gu, Jindong-myeon, Dagu-ri, N35.11309, E128.53067, 2014.08.31, S. Podenas.

***Elephantomyia* Osten Sacken, 1860**

Elephantomyia Osten Sacken, 1860: 220; Alexander, 1948: 522; Ito, 1948: 89; Ishida, 1959: 2; Savchenko and Krivolutskaya, 1976: 74; Savchenko, 1983: 62, 1986: 202, 1989: 49.

Type species - *Limnobiorhynchus canadensis* Westwood, 1836 (= *westwoodi* Osten Sacken, 1869).

Medium-sized crane flies, with wing length ranging from 6.0 to 11.0 mm. Main body color yellow or brownish yellow. Eyes large, often greenish in alive specimens. Rostrum strongly elongated, usually as long as abdomen. Small three-segmented palpi at the end of rostrum. Antenna short. Antennal flagellum usually 14-segmented with very small distal segment. Tubercular pits of prescutum missing. Wing subhyaline, spotless, sometimes jus costal field slightly pigmented. Veins Sc_1 and Sc_2 close to each other, ending slightly before branching point of *Rs*; two branches of *Rs* (R_{2+3} and R_{4+5}); R_2 (*r-r*) missing. Discal cell large, nearly right-angled. Basal deflection of CuA_1 close to the middle of discal cell. Cell a_2 large. Second and third pairs of coxae are close to each other, because meron is strongly reduced. Male genitalia large. Ninth tergite and ninth sternite forming complete genital ring. Ninth tergite usually with wide and deep median incision. Gonocoxite wide at base, getting narrower towards apex, without interbase. Two pairs of terminal or subterminal gonostyles. Outer gonostylus narrow, often bifid at tip. Penis usually very long and coiled, sometimes straight. Paramere large, often with set of spines apically. Ovipositor with long and slightly arched cercus. Hypovalvae reaching about to two thirds of cercus.

Larval body cylindrical, terete, yellowish white, covered with long silky light brown setae. Creeping welts present on abdominal segments V-VII. Spiracular field with four lobes, ventral pair is longest. Ventral lobe with very long apical bristle. Spiracular lobes heavily sclerotised and almost entirely covered with dark sclerites. Spiracles are medium-sized, widely separated, located at the base of lateral lobes. Anus is surrounded by four inconspicuous anal papillae. Head capsule is reduced, weakly sclerotised, very long and narrow. In general, the head capsule is more similar to that of subfamily Chioneinae. Labium membranous, with premandibles on ventral side. Mandible very small, heavily sclerotised with blunt apical teeth. Maxillae well-developed, membranous. Labium inconspicuous. One of the most outstanding features of the genus is presence of heavily sclerotised comb-like structures surrounding oesophangus.

Pupa free. Body pale, segments without tubercles, but cuticle covered with microscopic spines. Antennal sheath is lying across eye, short, reaching only wing base. Small crest present above the eye. Sheath of wing short, reaching end of abdominal segment II. Leg sheaths extending about to base of fifth abdominal segment; they are different in length. Pronotal breathing horns are very small, elongate, slightly widened and rounded at apex.

Larvae live in wet, rotten wood of various deciduous trees. Pupae develop in the same habitat as larvae (Alexander, 1920a; Krivosheina, 2010).

The genus includes 132 species distributed worldwide (Oosterbroek, 2015). The genus divided further into four subgenera, with which the largest subgenus includes 99 species from the world. Highest diversity of *Elephantomyia* (*Elephantomyia*) is observed in Neotropic (38 species) and Afrotropical Regions (37 species). Twelve species are known in Palaearctic Region. The genus was unknown from Korean Peninsula (Kim, 2013). Five species of *Elephantomyia* are known from Baltic and Dominican ambers (Evenhuis, 2014).

***Elephantomyia* (*Elephantomyia*) *edwardsi* Lackschewitz, 1932**

Elephantomyia edwardsi Lackschewitz, 1932: 220; Tjeder, 1953: 231; Savchenko, 1986: 205.

General color yellow. Body length of male 6.5 mm, female 6.0-9.6 mm. Wing length of male 7.3 mm, female 6.7-9.0 mm.

Head gray. Vertex narrow in both sexes, covered with sparse erect brownish setae. Eyes greenish in alive specimens. Length of male antennae 1.2 mm, length of female antennae 1.1-1.4 mm. Antenna brownish yellow, distal flagellomeres brownish. Scape and pedicel cov-

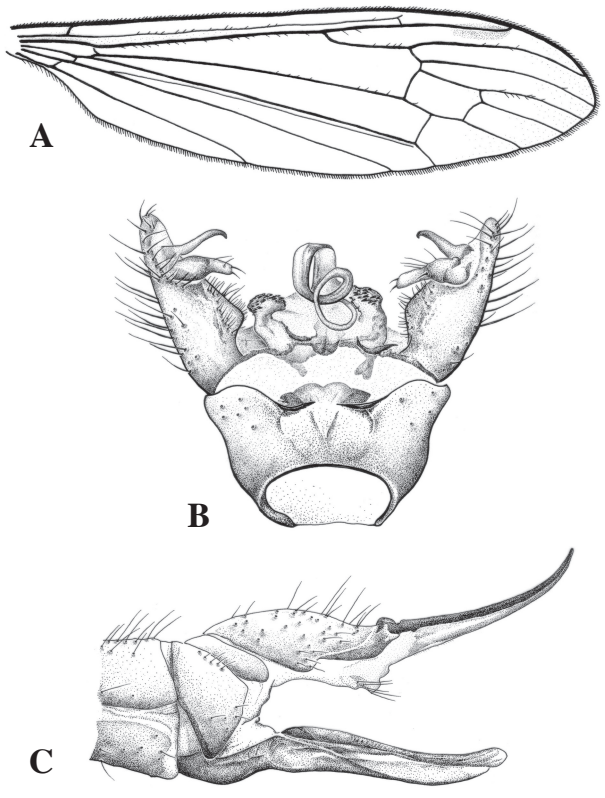

Fig. 3. *Elephantomyia* (*Elephantomyia*) *edwardsi*. A. wing. B. male genitalia, dorsal view. C. ovipositor, lateral view.

ered with sparse grayish pruinosity. Flagellum 12-segmented. Basal flagellomere large, oval, approximately as long as two suceeding segments. Remaining flagellomeres elongate, nearly cylindrical, distal flagellomere small, shorter than preceding segment. Verticils very long, nearly four times as long as respective segment. Short pubescence, covering segments sparse, semi-erect, brownish. Rostrum brown, nearly as long as whole body, covered with short brownish pubescence. Rostrum length of male 6.1 mm, that of female 5.2-8.9 mm long. Palpus very short, three-segmented, basal and distal segments very small, middle segment elongate. Labella yellowish.

Thorax generally yellow (in specimens kept in ethanol) to brownish (in old pinned specimens), covered with sparse grayish pruinosity, which is densier on pleura. Pronotum brownish dorsally, yellow laterally. Mesonotal prescutum with wide brown median line, which is darker frontally and getting very weak posteriorly. Margins of that line blurred. Median line in females sometimes less distinct than in males. Wing (Fig. 3A) subhyaline, with weak brownish tint, slightly yellowish at base and weakly darkened at distal end. Stigma light brown, oval. Veins brownish. Wing venation: vein *Sc* long, ending slightly before branching point of radial sector, very tip of it in some specimens indistinct; Sc_2 close to Sc_1 tip; *Rs* comparatively short, arched at base; R_2 (*r-r*) missing, cell r_1 widened distally; both branches of *Rs* slightly arched, tips bent posteriorly; cross-vein *r-m* short; discal cell large, nearly rectangular, nearly twice as long as wide; basal deflection of CuA_1 at the middle of discal cell; first anal vein nearly straight, second anal vein slightly arched at apex; anal lobe long, medium wide. Halter brownish yellow. Male halter 1.15 mm, that of female 1.05-1.50 mm long. Leg yellow, distal ends of femur and tibiae slightly darkened, brownish. Distal tarsomeres brownish. Legs covered with short, semi-adherent, brownish setae. Male femur I: 5.4 mm, tibiae I: 6.9 mm long. Female femur I: 4.3-5.7 mm long, II: 4.5-6.0 mm, III: 4.3-6.1 mm; tibiae I: 5.1-7.9 mm, II: 5.4-7.2 mm, III: 4.4-7.2 mm; tarsus I: 4.8-7.3 mm, II: 5.0-5.8 mm, III: 4.0-6.4 mm long. Claw simple, without additional spines, brownish.

Male abdomen yellow with rather broad brown rings on posterior margins of segments. Distal segments dark brown. Female abdomen with less distinct rings, caudal segments not so dark as in male. Dark rings on old pinned specimens somewhat faded. Gonocoxite of male genitalia (Fig. 3B) simple, brownish yellow, wider at base, narrower at apex. Gonostyles subterminal. Outer gonostylus with darkened and hook-shaped apex. Small subapical teeth is visible only in posterior view. Inner gonostylus fleshy, basal part wider than distal. Paramere with distinctly widened distal part, which is covered by abundant small teeth. Ovipositor (Fig. 3C) brownish yellow. Cercus and hypovalvae long and narrow. Tip of cercus gently turned upwards, tip of valvae reaching to about four-fifth of cercus.

Elevation range in Korea. The species is known to occur at altitudes from 730 m to nearly 1,700 m.

Period of activity. All specimens in Korea were collected only in June.

Habitat. Specimens from South Korea were collected in deciduous tree and shrub grooves on margins of permanent and temporary streams, soil covered with fallen leaves and tree branches, scarce grassy vegetation among rocks covered with moss.

General distribution. The species is widely distributed in Europe, and possibly it could be found in the continental part of Far East of Russia.

Examined materials (Fig. 10D): 1♀, North Korea, Seren Mts., alt. 2500 ft., VI-14.1938, Yankovsky; 1♀, North Korea, Seren Mts., alt. 2500 ft., VI-17.1938, Yankovsky; 1♂, 1♀ (on same pin), 2♀♀ (on same pin) and 3♀♀ (on same pin), North Korea, Seren Mts., alt. 5500 ft., VI-25.1938, Yankovsky; 1♀, 1 specimen with broken abdomen (on same pin), North Korea, Seren Mts., alt. 3500 ft., VI-29.1938, Yankovsky; 1♀, North Korea, Kankyo Nando, Puksu Pyaksan., alt. 5000 ft., VI-8.1939,

Yankovsky; 1♀, North Korea, Kankyo Nando, Puksu Pyaksan., alt. 5500 ft., VI-13.1939, Yankovsky; 2♀♀, South Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Woljeongsa, Odaesan National Park, N37.73920, E128.59398, altitude 794 m, 2012.06.22, coll. S. Podenas; 1♀, South Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan National Park, N37.74767, E128.57962, altitude 733 m, 2012.06.22, coll. S. Podenas; also compared with slide mounted male genitalia and wing of *E. subterminalis* holotype, ♂, Japan, Shikoku, mt. Tsurugi-Awa, VI-1-1950 (Issiki-Ito), and with *E. edwardsi* specimens from Lithuania (coordinates approximate): 1♂, Jurbarkas district, N55.09725, E22.66808, 1989.06.10, coll. S. Podenas; 4♂♂, Kaunas district, Ringove sanctuary, N55.05187, E23.49239, 1990.06.08, coll. S. Podenas; 1♀, Vilnius, N54.68517, E25.27166, 2011.06.08, coll. M. Vasyte.

Discussion. *Elephantomyia edwardsi* is closely related to *E. subterminalis*. Only these two species have subterminal gonostyles. When describing *E. subterminalis* from Japan (Island Shikoku), Alexander (1954) mentioned that beyond gonostyles these species in all other respects were very different. However the authors found that they are very similar with each other in many respect and some misunderstanding about them still exists. According to Oosterbroek (2014), *E. edwardsi* is European species, while *E. subterminalis* is known from Japan and Far East of Russia. Bangerter (1934) and Stackelberg (1951) listed *E. edwardsi* from Far East, but Savchenko (1986) decided that their species is not *E. edwardsi*, but *E. subterminalis*. Stackelberg (1951) mentioned just single female specimen from the Zoological Institute of Sanct Petersburg (Leningrad), Russia, probably same specimen of Bangerter (1934). These two species could be reliably discriminated only by the structure of male terminalia. Savchenko (1986) also pointed out that outer gonostylus of *E. edwardsi* had no extra subapical tooth, while that tooth clearly presented in *E. subterminalis*. The author found that European specimens have small subapical tooth, which is not visible in dorsal view, but is well visible in posterior view. Subapical tooth was shown in Fig. 50 of Alexander (1954) for *E. subterminalis*, but it was drawn from slide-mounted spcimens and thus the orientation of the structure might be distorted. The most distinct feature separating both species is paramere which *E. subterminalis* has narrow distal part with just few apical teeth (three or four), while that structure is wide and covered with abundant teeth (twelve to sixteen) in *E. edwardsi*. Specimens of *E. edwardsi* from Korean Peninsula showed that possibly the species also exist in the continental part of Far East of Russia and further research is warranted to clarify the identity of *E. subterminalis* from that territory.

***Geranomyia* Haliday, 1833**

Geranomyia Haliday, 1833: 154; Lackschewitz and Pagast, 1940: 4, 1942: 47; Savchenko and Krivolutskaya, 1976: 117; Savchenko, 1983: 109.
Limonia (*Geranomyia*) *Edwards*, 1938: 20, 44; Ishida, 1957: 125.
Limnobiorhynchus Westwood, 1836: 683.
Aporosa Macquart, 1839: 100.
Pletussa Philippi, 1866: 597.
Triphana Skuse, 1890: 777.
Tetraphana Skuse, 1890: 778.
Monophana Edwards, 1912: 200.
Proaporosa Alexander, 1922 (nomen nudum): 582.
Pseudaporosa Alexander, 1924: 177.
Parageranomyia Santos Abreu, 1923: 60.
Type species - *Geranomyia unicolor* Haliday, 1833.

Medium sized crane flies with body length 4.5-8.5 mm, wing length 5.5-10.5 mm. General body coloration from yellow and brownish yellow to dark brown or dark grayish brown. The most distinct feature of the genus is elongated mouth parts, labrum, hypopharynx and labella, which are modified into large proboscis, that is usually longer than head and sometimes even longer than head and thorax taken together. Maxillari palpus reduced from four-segmented, that is usual for most crane flies to one-, two- or three-segmented (sometimes basal segment is so small, that is hardly visible). Wing elongate, medium-wide, anal angle widely rounded. Many species have unpatterned translucent wings, when some have distinctly spotted wings. Details of pattern vary not only between species, but also among specimens belonging to same species, even both wings of same specimen usually have some small differences. Wing venation typical for most Limoniinae with *Rs* branching into two veins R_{2+3} and R_{4+5}; discal cell present. Vein *Sc* elongate, Sc_1 ending distinctly beyond base of *Rs*, usually at about two thirds of *Rs* length. Basal deflection of CuA_1 close to the branching point of *M*. Male genitalia with large oval and fleshy inner gonostylus, bearing small rostral elongation that is usually armed with two medium-sized spines, sometimes it could be one strongly elongate spine, or, in some unusual cases, even three small spines. Outer gonostylus elongate, strongly sclerotised and distinctly arched. Ninth tergite simple with wide and shallow median incision. Ovipositor with elongate, slightly arched cercus, wide and tapered hypovalve. Ninth sternite, at least in Korean species, is extended into long narrow rod-shaped structure.

Geranomyia have the curious habit of bobbing up and down while resting, the long, slender legs acting as springs. They practice this same oscilating movement while resting on a head of flowers and feeding (Alexander, 1920a).

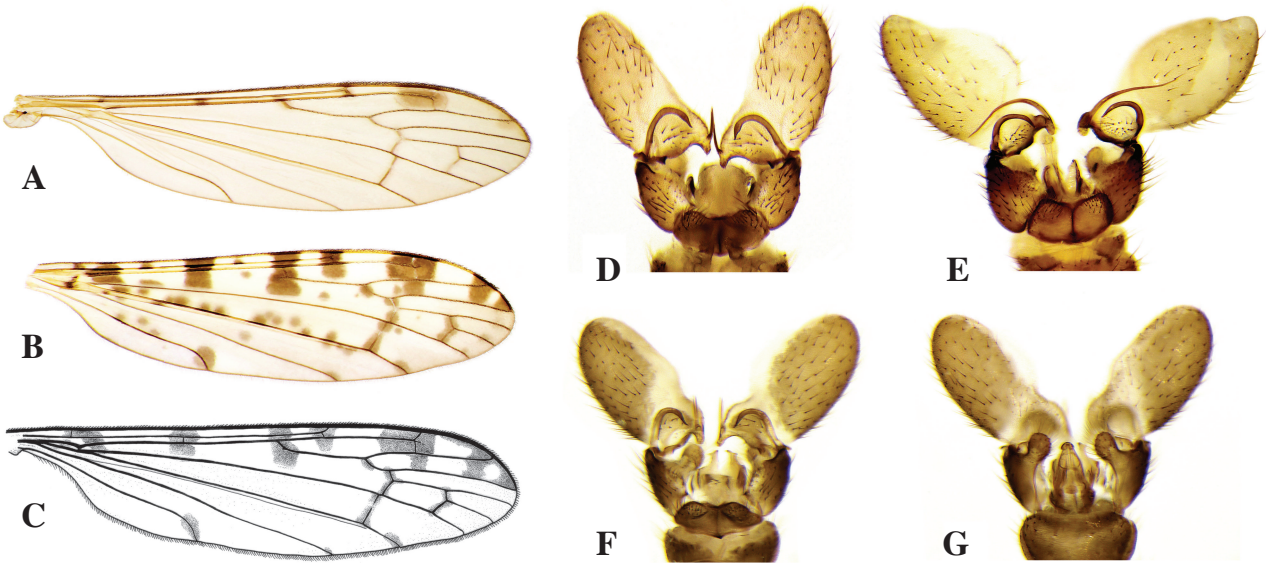

Fig. 4. *Geranomyia*. A. wing of *G. gifuensis*. B. wing of *G. multipuncta*. C. wing of *G. neavocetta*. D. male genitalia of *G. gifuensis*, dorsal view. E. male genitalia of *G. multipuncta*, dorsal view. F, G. male genitalia of *G. neavocetta*, F. dorsal view. G. ventral view.

Larva of *Geranomyia* is cylindrical, abruptly tapering posteriorly on the last abdominal segment, ending caudally in a rounded spiracular field. Spiracular lobes are almost reduced, respiratory disc is channeled on the median line, with sloping sides that folder together when underwater. Spiracles are large, oval shaped. Body segments II-VII each with ventral creeping welts. Tracheal gills four in number, large, constricted. Head capsule moderate in size, compact and not reduced, what is typical for most of Limoniinae. The head is wholly retracted within prothorax. Hypostoma with eleven teeth deeply split posteriorly (Alexander, 1920a; Oosterbroek and Theowald, 1991). Pupal body large at the anterior end, tapering posteriorly with smooth surface. Pronotal breathing horns earlike, broad, laterally flattened, apically flushed with each other. Abdominal segments with transverse welts of small spines, last segment of body terminating in two chitinized hooks (Alexander, 1920a; Oosterbroek and Theowald, 1991). Larvae and pupae develop in intertidal zone of seas among deposits of algae, also can develop in fresh water in a layer of algae (*fauna hygropetrica*) or in saturated cushions of mosses and liverworts growing on earth or rocks (Alexander, 1950).

A total of 341 species of *Geranomyia* are described. The genus has worldwide distribution with the highest diversity in Neotropical Region with 166 species and Oriental Region with 69 species. Only ten species are known from Eastern Palearctic Region (Oosterbroek, 2015). Two fossil species are described from Miocene, one species is known from Oligocene of France (Evenhuis, 2014).

Key to Korean species of the genus *Geranomyia* Haliday, 1833

1. Wing with few small and indistinct spots on frontal margin besides large stigma. Rest wing area unpatterned (Fig. 4A) ·· *Geranomyia gifuensis* Alexander, 1921
− Wing with few large and distinct spots on frontal wing margin and smaller spots behind them (Fig. 4B, C)····· ····· 2
2. Wing cells with lots of small spots, that are most abundant along vein *Cu* (Fig. 4B). Rostral prolongation of inner gonostylus of male genitalia armed with single long and arched spine (Fig. 4E)····· ····· *Geranomyia multipuncta* Alexander, 1922
− Wing cells without small spots (Fig. 4C). Rostral prolongation of inner gonostylus of male genitalia armed with two short and straight spines (Fig. 4F) ····· ····· *Geranomyia neavocetta* (Alexander, 1938)

***Geranomyia gifuensis* Alexander, 1921**

Geranomyia gifuensis Alexander, 1921: 114; Savchenko and Krivolutskaya, 1976: 125.
Limonia (*Geranomyia*) *gifuensis* Alexander, 1954: 286.

General body coloration grayish brown, but some specimens could be yellowish brown and other dark brown. Body length of male 4.1-6.4 mm, female 6.3-7.7 mm. Wing length of male 5.0-7.6 mm, female 6.1-9.0 mm.

Head dark brown. Anterior vertex narrow light gray pruinose. Eyes surrounded by light gray pruinose margin. Dorsally head covered with sparse erect dark brown setae. Eyes large, nearly reaching each other on ventral side of head. Length of male antennae 0.85-1.25 mm,

that of female 1.10-1.30 mm. Antenna dark brown. Scape elongate, slightly widened distally, covered with sparse gray pruinosity and bearing few long setae. Pedicel slightly elongate, getting wider distally. Flagellum 12-segmented. Flagellomeres oval, slightly decreasing in length distally. Apical segment elongate, slightly smaller than preceding segment. Verticils short, slightly shorter than respective segments. Erect whitish pubescence, covering segments is short, denser on ventral side of flagellum. Rostrum dark brown dorsally and laterally, ventral side yellow at base. Ventral side of rostrum covered with scarce erect yellowish setae. Mouth parts dark brown. Rostrum together with mouth parts is 2.00-2.90 mm long in male, 2.75-3.60 mm in female. Palpus very short, three-segmented. Basal segment elongate, cylindrical, yellowish, second segment slightly shorter but wider than basal, dark brown. Apical segment subglobular, dark brown, bearing few erect dark setae. Palpus is situated approximaly at four fifths of antena's length.

Thorax usually generally yellowish brown dusted with sparse gray pruinosity. Some specimens could be yellowish, but other are distinctly darker. Cervical sclerites dark brown. Pronotum brown medially, yellowish brown laterally. Mesonotal prescutum brown covered with sparse light gray pruinosity. Three dark brown stripes cnfluent posteriorly, interspaces castaneous brown, margins of stripes blurred. Area surrounding pseudosutural fovea usually yellow, but in dark specimens light reddish brown. That area extends to frontal margin of prescutum and frontally is interrupted by median dark brown stripe. Lateral margins of prescutum yellowish brown in lighter specimens, brown in darker specimens. Scutal lobes brown, medially separated with grayish brown. Central part of scutellum dark brown, lateral parts reddish brown. Scutellum covered with sparse gray pruinosity. Mediotergite reddish brown with indistinct dark brown median line. Light gray pruinosity covering mediotergite is densier frontally, posteriorly nearly missing. Coloration of pleura varies among specimens. Most specimens have testaceous yellow pleura, other specimens have brownish, and some grayish brown pleura. Wing (Fig. 4A) brownish with yellowish basal part. Stigma oval, dark brown. Small brownish spots present at the supernumerary crossvein in cell *sc*, at origin of *Rs*, Sc_1 and Sc_2, and at tip of R_2. Very narrow and indistinct brownish seams surround the cord and outer end of discal cell. Subcostal cell yellowish. Veins brown, yellowish at wing base. Venation: vein *Sc* long, it's length slightly varies, thus Sc_1 reaching wing margin from shortest approximately at the middle of *Rs* to longest at approximately three/fourth of *Rs* length, Sc_2 close to Sc_1 tip, but it's position also varies from slightly before, to slightly beyond tip of Sc_1. Position of additional cross vein in cell *sc* varies from the middle between humeral vein and beginning of *Rs* to at about two-thirds of the distance between *h* and base of *Rs*. *Rs* usually arched at base, sometimes indistinctly angulated. R_1 and R_2 transverse and starting at the same point, or R_2 starts slightly beyond R_1. Often present a small free tip of *R*. Discal cell twice as long as wide. Position of basal deflection of CuA_1 varies from slightly before to slightly beyond branching point of *M*. Vein A_1 nearly straight, A_2 slightly arched at tip. Cell a_2 wide, anal angle widely rounded. Length of male halter 0.75-1.10 mm, that of female 0.80-1.30 mm. Stem of halter grayish yellow with paler base. The knob and outer end of the stem dark brownish. Coxa and trochanters testaceous. Legs brown with paler bases of femora, distal tarsomeres dark brown. Male femur I: 4.6-5.1 mm long, II: 4.6-5.9 mm long, III: 4.4-5.9 mm; tibiae I: 5.5-6.4 mm, II: 4.7-6.1 mm, III: 5.0-6.6 mm; tarsus I: 4.2-4.9 mm, II: 3.3-4.5 mm, III: 3.2-4.0 mm long. Female femur I: 4.5-6.1 mm long, II: 5.1-6.5 mm, III: 5.4-6.8 mm; tibiae I: 5.5-7.5 mm, II: 5.4-6.7 mm, III: 5.9-7.4 mm; tarsus I: 4.3-5.4 mm, II: 4.3-4.7 mm, III: 3.9-4.4 mm long. Claw dark with small subbasal spine.

Abdominal tergites dark brown, covered with sparse grayish pruinosity and yellowish setae. Posterior margins somewhat paler. First tergite with pale frontal margin and wide pale spot in the middle, only lateral margins grayish brown. Sternites distinctly lighter than tergites, brownish yellow in some specimens to testaceous or brownish in other. Ninth sternite of male dark brown at base, margins widely pale, that of female usually not darker than remaining abdominal sternites. Male genitalia (Fig. 4D) reddish brown. Ninth tergite transverse, dark brown, posterior margin with wide shallow median emargination. Lateral sides of tergite swollen and setose. Gonocoxite rusty brown, comparatively short, with large ventro mesal lobe, distal end of which rounded and setose. Outer gonostylus short, hook-shaped, sclerotised, yellowish brown, tip acute. Inner gonostylus large, widened at base, twice as long as gonocoxite. Rostral appendage short and strongly bent forward. In the middle of posterior margin it bears small tubercle from which start two medium-long dark brown spines. They are close together along entire length. Paramere wide at base, very narrow and arched at distal end. Edeagus long and narrow in dorsal view, "S"-shaped in lateral view. Ovipositor (Fig. 5A) reddish brown hypovalvae yellow, some specimens have brownish markings at base of tenth tergite and base of eigth sternite. Cercus very narrow and nearly straight, tip rounded. Hypovalvae wide, reaching to about middle of cercus, apex rounded. Vaginal apodeme large, distinctly elongate, wide at base, turning much narrower at apex.

Elevation range in Korea. Specimens were collected at altitudes from 0 m to nearly 1950 m.

Period of activity. Adults are flying from middle of May through middle of October in Korea.

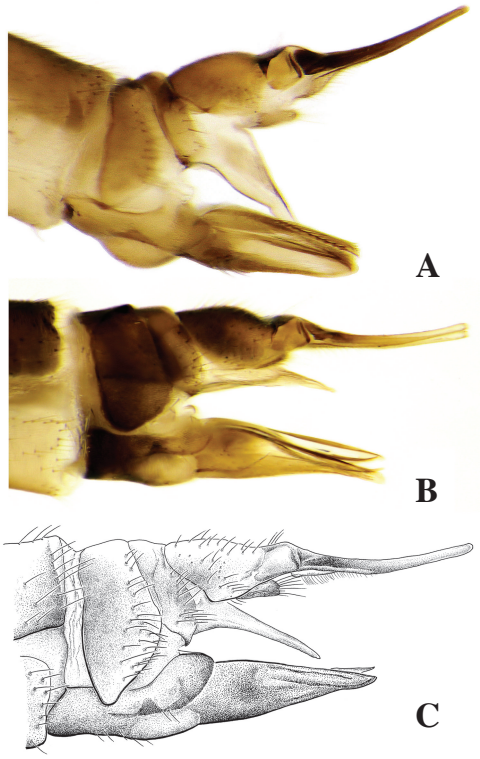

Fig. 5. Ovipositors of *Geranomyia*, lateral view. A. *G. gifuensis*. B. *G. multipuncta*. C. *G. neavocetta*.

Habitats. The species belongs to fauna hygropetrica, living in the water film over the surface of emergent rocks or boulders in quick-flowing streams, and larvae are developing in wet places where running water constantly moisturizes rock surfaces. They were found at springs, waterfalls, at the edges of fast running streams and rivers.

General distribution. The species is known from Japan (Honshu and Shikoku Islands), Far East of Russia, and Korean Peninsula (Oosterbroek, 2015).

Examined materials (Fig. 10E): 2♀♀ (pinned), N. Korea, Seren Mts., altitude 6000 ft., 1937.10.09, Yankovsky (USNM); 1♂, 2♀♀ (pinned), N. Korea, Ompo, altitude 200 ft., 1938.05.26, Yankovsky (USNM); 1♂ (pinned), N. Korea, Ompo, altitude 350 ft., 1938.06.11, Yankovsky (USNM); 1♂, 2♀♀, 1 specimen of unclear sex (pinned), N. Korea, Seren Mountains, altitude 3500-4000 ft., 1938.07.15, Yankovsky (USNM); 1 specimen of unclear sex (pinned), N. Korea, Seren Mountains, altitude 4000 ft., 1938.09.14, Yankovsky (USNM); 1♀ (pinned), N. Korea, Kankyo Nando Puksu Pyaksan, altitude 6000 ft., 1939.06.11, A. Yankovsky (USNM); 1♀ (pinned), N. Korea, Chonsani, altitude 4000 ft., 1940.06.20, Yankovsky (USNM); 1♀ (pinned), N. Korea, Pontani Paiktusan, 3500 ft., 1940.07.28, Yankovsky (USNM); 1♂ (pinned), N. Korea, Pontani Paiktusan, 5000 ft., 1940.07.29, Yankovsky (USNM); 1♀ (pinned), N. Korea, Pontani Paiktusan, 5500 ft., 1940.07.31, Yankovsky (USNM); 1♀ (pinned), N. Korea, Pontani Paiktusan, altitude 5800-6372 ft., 1940.08.04, Yankovsky (USNM); 2♀♀ (pinned), N. Korea, Pontani Paiktusan, altitude 5000-6000 ft., 1940.08.05, Yankovsky (USNM); 2♂♂ (2 slides, could be fragments of same male), N. Korea (USNM), no other data; 27♂♂, 7♀♀ (pinned), S. Korea, #32, Cheju-do, Chungmun-ni waterfall, [Cheonjeyeon waterfall, N33.25071, E126.41655], 10 mi. E Mosulp'o, altitude 125 ft., 1954.09.07, George W. Byers (KU); 14♂♂, 14♀♀, 1 specimen of unclear sex (pinned), S. Korea, #33, Cheju-do, Sogwi-ri, waterfall, [Seogwipo-si, Cheonjiyeon waterfall, N33.24707, E126.55456], 18 mi. E Mosulp'o, altitude 30 ft., 1954.09.07, George W. Byers (KU); 1♀ (pinned), S. Korea, #38, Hill 1468, 16 mi. NW Chunchon, 127°30′E, 38°00′N, altitude 4300 ft., 1954.09.17, George W. Byers (KU); 1♀ (in ethanol), S. Korea, Gyeongsangbuk-do, Cheongdo-gun, Unmun-myeon, Sinwon-ri, Mt. Ulmunsan, N35.6532778, E129.0256111, alt. 439 m, 2009.06.04-07.09, J.D Yeo & J.D. Yoon, Malaise trap (NIBR); 1♀ (in ethanol), S. Korea, Ulsan, Ulju-gun, Sangbuk-myeon, Deokhyeon-ri, Mt. Gajisan, N35. 62150, E129.04722, alt. 276 m, 2009.08.06-09.04, J.D Yeo, Malaise trap (NIBR); 1♀ (in ethanol), S. Korea, Yeosu environs, Manheung-dong, Manseong-ri Black Sand Beach, N34.78094, E127.74765, alt. 12 m, 2012.06.25, S. Podenas, net (NIBR); 2♀♀ (in ethanol), S. Korea, Gyeonsangnam-do, Goseong-gun, Guman-myeon, Masan-Shi, N35.07756, E128.36700, alt. 29 m, 2012.08.26, C. L. Young, net (NIBR); 1♂, 1♀ (in ethanol), S. Korea, Jeollabuk-do, Namwon-si, Sannae-myeon, Ipseok-ri, N35.41021, E127.64735, alt. 319 m, 2013.05.11, S. Podenas, net (NIBR); 1♂ (in ethanol), S. Korea, Gyeongsangnam-do, Hamyang-gun, Macheon-myeon, Samjeong-ri, N35.36713, E127.65228, alt. 406 m, 2013.05.11, S. Podenas, net (NIBR); 1♂, 1♀ (in ethanol), S. Korea, Gyeonggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri, N38.02982, E127.44310, alt. 560 m, 2014.08.20, S. Kim, net (NIBR).

***Geranomyia multipuncta* Alexander, 1922**

Geranomyia multipuncta Alexander, 1922: 177.

General coloration brown to light brown. Body length of male 4.7-6.8 mm, female 5.5-7.1 mm. Wing length of male 5.8-7.8 mm, female 6.7-7.8 mm.

Head dark brown with a narrow longitudinal light gray median line on vertex. Anterior vertex very narrow in male, somewhat wider in female, covered with silvery gray pruinosity. Dorsally head covered with sparse erect brown setae. Eyes large, reaching each other on ventral side of head. Length of male antennae 0.75-1.20 mm, that of female 1.00-1.25 mm. Whole antenna entirely

dark brown. Scape elongate, cylindrical, covered with scarce gray pruinosity. Pedicel slightly elongate, getting wider distally. Flagellum 12-segmented. Flagellomeres elongate, nearly equal in length, just basal segment somewhat longer. Distal segment elongate, nearly as long as preceding segment. Verticils very short, shorter than respective segments. Erect grayish pubescence, covering segments is very short, denser on ventral side of flagellum. Rostrum and mouth parts entirely dark brown. Ventral side of rostrum covered with scarce erect long setae. Mouth parts covered with very short setae. Rostrum together with mouth parts is 2.5 mm long in male and 1.7-2.5 mm in female. Palpus dark brown and very short, three-segmented, but basal segment is so small, that palpus seems two-segmented. Palpomeres covered with short erect setae. Subapical segment elongate, nearly cylindrical, apical segment oval and somewhat lighter, brownish. Palpus is situated approximaly at four fifths of antena's length.

Thorax generally yellowish brown. Pronotum grayish brown with distinct dark brown longitudinal median line. Mesonotal prescutum light brown with somewhat darker central part and with three distinct dark brown longitudinal lines. Central line wide frontally, getting narrower posteriorly, lateral lines narrow and close to median line. Lateral margins of prescutum widely light brown. Lobes of scutum dark brown, just margins narrowly light brown. Scutellum light brown with narrow dark brown median line. Mediotergite dark brown, without median line, just fronto-lateral corners lighter. Pleura light brown with dark brown longitudinal line extending along dorsal margin, right beneath the wing. Ventral margin of katepisternum pale. Wing (Fig. 4B) with light brownish tinge and distinct pattern of brown spots, which are most pronounced at frontal wing margin. Wing base with few separate small spots. Largest irregular spot at base of *Rs*, which nearly reaches vein *M*. Large spot before base of *Rs* also nearly reaches *M*, but spot beyond base of *Rs* not reaches even *Rs*. Large spot at tip of *R* extends between vein *C* and R_{2+3}. It has narrower extension reaching R_{4+5}. Large spot at distal end of cell r_3 has small light window. Distal end of *Rs*, cord and distal margin of discal cell are surrounded by dark areas. Small dark spots also present at tips of all longitudinal veins, the most distinct of them is at tip of A_2. Many small spots present in cells m and a_1, but usually cell *cu* is free from small spots. Number and position of small spots is variable among specimens. Somewhat variable is also shape and position of largest spots. Whole distal wing margin is slightly darker than remaining wing area. Subcostal cell yellowish. Wing veins brown, *Sc* and base of *R* yellowish. Venation: Sc_1 reaching wing margin somewhat beyond middle of *Rs*, Sc_2 close to Sc_1 tip. Indistinct additional cross vein present in the middle between arculus and base of *Rs*, sometimes it is closer to base of *Rs*. *Rs* angulated and short-spurred at base. R_1 and R_2 transverse and starting at the same point. Discal cell twice as long as wide. Basal deflection of CuA_1 is at or slightly before branching point of *M*. Vein A_1 very slightly sinuous, A_2 slightly arched at tip. Cell a_2 wide. Length of male halter 0.9-1.1 mm, that of female 0.9-1.2 mm. Stem of halter light brown with pale base. Knob slightly darkened, brownish. Coxa and trochanters very light brown or yellow. Legs obscure yellow, distal tarsomeres brown. Femur in some specimens just slightly darkened at tip. Male femur II: 4.9-5.5 mm long, III: 5.0 mm; tibiae II: 5.1-6.1 mm, III: 5.5 mm; tarsus II: 4.4 mm long. Female femur I: 5.2-6.0 mm long, II: 5.7-6.6 mm, III: 4.9-6.6 mm; tibiae I: 6.0-7.2 mm, II: 6.0-7.1 mm, III: 5.5-7.4 mm; tarsus I: 5.2-6.4 mm, II: 4.9-5.2 mm, III: 4.1-4.9 mm long. Claw with small subbasal spine.

Abdominal tergites brown, two basal tergites somewhat darker. Posterior and lateral margins of tergites narrowly grayish. Tergites covered with short scarse yellowish setae. Sternites distinctly lighter than tergites, light brown. Three basal sternites pale yellow. Distal (genital) sternite darkened. Male genitalia (Fig. 4E) large. Ninth tergite transverse, dark brown, posterior margin with small median emargination. Lateral sides of tergite swollen and setose. Gonocoxite dark brown, very wide at base and distinctly narrower at tip, with large ventro mesal lobe, distal end of which rounded and setose. Outer gonostylus short, hook-shaped, sclerotised and dark brown. Inner gonostylus large, slightly more than twice as long as gonocoxite, widened at central part, getting narrower towards apex. Rostral appendage short and strongly curved with single but very long and curved subapical spine. It reaches to the middle of gonostylus, if extended. Paramere wide at base, very narrow and arched at distal end. Edeagus long and narrow. Ovipositor (Fig. 5B) with cercus and hypovalve light brown to brown. Cercus very narrow and nearly straight, tip rounded. Hypovalvae wide at base turning distinctly narrower towards apex, reaching to about middle of cercus.

Elevation range in Korea. Specimens were collected at altitudes from about 90 m to about 430 m in South Korea.

Period of activity. Adults are flying from late April through middle of July in South Korea.

Habitats. Adults were collected at the medium-sized, very fast flowing mountainous streams with rocky bottom.

General distribution. The species was known only from Japan (Honshu and Shikoku Islands) (Oosterbroek, 2015).

Examined materials (Fig. 10F): 1 ♀ (pinned), [South] Korea, #18, Central Nat'l. Forest, 18 mi. NE Seoul, [N37. 74813, E127.29364], 350-500′, 6 July 1954, George W.

Byers (KU); 1♀ (pinned), Korea, #20, 2 mi. S Pup'yong-ni, 16 mi. NE Seoul, [N37.74075, E127.22069], 300-450′, 11 July 1954, George W. Byers (KU); 1♂, 1♀ (pinned), Korea, #22, Central Nat'l. Forest, 18 mi. NE Seoul, [N37.74813, E127.29364], 400-500′, 11 July 1954, George W. Byers (KU); 1♂ (in ethanol, wing slide-mounted), S. Korea, Jeollabuk-do, Jirisan National Park, N35.26137, E127.60302, alt. 431 m, 2012.04.29, S. Podenas (NIBR); 1♀ (pinned), S. Korea, Gyeongsangnam-do, Hadong-gun, Hwagae-myeon, Beomwang-ri, N35.27655, E127.61796, alt. 364 m, 2013.05.08, S. Podenas, H.-W. Byun (NIBR).

***Geranomyia neavocetta* (Alexander, 1938)**

Limonia (*Geranomyia*) *neavocetta* Alexander, 1938: 138.

General coloration brown. Body length of male 6.8 to 8.4 mm, female 6.4-8.5 mm. Wing length of male 8.1 to 9.3 mm, female 6.7-10.1 mm.

Head dark brown to black, covered with sparse grayish pruinosity. Anterior vertex very narrow in male, somewhat wider in female, covered with sparse erect grayish setae. Eyes large, reaching each other on ventral side of head. Length of male antennae 1.2-1.4 mm, that of female also 1.2-1.4 mm. Scape elongate, cylindrical. Ventral side of it reddish brown, dorsal side blackish, covered with grayish pruinosity. Pedicel nearly rounded, ventral side brownish. Flagellum 12-segmented, dark brown to black. Flagellomeres oval. Basal flagellomeres distinctly narrower, but approximately as long as pedicel, distal flagellomeres getting somewhat longer. Distal segment elongate, approximately 1.5 times as long as preceding segment. Verticils very short, shorter than respective segments. Erect grayish pubescence, covering segments is very short, denser on ventral side of flagellum. Rostrum light brown dorsally, blackish laterally, reaching approximately to the end of second flagellar segment. Mouth parts dark brown, covered with short erect brownish setae. Rostrum together with mouth parts is 2.30-3.55 mm long in male and 2.25-2.70 mm in female. Palpus very short, three-segmented. Basal and distal segments very short and narrow, second segment widely oval. Palpomeres dark brown to black, covered with very short stout setae. Position of palpus slightly varies in different specimens, from before to well behind level of antennal tip.

Thorax generally dark brown dorsally, reddish brown laterally and light brown to yellowish ventrally. Pronotum dark brown covered with rather dense grayish pruinosity, postero-lateral margin paller. Mesonotal prescutum nearly uniformly dark brown, covered with gray pruinosity, shoulders obscure yellow. Weak narrow blackish median prescutal stripe is visible in some specimens, but missing in others. Lateral stripes usually not expressed, but visible as narrow lines in light specimens. Lobe of scutum dark brown, margin at wing base widely reddish brown. Scutellum and mediotergite uniformly dark brown. Pleura rusty brown with yellowish brown ventral part. Wing (Fig. 4C) brownish with distinct pattern of brown spots, which are most distinct at frontal wing margin. Spot at wing base, surrounding humeral vein and arculus, extends from costal to medial vein. Second spot is in the middle between spot at wing base and at base of *Rs*. It extends between veins *C* and *M* and is nearly quadrate in shape. It surrounds extra cross-vein in cell *sc*, but that vein is hardly visible. Spot at base of *Rs* is nearly rectangle in shape and nearly reaches vein *M*. Smaller spot surrounds Sc_1 and Sc_2. It reaches on vein *Rs*. The largest spot at tip of R_1 extends between *C* and R_{2+3} and has narrower extension reaching R_{4+5}. Large spot at distal end of cell r_3 has light rounded window, which sometimes divides that spot in two. Distal end of *Rs*, cord and distal margin of discal cell are surrounded by dark areas. Dark spots also present at tips of CuA_2 and A_2, very light spots also present at tips of CuA_1 and A_1. Whole distal wing margin is slightly darker than remaining wing area. Subcostal cell yellowish. Wing veins brown, *Sc* and base of *R* yellowish. Venation: Sc_1 reaching wing margin at the middle of *Rs*, Sc_2 close to Sc_1 tip. Indistinct additional cross vein present in the middle between arculus and base of *Rs*. *Rs* arched or angulated and short-spurred at base. R_1 and R_2 transverse and starting at the same point. Discal cell twice as long as wide. Basal deflection of CuA_1 is slightly before branching point of *M*. Vein A_1 very slightly sinuous, A_2 distinctly arched at tip. Cell a_2 wide. Length of male halter 1.10-1.30 mm, that of female 1.05-1.30 mm. Stem of halter pale yellow, knob slightly darkened, brownish. Coxa brownish yellow, trochanters yellow with blackened distal margin. Femur yellow, distal end slightly darkened. Tibia light brown, distal end narrowly dark brown. Tarsus light brown at base, passing into dark brown distally. Male femur I: 5.4-5.8 mm long, II: 6.1-7.1 mm, III: 5.8-7.1 mm; tibiae I: 6.0-7.6 mm, II: 6.4-7.0 mm, III: 6.4-7.5 mm; tarsus I: 5.3-5.8 mm, II: 4.4-5.2 mm, III: 4.2-5.0 mm long. Female femur I: 6.7 mm long, II: 5.4-6.1 mm, III: 5.4-6.0 mm; tibiae I: 7.1 mm, II: 5.8 mm, III: 6.1-6.4 mm; tarsus I: 6.6 mm, II: 4.0 mm, III: 3.8 mm long. Claw with small subbasal spine in both sexes.

Abdominal tergites brown, just basal tergite dark brown. Posterior and lateral margins of tergites light, yellowish or grayish. Tergites covered with short scarse golden setae, which could be missing in older specimens. Sternites distinctly lighter than tergites, light brown. Male genitalia (Fig. 4F, G) large. Ninth tergite transverse, dark brown, posterior margin with small median emargination. Lateral sides of tergite swollen and setose. Gonocoxite dark brown, slightly elongate, with large ventro

mesal lobe, distal end of which widened, rounded and setose. Outer gonostylus short, hook-shaped, sclerotised, pale at base, blackened at tip. Inner gonostylus large, twice as long as gonocoxite, oval, covered with short setae, bearing short rostral prolongation. Two straight medium-long rostral spines starting from subapical tubercle. Both spines are very close together for their entire length. Paramere wide at base, narrow at distal end. Postero-lateral angles slightly extended laterally. Edeagus long, wide at base, narrow at apex, very tip distinctly turned downwards. Ovipositor (Fig. 5C) with cercus and hypovalve light brown to brown. Cercus nearly parallel-sided, slightly curved at middle, tip rounded. Hypovalvae wide and comparatively short, reaching to about middle of cercus. Vaginal apodeme extended into long narrow rod, which nearly reaches tip of valvae.

Elevation range in Korea. Specimens were collected at altitudes from 0 m to nearly 400 m.

Period of activity. Adults are flying through May and June in Korea.

Habitats. Adults were collected on wet rocks, where their larvae were found among other fauna hygropetrica organisms. They were also found at the medium-sized, very fast mountainous streams with rocky bottom.

General distribution. Species is endemic for Korean Peninsula.

Examined materials (Fig. 10G): Holotype, 1♀ (pinned, wing slide-mounted), N. Korea, Ompo, 170′, VI-3.37 [1937], Yankovsky (USNM); 1♂, 2♀♀ (in ethanol), S. Korea, Yeosu environs, Manheung-dong, Manseong-ri Black Sand Beach, N34.78094, E127.74765, alt. 12 m, 2012.06.25, S. Podenas, *Fauna hygropetrica*, (NIBR); 4♂♂ (pinned), 2♂♂, 1♀ (in ethanol), S. Korea, Gyeongsangnam-do, Hadong-gun, Hwagae-myeon, Beomwang-ri, N35.27655, E127.61796, alt. 364 m, 2013.05.08, S. Podenas, H.-W. Byun (NIBR); 2♀♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naedong-ri, N35.26580, E127.58128, alt. 378 m, 2013.05.10, S. Podenas (NIBR).

Discussion. *Geranomyia neavocetta* is closely related to *G. avocetta* Alexander, 1913. Original description of *G. neavocetta* is based on single female from Ompo, North Korea, which differs from Japanese *G. avocetta* only in coloration of thorax. The authors noticed that Korean specimens are varied in coloration of thorax, but male genitalia of lighter and darker specimens are identical.

Helius Lepeletier & Serville, 1828

(characteristic in Podenas and Byun, 2014a)

Key to Korean species of the genus *Helius* Lepeletier & Serville, 1828

1. Wing cord surrounded by distinctly darkened area····· ·····*Helius* (*Helius*) *gracillimus* Alexander, 1938
− Wing cord surrounded by indistinct darkening at most, usually not darkened ····· 2
2. Thorax gray. Radial sector (*Rs*) straight····· ·····*Helius* (*Helius*) *polionotus* Alexander, 1938
− Thorax light brown or yellowish. Radial sector (*Rs*) angulated or arched at base ····· 3
3. Radial sector (*Rs*) angulated and short-spured at base, cross-vein *r-m* less than its own length beyond branching point of *Rs*. Gonocoxite of male genitalia with extra lobes on dorsal surface····· ·····*Helius* (*Helius*) *obliteratus* (Alexander, 1920b)
− Radial sector (*Rs*) arched at base, cross-vein *r-m* far beyond branching point of *Rs* (Fig. 6D). Gonocoxite of male genitalia simple, without extra lobes on dorsal surface (Fig. 6E)····· ····· *Helius* (*Helius*) *nipponensis* (Alexander, 1913)

Helius (*Helius*) *nipponensis* (Alexander, 1913)

Rhampidia nipponensis Alexander, 1913: 207; 1920b: 8.
Helius nipponensis Alexander, 1929: 532.

General coloration light brown. Body length of male 4.9 to 8.0 mm, female 5.9-7.8 mm. Wing length of male 5.6 to 8.1 mm, female 6.2-8.3 mm.

Head dark brown, covered with sparse grayish pruinosity. Anterior vertex very narrow, covered with sparse erect grayish setae. Eyes large, ventrally nearly reaching each other. Length of male antennae 1.08-2.50 mm, that of female 1.55-1.80 mm. Antenna brown. Scape slightly widened distally, dark brown, covered with sparse gray pruinosity. Pedicel oval, yellowish brown in some specimens, dark brown in other. Flagellum 14-segmented, dark brown at base, getting somewhat lighter distally. Just base of basal flagellomere yellowish. Flagellomeres long, cylindrical. Basal flagellomere slightly less than twice as long as pedicel, widened in middle. Succeeding few flagellomeres subequal in length, cylindrical. Apical flagellomere very small, distinctly shorter than penultimate in male, but just slightly shorter in female. Verticils nearly twice as short as length of respective segments. Erect brownish pubescence, covering segments is rather short, uniformly dense on all sides of flagellum. Rostrum blackish, covered with short semi-erect blackish setae, 0.55-0.85 mm long in male and 0.55-1.00 mm long in female. Palpus dark brown, covered with erect dark brown setae. Mouth parts light yellow, covered with dark brown erect setae.

Thorax generally pale brownish yellow. Pronotum dark brown dorsally, yellow laterally. Mesonotal prescutum light brown, getting brownish yellow laterally. Median prescutal stripe is longest and broadest, dark brown, especially dark frontally. Lateral stripes less distinct; they start behind the pseudosutural fovea and extend onto

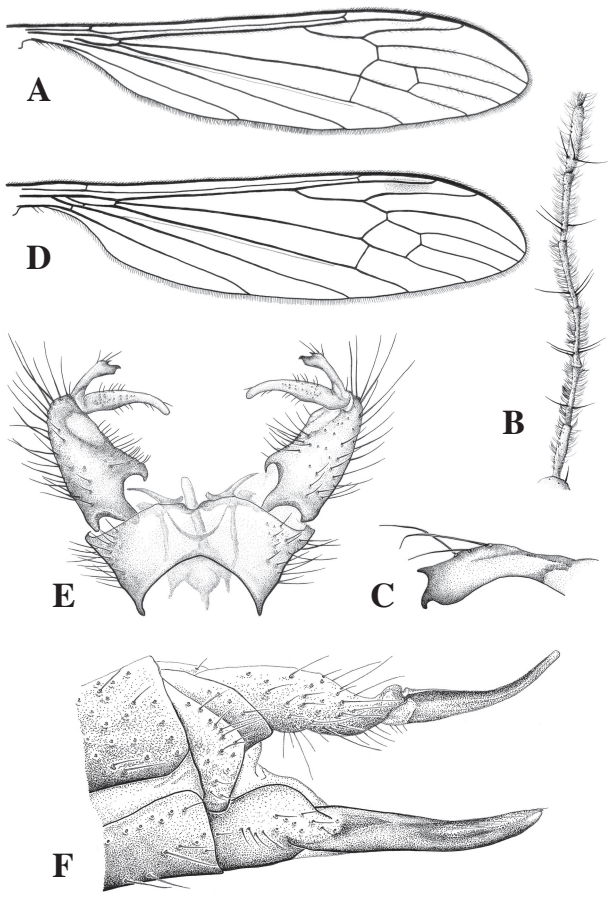

Fig. 6. *Helius*. A-C. *H. nawaianus*. A. wing, B. basal flagellomeres. C. outer gonostylus of male genitalia. D-F. *H. nipponensis*. D. wing. E. male genitalia, dorsal view. F. ovipositor, lateral view.

scutal lobes, which are dark brown. In dry specimens, that were collected long time ago, lateral stripes could be missing. Scutellum brownish yellow, margins yellow, frontal part brown. Mediotergite brownish yellow or light brown. Pleura brownish yellow, in some specimens getting whitish yellow posteriorly. Ventral surface of katepisternum brown. In general, thorax of Korean specimens is somewhat lighter than that of Japanese specimens, described by Alexander (1913; 1920b). Wing (Fig. 6B) translucent, yellowish, without dark spots, except very weak darkening in stigmal area. Stigma big but very indistinct, light brown. Costal area more intensely yellowish, than remainder of wing. Veins brownish. Venation: Sc_1 reaching wing margin at or slightly before branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* slightly arched at base. Separate vein R_2 missing. Both branches of *Rs* distinctly diverging distally. Cross-vein *r-m* very short, in some specimens it is shorter, than that shown in Fig. 6B, but in this case proximal part of discal cell is wider. Discal cell wide, about 1.6 times as long as wide, sometimes less than that. Basal deflection of CuA_1 distinctly beyond branching point of *M*, about at one-fifth of discal cell's length. Both anal veins long and nearly straight. Anal angle medium-sized, comparatively narrow. Length of male halter 0.80-1.25 mm, that of female 0.85-1.10 mm. Stem of halter light yellow, base whitish, knob slightly darkened, brownish. Frontal coxa brownish yellow, middle coxa yellow, posterior coxa whitish yellow. Trochanters yellow, distal margin blackened. Femur yellowish brown, lighter basally. Tibiae brown. Tarsi brown passing into dark brown distally. Male femur I: 4.8-5.8 mm long, II: 5.1-7.6 mm, III: 5.1-7.4 mm; tibiae I: 6.7 mm, II: 5.5-8.2 mm, III: 8.0 mm; tarsus I: 5.4-5.8 mm, II: 4.9-6.2 mm, III: 5.8 mm long. Female femur I: 5.1-6.4 mm long, II: 5.1-6.5 mm, III: 5.3-5.6 mm; tibiae I: 6.5-6.8 mm, II: 6.1-7.0 mm, III: 5.9-6.0 mm; tarsus I: 5.1-5.8 mm, II: 5.4 mm, III: 4.1-5.0 mm long. Claw simple, yellowish brown, without additional spines.

Abdominal tergites dark brown, with or without weak median dark line. Sternites somewhat lighter than tergites, especially at base of abdomen. Distal segments distinctly blackened in male, less so in female. Tergites and sternites covered with semi-erect scarce, yellowish setae. Membranes between tergites and sternites yellow, better visible in females. Abdomen of females in ethanol could be distinctly lighter, fouly yellow, with more distinct longitudinal dorsal line. Male genitalia (Fig. 6E) brownish yellow. Ninth tergite simple, posterior margin with small median emargination, margins of which covered with short blackish setae. Gonocoxite elongate, wider basally than distally. Outer gonostylus short, slightly widened distally, produced into slightly arched apical spine, bearing small subapical spine and three long setae on posterior margin. Inner gonostylus distinctly longer than outer, fleshy, wider basally, turning narrower distally, tip blunt and narrow. Gonostylus covered with semi-erect setae. Penis short, simple and narrow. Interbase narrow, acute, spine-shaped. Ovipositor (Fig. 6F) yellow. Cercus brownish dorsally, strongly arched, with apex turned up-wards. Hypovalvae long, not reaching tip of cercus.

Elevation range in Korea. Specimens are known to occur at altitudes from 0 m to 630 m.

Period of activity. Adults are flying from late June through October in South Korea.

Habitats. The species was collected in dense willow shrubs with grassy vegetation on wet, swampy soil; on river slopes, covered with deciduous forest; in high grassy vegetation on banks of slow flowing water pond; in abandoned farm land with small stream at mixed forest edge. Males were attracted to light. Larvae were developing at margins of ponds and marshes, in mud rich of decaying plant material.

General distribution. The species is known from Japan, Honshu Island and China, Zhejiang.

Examined materials (Fig. 10H): 1♂ (pinned), S. Ko-

rea, #14, Oho-ri, east coast, 128°30′, 38°20′, 10-50′, 1954.07.11, coll. George W. Byers (KU); 2♂♂ (pinned), Korea, Davis Trap 16, 1959.08 (USNM); 1♂ (pinned), Korea, Pusan, Davis Trap 23, 1959.10 (USNM); 1♀ (in ethanol), S. Korea, Gangwon-do, Wondeok-eup, Wolcheon-ri, Samcheog, N37.14899, E129.35933, alt. 629 m, 2012.06.23, coll. S. Podenas (NIBR); 1♂ (pinned), 1♂ (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35. 26590, E127.58096, alt. 446 m, 2014.08.24, coll. S. Podenas, with net and at light (NIBR); 5♂♂, 4♀♀ (in ethanol), S. Korea, Jeollabuk-do, Buan-gun, Byeosan-myeon, Daehang-ri, Byeonsanbando National Park, Jiksocheon, N35.67249, E126.56445, alt. 26 m, 2014.08.26, coll. S. Podenas (NIBR); 3♂♂, 2♀♀ (in ethanol), Gyeongsangnam-do, Changwon-si, Masanhappo-gu, Jindong-myeon, Dagu-ri, N35.113086, E128.530671, 2014.08.31, coll. S. Podenas (NIBR). Also compared with: Holotype, 1♀ (slide-mounted), Japan, Tokyo, April 26, 1912; Metatype: 1♂ (slide-mounted), China, Hang-chow, Che-kiang, April 28, 1924, coll. S. Manson, det. Ch. Alexander (USNM).

Discussion. *Helius nipponensis* is closely related to *H. nawaianus* Alexander, 1929 (Fig. 6A-C), but differences could be observed in wing venation, and especially in outer gonostylus. Outer gonostylus of *H. nipponensis* is produced into a long apical spine (Fig. 6E), while it ends in two subequal blackened knobs or obtuse spines in *H. nawaianus* (Fig. 6C). *H. nawaianus* is known only from islands (Kunashir, Sakhalin and Honshu). Other closely related species is *H. brevioricornis* (Alexander, 1920b), known only from Japan. Male genitalia of *H. nipponensis* and *H. brevioricornis* are very similar (compared with slide-mouted genitalia of Alexander's metatype). According to Alexander (1920b), *H. nipponensis* has longer male antennae. The clear difference between these two species is coloration of thorax, which is brownish yellow in *H. nipponensis* and gray in *H. brevioricornis*. It is possible that they represent just different morphs of same species, but additional studies are needed.

***Libnotes* Westwood, 1876**

Libnotes Westwood, 1876: 505; Edwards, 1928: 74; Savchenko and Krivolutskaya, 1976: 118; Savchenko, 1983: 110; 1985: 39, 1989: 323.

Limonia (*Libnotes*) Alexander, 1929: 242, 245; Ishida, 1957: 125.

Type species - Libnotes thwaitesiana Westwood, 1876 (Sri Lanka).

Most species of *Libnotes* are big, with body size up to 15-17 mm, or very big, up to 23-24 mm, when compared with other Limoniidae crane flies. Body coloration varies from yellow to gray, dark brown or nearly black. Antennal flagellum 12-segmented, apical flagellomere big, usually nearly twice as long as preceding segment, often wider at base and distinctly narrowed at distal part. Wing comparatively long and narrow, reaching far beyond tip of abdomen. Stigma well defined, dark areas often surround cord and distal cross-veins. Some species have darkenings also along distal longitudinal veins, in some cases these darkenings are broken into many small spots or dashes. Wing venation: humeral vein at the level of *arculus*; *Sc* long, Sc_1 usually reaches far beyond branching point of *Rs*, only in some cases it ends approximately at branching point of radial sector; Sc_2 usually close to tip of Sc_1, just in some species it is distinctly before that, at approximately middle of *Rs*; R_1 often short and transverse, but in some species it is elongate; R_2 short and transverse, position of it varies, but in most cases it is close to tip of R_1; radial sector short, oblique, it starts approximately at middle of wing length; distal radial and medial cells long and narrow; distal branches of radial and medial veins distinctly arched, tips pointed towards posterior wing margin; distal cell long and narrow; basal deflection of CuA_1 beyond branching point of *M*; A_1 long and nearly straight; A_2 shortened, arched or slightly sinuous. Anal angle small or medium-wide. Males of some species have numerous small spines on frontal femorae and tarsi, which are missing in females. Inner gonostylus of male genitalia with unique lobe, that carries apically distinct pencil of long setae; ninth tergite simple, posterior margin rounded or straight; penis bifid at apex. Cercus of ovipositor with unique subapical teeth, hypovalvae with saw-shaped margin.

Larvae of *Libnotes* are metapneusnistic. Their body coloration light, surface covered with short pubescence, form terete and elongate. Abdominal segments with ventral and dorsal creeping welts formed by spinulae. Spiracular disc with four inconspicuous spiracular lobes, spiracular field with two ventral sclerites. Spiracle oblique, oblong or elliptical. Anal field surrounded by four long, white and fleshy anal papillae. Head capsule hemicephalic, prognatous, oval, with caudal end turned into acute spine. Labrum fused with broad clypeus. Hypostoma dentate (5-7 teeth) and deeply split posteriorly. Larvae are developing in wet rotten wood of deciduous and coniferous trees. They also could be found in tunnels of wood-boring beetles.

Pupa terete, gradually tapering from base of wing pads to slender cauda. Pronotal horns elongate, curved and flattened against thorax. Tips of wings reach posterior margin of second abdominal segment. Antennal sheath reach the wing base. Numerous spiracular openings are situated laterally. Abdominal segments 3-7 subdivided into two annuli. End of female abdomen cone-likely narrowed without additional hooks. Cauda of male abdomen rounded without additional hooks (Wood, 1952; Krivo-

sheina and Krivosheina, 2011).

A total of 286 species belong to the genus *Libnotes* is recorded worldwide. The largest diversity is observed in Oriental Region, 131 species and Australian Region, 110 species. Thirty nine species are known from Afrotropic and 16 from Palaearctic Region, except Nearctic and Neotropical Regions (Oosterbroek, 2015). No fossil species of the genus *Libnotes* are known so far (Evenhuis, 2014).

Key to Korean species of the genus *Libnotes* Westwood, 1876

1. Vein Sc_1 reaching wing margin approximately at the level of *Rs* branching point, basal deflection of CuA_1 just slightly beyond branching point of *M* (Fig. 7A) ··· *Libnotes* (*Afrolimonia*) *ladogensis* (Lackschewitz, 1940)
− Vein Sc_1 reaching wing margin far beyond branching point of *Rs*, basal deflection of CuA_1 at least its own length beyond branching point of *M* (Fig. 7B-G) ····· ····· *Libnotes* (*Libnotes*) 2
2. Wing patterned with large dark brown spots, which usually make cross bands at least at cord and at the level of stigma - distal margin of discal cell. Radial sector (*Rs*) entirely surrounded by distinct dark brown area (Fig. 7B, C) ····· ····· *Libnotes* (*Libnotes*) *amatrix* (Alexander, 1922)
− Wing patterned with small brownish or grayish spots and narrowly darkened areas at cord and distal margin of discal cell at most (Fig. 7D-G) ····· 3
3. Longitudinal veins, especially *Cu* and branches beyond cord patterned with lots of small spots (Fig. 7E, G) ····· 4
− Longitudinal veins without small spots (Fig. 7D, F) ··· ····· 5
4. Large species, wing length exceeds 15 mm. Small elongate spots distributed only along longitudinal veins (Fig. 7E) ····· ····· *Libnotes* (*Libnotes*) *longistigma* Alexander, 1921
− Small species, wing length not exceeds 10 mm. Small rounded spots distributed not only along veins, but also in all cells (Fig. 7G) ····· ····· *Libnotes* (*Libnotes*) *puella* Alexander, 1925
5. Costal area of wing before humeral vein distinctly dark brown. Entire vein *Cu* surrounded by dark area, *Rs* has dark spot only at base (Fig. 7D) ····· ····· *Libnotes* (*Libnotes*) *basistrigata* (Alexander, 1934)
− Costal area at wing base not darkened. Vein *Cu* not surrounded by dark area, dark area extends along entire *Rs* (Fig. 7F) ····· ····· *Libnotes* (*Libnotes*) *nohirai* Alexander, 1918

***Libnotes* (*Afrolimonia*) Alexander, 1965**

Limonia (*Afrolimonia*) Alexander, 1965: 48.
Libnotes (*Afrolimonia*) Savchenko and Krivolutskaya, 1976: 120; Savchenko, 1983: 114, 1985: 41, 1989: 325. Type species - *Limonia rhizosema* Speiser, 1909 (Africa).

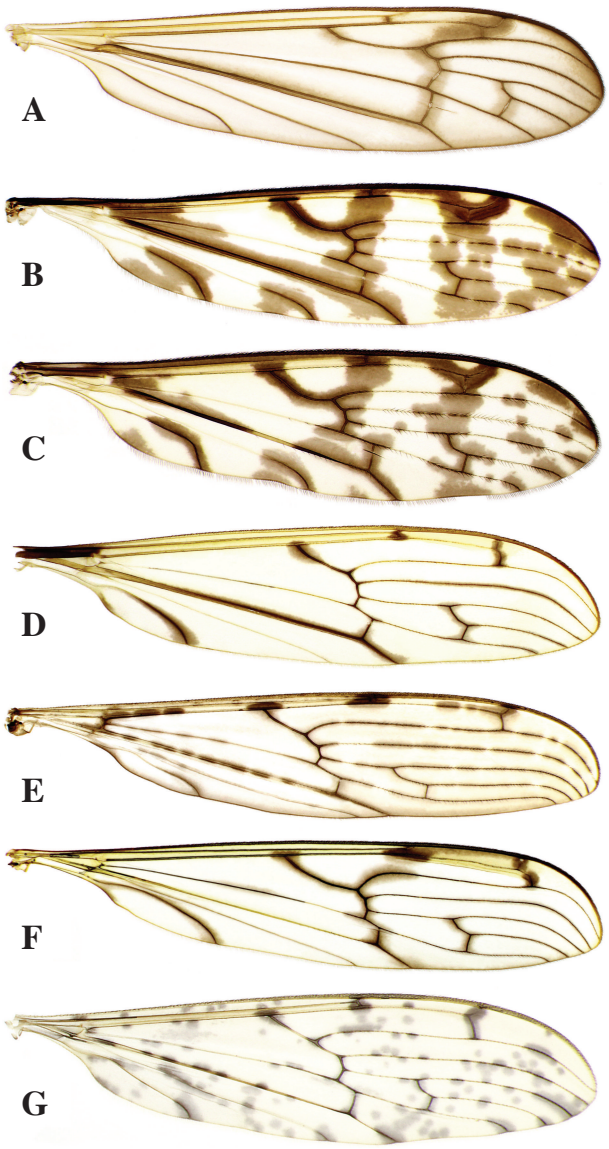

Fig. 7. Wings of *Libnotes*. A. *L.* (*Afrolimonia*) *ladogensis*. B. *L.* (*Libnotes*) *amatrix*, male. C. *L.* (*Libnotes*) *amatrix*, female. D. *L.* (*Libnotes*) *basistrigata*. E. *L.* (*Libnotes*) *longistigma*. F. *L.* (*Libnotes*) *nohirai*. G. *L.* (*Libnotes*) *puella*.

Dark brownish gray, gray or nearly black crane flies. They are generally similar to crane flies belonging to nominative subgenus, differences are observed mainly in wing venation: vein *Sc* long, Sc_1 approximately at the level of *Rs* branching point, Sc_2 some distance before tip of Sc_1, usually close to the middle of *Rs*; R_1 longitudinal; R_2 well before R_1 tip; radial sector, if compared with that in other subgenera, long and nearly straight; distal branches of radial and medial veins just slightly arched,

distal cells comparatively short; basal deflection of CuA_1 just slightly beyond branching point of *M*.

Larva of *Afrolimonia* is generally similar to larvae of other subgenera. Differences are found in hypostoma with which the larvae of *Afrolimonia* have five teeth, while other known larvae have more than five; sclerites on spiracular field have blurred edges, while sclerites of other larvae have sharp edges (Krivosheina and Krivosheina, 2011).

A total of 42 species of the genus *Afrolimonia* is recorded, with 38 species from Afrotropical Region and only 2 species each from Palaearctic and Oriental Region (Oosterbroek, 2015).

***Libnotes* (*Afrolimonia*) *ladogensis* (Lackschewitz, 1940)**

Limonia ladogensis Lackschewitz, 1940: 6.

Libnotes (*Afrolimonia*) *ladogensis*: Savchenko, 1983: 115, 1985: 42.

General coloration dark grayish brown. Female body length 10.0 mm, wing length 14.8 mm.

Head black, covered with gray pruinosity, which is more intense at eye margins. Semi-erect brown setae densier at eye margins and on ventral side. Anterior vertex very narrow. Eyes large, ventrally nearly reaching each other. Antenna 14-segmented. Scape long and wide, reaching to about tip of rostrum, dark reddish brown to blackish, covered with sparse gray pruinosity. Pedicel short, slightly widened distally, dark reddish brown with lighter base. Basal flagellomeres short, nearly rounded, dark brown to blackish, covered with gray pruinosity. Apical flagellomere wide at base and distinctly narrowed at distal end, nearly twice as long as preceding segment. Verticils approximately as long as respective segments. Short pubescence, covering segments whitish, densier on ventral side. Rostrum dark brown, semi-polished. Palpus dark brown, covered with erect dark brown setae. Mouth parts dark brown.

Thorax dorsally brownish gray. Cervical sclerites, pronotum and mesonotal prescutum semi-polished, dark brown, covered with sparse gray pruinosity. Prescutum with four polished blackish stripes. Central stripes separated by narrow gray witta. Gray pruinosity densier on lateral margins of sclerite. Scutal lobes dark brown, semi-polished separated by wide silvery gray area. Scutellum and mediotergite reddish brown, but covered with dense gray pruinosity. Pleura dark brown, semi-polished, covered with gray pruinosity, which is densier posteriorly. Katepisternum bears few long yellow setae. Wing (Fig. 7A) with brownish tinge. Stigma large, elongate and dark brown. Costal area yellowish. Dark areas surround cord, distal end of discal cell and cubital vein. Distal margin of wing darkened, small dark spots surround base of *Rs* and distal ends of anal veins. Veins brown. Venation: Sc_1 reaching wing margin slightly before branching point of *Rs*, Sc_2 slightly before Sc_1 tip. *Rs* slightly arched at base. Both branches of *Rs* long, parallel to each other and slightly turned backwards before wing margin. Vein R_2 twice its own length before R_1 tip. Cross-vein *r-m* distinct, at base of discal cell. Discal cell elongate, 2.4 times as long as wide. Basal deflection of CuA_1 slightly beyond branching point of *M*. A_1 nearly straight, A_2 slightly sinuous. Anal angle medium-sized, posterior margin widely rounded. Length of female halter 2.05 mm. Stem of halter pale, base light brown, knob brownis distally. Coxae brown with yellowish distal part. Trochanter brownish yellow, distal margin narrowly blackened. Femur yellow at base, turning brown towards distal end. Tibia and tarsus brown. Female femur I: 8.5 mm long, II: 9.2 mm, III: 9.8 mm; tibiae I: 10.4 mm, II: 10.0 mm, III: 11.0 mm; tarsus I: 11.7 mm, II: 10.0 mm long. Claw with three additional spines.

Abdomen dark brown. Two basal sternites of female abdomen each with large obscure-yellow basal spot. Tergites and sternites covered with semi-erect scarce, whitish setae. Male genitalia (redescription based on specimens from Lithuania) same color as abdomen. Ninth tergite simple, posterior margin with small median emargination. Gonocoxite slightly elongate, with large setose ventro-mesal lobe. Outer gonostylus narrow, sclerotised and hook-shaped. Inner gonostylus large, fleshy and setose, bearing large elongate rostral prolongation armed with erect spine at middle of posterior margin. Elongate lobe with apical pencil of setae starts beyond base of rostral prolongation. Paramere distinctly narrowed towards distal end, acute-apexed. Penis simple, elongate with bifid apex. Ovipositor (Fig. 8E) with black tenth tergite and base of hypovalvae. Cercus polished brown to yellowish brown, nearly straight, with subapical bump. Hypovalvae long, reaching to about middle of cercus, distal end slightly enlarged and smoothly serrated.

Elevation range in Korea. Single female was captured nearly at 1920 m altitude in North Korea.

Period of activity. Single female was captured in middle of August in North Korea.

Habitats. The species was collected by the author in dense mixed forests, on river slopes covered with old deciduous trees, in marshy areas covered by forests in Eastern and Western Palaearctic Regions. The species is attracted to light. According to Savchenko (1985), larvae are developing in dead wood of deciduous trees.

General distribution. The species is widely distributed in Palaearctic Region.

Examined materials (Fig. 10I): 1 ♀ (pinned), North Korea, Kankyo Nando, Puksu Pyaksan, alt. 6300 ft., VIII-14, 1939, A. Yankovsky (USNM).

***Libnotes* (*Libnotes*) Westwood, 1876**

Libnotes Westwood, 1876: 505.

Type species - *Libnotes thwaitesiana* Westwood, 1876 (Sri Lanka).

Usually large yellow, brownish or gray crane flies with long and comparatively narrow wings. Vein *Sc* very long, tip of Sc_1 reaches far beyond branching point of radial sector (*Rs*). Distal wing cells without additional cross veins. Basal deflection of CuA_1 at its own length beyond branching point of *M*. Ninth tergite of male genitalia simple, posterior margin widely rounded, gonocoxite with large ventro-medial lobe, outer gonostylus narrow and slightly arched, inner gonostylus oval or nearly so with well developed rostral prolongation and additional lobe bearing few long apical setae. Ovipositor usually bifid at apex. Larvae typical for the genus, developing in dead, rotten wood. Hypostoma with more than five teeth. Ventral sclerites of spiracular field with distinct margins (Krivosheina and Krivosheina, 2011). A total of 145 species of the subgenus *Libnotes* is recorded worldwide. Most of them are known from Oriental (84 spp.), Australia (59 spp.), and Eastern Palaearctic Region (11 spp.). Single species is known from Afrotropical Region (Oosterbroek, 2015).

***Libnotes* (*Libnotes*) *amatrix* (Alexander, 1922)**

Limnobia amatrix Alexander, 1922: 181.

Libnotes (*Libnotes*) *amatrix* Savchenko and Krivolutskaya, 1976: 120; Savchenko, 1983: 112.

General coloration yellowish to grayish brown. Body length of male 5.7-9.5 mm, female 6.5-7.6 mm. Wing length of male 9.5-12.0 mm, female 9.0-10.8 mm.

Head dark brown, covered with dense silvery gray pruinosity, which is especially dense along eye margin and on dorsal surface. Vertex dorsally with narrow dark medial line. Anterior vertex very narrow, yellowish brown, covered with sparse erect grayish setae. Eyes large, ventrally nearly reaching each other. Length of male antennae 1.55-2.10 mm, if bent backwards, ending before wing base. Antenna of female 1.65-1.90 mm long. Scape brown, covered with sparse gray pruinosity and few long setae. Pedicel oval, yellow. Flagellum 12-segmented. Flagellomeres light yellow, just three-four distal segment slightly infuscated. Basal segments short, distal slightly elongate. Apical flagellomere nearly twice as long as preceding segment, wider at base, distinctly narrowed at distal end. Verticils on dorsal surface of male antenna nearly twice as long as respective segments, verticils of female antennae very short, indistinct. Pubescence, covering segments short and whitish. Rostrum brown at base, turning dark brown towards distal end, semi-polished. Palpus dark brown, covered with erect blackish setae. Mouth parts same color as palpus.

Thorax obscure yellow. Pronotum large, strongly elongate, greenish yellow in fresh specimens, brownish yellow in old specimens. Mesonotal prescutum brownish yellow with two reddish brown stripes. Darker specimens have remains of lateral stripes. Central stripes separated by narrow whitish yellow line. Scutal lobe conspicuously marked with brown, the lateral area yellowish. Scutellum brown, the median portion and posterior margin obscure yellow. Mediotergite dark brown, the sides paler. Pleura brownish yellow with a narrow, dorsal, longitudinal, brown stripe extending from the cervical sclerites to beneath the wing-root. Male wing slightly narrower than female wing. Wing (Fig. 7B, C) tinged with pale yellow. Costal cell entirely dark brown, subcostal cell yellow between dark spots. Stigma distinct, large, "U"-shapely arched. Distinct brown pattern of male wing as follows: costal cell entirely brown, subcostal cell brown at wing base, at base of *Rs* and at tip; wing base with brown spot; whole radial sector surrounded by distinct brown area; darkenings surround whole cord and distal margin of discal cell; small rounded spots along veins beyond cord; darkened posterior part of cell r_1 at wing margin; dark spots surroud branches of *M* and CuA_1 at wing margin; brown area extends along whole frontal margin of cubital vein, distal part of *Cu* surrounded by brown from both sides; dark spots at tips of both anal veins; such spot also extends along posterior margin of cell a_2. Wing pattern of female less intense, some small spots, especially on distal longitudinal veins reduced. Veins yellow in light areas, but dark brown in darkened areas. Venation very similar in both sexes: *Sc* long, Sc_1 reaching wing margin far beyond branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* distinctly arched. Vein R_2 more than twice its own length from the tip of R_1. R_1 distinctly arcuated at branching point of R_2. Both branches of *Rs* long and nearly parallel to each other, tips slightly bent posteriorly. Cross-vein *r-m* distinct. Discal cell very long, slightly widened distally, about 3.75 times as long as wide. Basal deflection of CuA_1 its own length beyond branching point of *M*, at about one-sixth of discal cell's length. Both anal veins slightly bent towards posterior wing margin. Anal angle medium-sized, wide. Length of male halter 1.35-1.60 mm, that of female 1.30-1.40 mm. Stem of halter yellow, base whitish, knob dark brown. Coxae yellow. Frontal coxa slightly infuscated. Trochanters obscure yellow. Femur dark brown, slightly widened at distal end, with conspicuously light yellow tip. Tibia and tarsus dark brown. Basal tarsomere somewhat lighter. Male femur I: 6.9-7.4 mm long, II: 7.4-8.0 mm, III: 7.7-10.0 mm; tibiae I: 8.8-9.3 mm, II: 7.8-8.6 mm, III: 8.1-11.0 mm; tarsus I: 7.6-7.7 mm, II: 5.9-6.0 mm, III: 5.5-6.9 mm long. Female femur I: 6.2-7.5 mm long, II: 6.6-8.3 mm, III: 7.0-8.5 mm; tibiae I: 7.8-9.1 mm, II: 7.4-8.7 mm, III: 7.4-

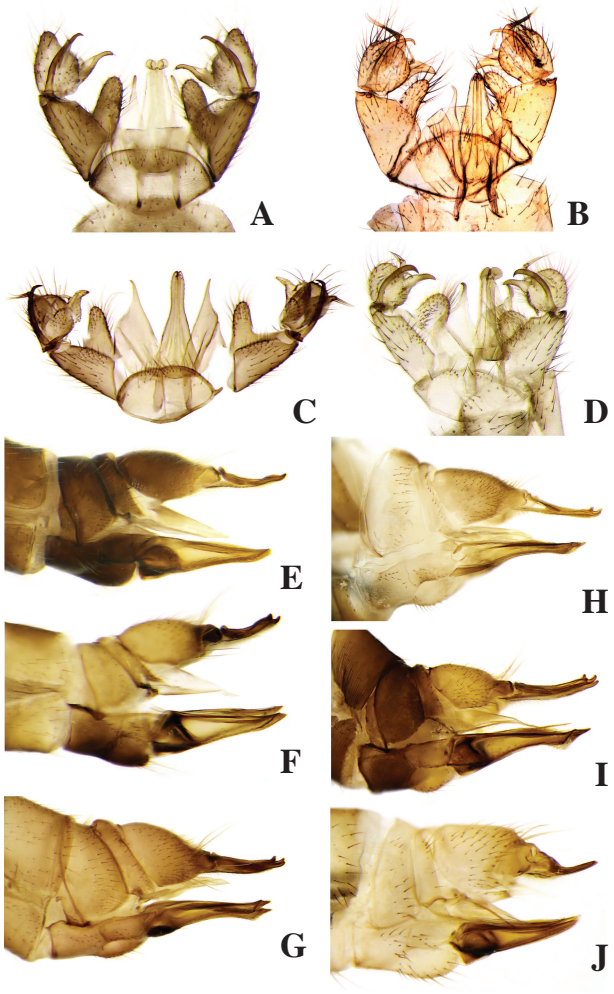

Fig. 8. Male and female terminalia of *Libnotes*. A-D. male genitalia, dorsal view. A. *L.* (*Libnotes*) *amatrix*. B. *L.* (*Libnotes*) *basistrigata*. C. *L.* (*Libnotes*) *nohirai*. D. *L.* (*Libnotes*) *puella*. E-J. ovipositor, lateral view. E. *L.* (*Afrolimonia*) *ladogensis*. F. *L.* (*Libnotes*) *amatrix*. G. *L.* (*Libnotes*) *basistrigata*. H. *L.* (*Libnotes*) *longistigma*. I. *L.* (*Libnotes*) *nohirai*. J. *L.* (*Libnotes*) *puella*.

8.7 mm; tarsus I: 6.8-7.7 mm, II: 5.4-5.8 mm, III: 5.3-5.4 mm long. Claw dark brown, with three small subbasal spines.

Abdomen brown, distal segments dark brown. Female abdomen yellowish at base, fresh specimens with greenish basal segments. Tergites and sternites covered with erect golden setae. Male genitalia (Fig. 8A) brown. Ninth tergite simple, posterior margin widely rounded. Gonocoxite slightly elongate, wider at base, narrower at apex, with elongate setose ventro-mesal lobe. Outer gonostylus narrow, sclerotised, very tip slightly curved and sharply pointed. Inner gonostylus with wide basal part, distal end getting distinctly narrower; rostral lobe long and narrow, slightly sinuous, bearing single subbasal spine; additional narrow lobe starts at the middle of segment and bears two long apical setae. Paramere distinctly narrowed towards distal end, acute-apexed. Penis simple, elongate with bifid apex. Ovipositor (Fig. 8F) generally same color as distal abdominal segments. Cercus short, dark brown, bidentate at tip. Hypovalvae long, darkened basally, nearly reaching tip of cercus, distal end with minute subapical teeth on dorsal surface. Vaginal apodeme elongate, reaching beyond base of cercus.

Elevation range in Korea. Specimens are known to occur at altitudes from about 350 m to 800 m.

Period of activity. Adults are flying from late June through late July in South Korea.

Habitats. The species was collected by the author in dense mixed forests on slopes to small and medium-sized rivers.

General distribution. The species is known from Far East of Russia and Japan.

Examined materials (Fig. 10J): 1♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Yongpyeong-myeon, Nodong-ri, Mt. Gyebangsan, N37.69775, E128.47627, altitude about 800 m, 2008.07.19, J.D. Yeo *et al.*, malaise trap (NIBR); 1♂ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Woljeongsa, Odaesan National Park, N37.73920, E128.59398, altitude 794 m, 2012.06.22, S. Podenas (NIBR); 1♂, 1♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Topdong-ri, Odaesan National Park, N37.72722, E128.55222, 2012.06.28-07.31, S.-J. Park & I.-J. Hur, malaise trap (NIBR); 1 specimen with unclear sex (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naedong-ri, N35.26580, E127.58128, altitude 378 m, 2013.05.11, S. Podenas, collected from spider web (NIBR).

Libnotes (*Libnotes*) *basistrigata* (Alexander, 1934)

Limonia basistrigata Alexander, 1934: 40.

General body coloration yellow. Body length of male 10.7-15.0 mm, female 14.1-15.3 mm. Wing length of male 16.3-21.0 mm, female 17.5-19.0 mm.

Head brownish yellow, covered with sparse light gray pruinosity, which is denser along eye margin. Anterior vertex very narrow, covered with sparse erect light brown setae. Eyes large, ventrally nearly reaching each other. Length of male antennae 2.3 mm, if bent backwards, far not reaching base of wing. Antenna of female 2.65 mm long. Scape elongate, nearly cylindrical, brown, covered with sparse gray pruinosity. Pedicel very short, nearly rounded, light brownish yellow, bearing few erect setae. Flagellum 12-segmented, yellow. Basal flagellomere very similar in shape and size to pedicel. Remaining flagellomeres getting oval to elongate towards apex, apical flagellomere wider at base, distal part suddenly narrowed and blackened. It is approximately twice as long as

preceding segment. Verticils approximately as long as respective segments on basal flagellomeres and approximately 1.5 times as long as respective segments on distal flagellomeres. Pubescence, covering segments short, yellowish, uniformly dense on all sides of flagellum. Rostrum brown, semi-polished, covered only with very short pubescence. Palpus dark brown, covered with erect dark brown setae and silvery pubescence. Mouth parts brown at base, distal margin dark brown.

Thorax entirely yellow, unmarked. Wing (Fig. 7D) pale yellow, patterned with dark brown or black: distinct black spot at wing base in costal area before humeral vein; small brown spots surround base of *Rs*, Sc_2 and R_2, restricted brown areas surround cord, distal end of discal cell, basal and distal parts of vein *Cu*, middle part of R_{4+5}, distal end of A_2; dark spot also present at the very wing base, in axillary region. Costal field lighter than remaining wing area. Veins yellow, but brown in darkened areas. Venation: *Sc* long, Sc_1 reaching wing margin far beyond branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* very short, slightly arched. Vein R_1 very short, transverse; R_2 transverse, slightly beyond the tip of R_1. Both branches of *Rs* very long, parallel to each other and distinctly arcuated towards posterior wing margin, thus cell r_1 very wide at wing margin. Cross-vein *r-m* distinct, at base of discal cell. Discal cell very long and narrow, approximately five times as long as wide. Longitudinal veins issuing from it arcuated towards posterior wing margin. Basal deflection of CuA_1 approximately its own length beyond branching point of *M*. A_1 long and nearly straight, A_2 shortened and strongly curved towards posterior wing margin, thus leaving very wide cell a_1 at wing margin. Anal angle small, but comparatively wide. Length of male halter 2.50-2.60 mm, that of female 2.35-2.55 mm. Stem of halter pale, base yellowish, knob blackish. Coxae and trochanters light yellow. Distal margin of trochanter rimmed with black. Femur yellow with dark brown distal end. Darkened part slightly widened. Whole segment covered with minute semi-erect brown setae. Tibia yellow with dark brown distal end. Basal half of first tarsomere brownish yellow, distal half dark brown, remaining tarsomeres dark brown. Male femur II: 13.3 mm, III: 14.6-16.2 mm; tibiae II: 14.1 mm, III: 15.8 mm; tarsus III: 7.7 mm long. Female femur I: 12.8-13.5 mm long, II: 12.5 mm, III: 15.3 mm; tibiae I: 15.5 mm, II: 15.3 mm, III: 13.5 mm; tarsus I: 14.1 mm, II: 15.4 mm long. Claw black, with few small subbasal teeth in both sexes.

Basal part of abdomen light yellow, distal segments obscure yellow. Male genitalia (Fig. 7B) yellow. Gonocoxite with elongate setose ventro-mesal lobe. Outer gonostylus long, narrow, rod-shaped, strongly sclerotised. Inner gonostylus rounded, with long rostral prolongation armed with two long unequal spines arising from same tubercle and with additional lobe bearing four or five long powerful setae. Paramere with narrow distal part. Penis simple, elongate. Basal part of ovipositor (Fig. 7G) brownish yellow. Cercus and hypovalvae dark brown, semi-polished. Cercus bifid at tip. Hypovalvae long and narrow, nearly reaching tip of cercus, distal end slightly enlarged.

Elevation range in Korea. Specimens from North Korea have no data at which altitudes they were collected. Single specimen from Jirisan National Park was found at nearly 380 m altitude.

Period of activity. Adults were collected only in the middle of October in North Korea.

General distribution. The species is known only from North Korea and Fujian province of China.

Examined materials (Fig. 10K): Holotype, ♂ (pinned), Mt. Congo, Corea, Oct. 16, 33 [1933], J. Machida (USNM); paratype, 1♂ (pinned and slide mounted), Corea, Mt. Kongo, Oct. 17, 1933, J. Machida (USNM); allotype, 1♀ (pinned, leg slide mounted), Corea, Mt. Kongo, Oct. 17, 1933, J. Machida (USNM); 1♀ (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naedong-ri, N35.26580, E127.58128, altitude 378 m, 2013.05.09-11, S. Podenas (collected from spider web) (NIBR). Also compared with metatype, 1♂ (pinned and slide mounted), E. China, Fukien, Ta-chu-lan, 4500′, Nov. 18. 42 [1942], Jos. Fu (USNM); 1♀ (pinned), E. China, Fukien, Ta-chu-lan, Dec. 22. 42 [1942], Jos. Fu (USNM).

***Libnotes* (*Libnotes*) *longistigma* Alexander, 1921**

Libnotes longistigma Alexander, 1921: 180; Savchenko and Krivolutskaya, 1976: 119; Savchenko, 1983: 111.

General coloration brown. Body length of female 18.5 mm. Wing length of female 16.3 mm, maximal width 3.4 mm.

Head brown, darker anteriorly, lighter posteriorly. Narrow area along eye margin light gray. Vertex covered with sparse semi-erect brownish setae, that are longer frontally and getting shorter posteriorly. Anterior vertex very narrow, slightly rised between eyes, covered with short erect setae. Eyes large, ventrally nearly reaching each other. Antenna of female 2.95 mm long, if bent backwards, ending far before wing base. Scape elongate, slightly widened at distal end, dark brown, covered with sparse erect brownish setae. Pedicel short, elongate, slightly widening towards distal end, dark brown, covered with few short brown setae. Flagellum 12-segmented, brownish yellow. Basal flagellomere as long as pedicel, succeeding segment shorter, but remaining flagellomeres getting longer towards distal end of antennae. Apical flagellomere slightly longer than preceding segment, wider at base and distinctly narrower at apex. Verticils short, less than length of respective segments. Light pub-

escence, covering segments, very short, but dense. Rostrum dark brown. Palpus reaching to the fifth flagellomere. Two basal flagellomeres elongate, nearly cylindrical, dark brown, third segment distinctly shorter, oval, brown with yellowish base, last palpomere elongate and narrow, brown. Palpus covered with erect brown setae. Labella pale yellow, just distal end marked with brown.

Thorax brownish. Cervical sclerites light brown. Pronotum elongate, brown, slightly infuscated frontally, posterior margin narrowly yellow. Ground color of mesonotal prescutum dark brown. Prescutum with four brown stripes. Median stripes separated by narrow dark brown vita. Lateral stripes distinctly shorter than median. Lateral margin of prescutum broadly dark brown. Scutal lobes widely separated by light brown area. Central part of lobe brown, margins light brown. Scutellum light brown, posterior margin narrowly darkened, two narrow transverse brown spots before caudal end. Mediotergite brownish with narrow light medial line, fronto-lateral angle dark brown. Pleura frontally brownish, posteriorly yellowish. Dark brown stripe extends from cervical sclerites through fore coxa, anepisternum and anepimeron and reaching fronto lateral angle of mediotergite, but getting less distinct and narrower posteriorly. Wing (Fig. 7E) yellowish, patterned with lots of small brown and gray spots arranged along veins. Five dark brown spots are at frontal wing margin in cell *sc*: three at basal part, one at base of *Rs* and one at the end of *Sc*. Stigma brown, surrounding R_1. Brownish elongate spots situated along distal part of *R* and between vein *Cu* and false vein. Cord and distal part of A_2 surrounded by dark, longitudinal short grayish spot arranged along longitudinal veins beyond cord and along A_1. Veins yellow, but brown in darkened areas. Venation similar in both sexes: *Sc* long, Sc_1 reaching wing margin far beyond branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* very short, nearly straight and oblique. Vein R_1 short, oblique; R_2 nearly transverse, slightly before tip of R_1 in both sexes. Both branches of *Rs* very long, parallel to each other and distinctly arcuated towards posterior wing margin, thus cell r_1 very wide at wing margin. Cross-vein *r-m* distinct, at base of discal cell. Discal cell very long and narrow, five times as long as wide. Longitudinal veins issuing from it distinctly turned towards posterior wing margin. Basal deflection of CuA_1 nearly twice its own length beyond branching point of *M*. A_1 long and nearly straight, A_2 shortened, distal end turned towards posterior wing margin. Cell a_1 medium width, thus anal angle small, widely rounded. Wing approximately five times as long as wide (Savchenko and Krivolutskaya (1976) stress that wing of *L. longistigma* is about six times as long as wide, thus differing from *L. undulata* Matsumura, 1916, wing of which is five times as long as wide. Despite this, Savchenko (1989) gives illustration of *L. longistigma* wing (Fig. 160, 4, page 324), but length of it is slightly less than five times as long as wide). Halter elongate. Length of female halter 1.8 mm. Basal half of stem blackened, distal pale. Knob obscure yellow, dorsal part slightly infuscated. Frontal coxa mostly dark brown, ventral part pale yellow, dorsal yellowish brown. Middle and posterior coxa yellowish. Trochanters obscure yellow, distal margin narrowly blackened. Femur yellow with conspicuously darkened tip. Tibia yellow with darp brown apex. Abdomen yellowish brown. Three longitudinal lines extend on tergites, medial and two lateral. They are narrowly interrupted on posterior margins of segments. Lines are distinct on frontal tergites, but getting weak towards posterior end of abdomen. Sternites yellowish brown with indistinct median line. Abdominal sclerites covered with very short and sparse brown setae, which are denser on tergites. Ovipositor (Fig. 8H) with yellow cercus and light brown hypovalva. Cercus bifid at tip. Basal part of hypovalvae dark brown. Hypovalvae long and narrow, reaching to about subapical branch of cercus, distal end slightly enlarged and armed with small lateral subapical branch.

Elevation range in Korea unknown.

Period of activity. Single female was collected in August.

Habitats. Wet broad-leaved and mixed forests. Larvae were developing in the wood of cork tree (*Phellodendron sachalinensis*), japanese angelica-tree (*Aralia elata*), maackia (*Maackia*), poplar (*Populus*) and birch (*Betula*) (Savchenko and Krivolutskaya, 1976; Savchenko, 1983; Krivosheina and Krivosheina, 2011).

General distribution. The species was known from Japan, Taiwan and Far East of Russia (Oosterbroek, 2015).

Examined materials (Fig. 10L): 1 ♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Topdong-ri, Odaesan National Park, N37.72722, E128.55222, 2012.07.31-08.30, S.-J. Park & I.-J. Hur, flight interception trap.

***Libnotes* (*Libnotes*) *nohirai* Alexander, 1918**

Libnotes nohirai Alexander, 1918: 445; Savchenko, 1983: 113.

Limonia ingentissima Alexander, 1947: 352.

General body coloration yellowish brown, surface covered with light gray to whitish pruinosity. Body length of male 8.6-11.2 mm, female 8.2-12.5 mm. Wing length of male 13.3-17.7 mm, female 12.5-17.3 mm. In general, Korean males of *L. nohirai* are distinctly smaller, than specimens from Japan.

Head dark brown dorsally, getting yellowish laterally, covered with light gray to whitish pruinosity, which is densier along eye margin. Sparse erect brownish setae making row behind posterior eye margin. Vertex dorsal-

ly with very narrow median line. Anterior vertex very narrow, slightly rised between eyes, covered with yellowish pruinosity. Eyes large, ventrally nearly reaching each other. Length of male antennae 1.55-1.85 mm, if bent backwards, far not reaching wing base. Antenna of female 1.55-2.35 mm long. Scape elongate, nearly cylindrical, brown, dorsally covered with sparse gray pruinosity and few semi-erect brown setae. Pedicel short, narrower at base wider at apex, brownish basally, yellowish distally. Flagellum 12-segmented, but because distal segment is distinctly narrowed at middle, it looks as if flagellum has 13 flagellomeres. Basal segments of flagellum short, nearly rounded, yellow, segments getting elongate towards distal end of antenna, distal end of flagellum grayish. Apical flagellomere elongate, distinctly longer than preceding segment, wider at base, narrower at apex. Verticils nearly twice as long as respective segments. Pubescence, covering segments short, yellowish, uniformly dense on all sides of flagellum. Rostrum dark brown at base, getting yellowish brown towards distal end, distal margin rimmed by light gray. Rostrum semi-polished, covered with few erect setae and grayish pruinosity. Palpus dark brown, covered with erect dark brown setae. Mouth parts grayish brown.

Thorax brown, covered with fine gray pruinosity. Cervical sclerites dark brown. Pronotum elongate, brownish gray with dark brown dorsal surface and yellowish postero lateral margins. Base color of mesonotal prescutum yellowish, but nearly whole surface of sclerite ocupied by four brown, stripes, that nearly reach each other, margins indistinct. Median stripes wide and darker, indistinctly divided longitudinally by weak median vita. Area between median and lateral stripes bears few erect setae. Lateral stripes very short. Scutal lobes brown, densely covered with gray pruinosity. Scutellum and mediotergite dark brown, covered with dense gray pruinosity. Pleura yellowish brown to gray in male, yellowish to brownish in female, covered with gray pruinosity. Katepisternum brown, just frontal angle yellowish. Dorsopleural membrane yellow. Wing (Fig. 7F) yellow, patterned with brown. Brown areas surround veins Sc_1 and Sc_2, R_1 and R_2, wing membrane darkened along entire length of *Rs* and this darkening through cord reaches posterior wing margin, also darkened distal margin of discal cell and distal part of vein A_2. Small dark spots around R_1 and tip of R_2 are separate, not connected like in related species. Veins yellow, but brown in darkened areas. Venation: *Sc* long, Sc_1 reaching wing margin far beyond branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* very short, slightly arched. Vein R_1 very short, transverse; R_2 oblique and extends beyond tip of R_1 in male, but in female it is transverse and at same level as R_1. Both branches of *Rs* very long, parallel to each other and distinctly arcuated towards posterior wing margin, thus cell r_1 very wide at wing margin. Cross-vein *r-m* distinct, at base of discal cell. Discal cell long and narrow, slightly more than three times as long as wide. Longitudinal veins issuing from it distinctly turned towards posterior wing margin. Basal deflection of CuA_1 slightly more than its own length beyond branching point of *M*. A_1 long and nearly straight, A_2 shortened and strongly curved towards posterior wing margin, thus leaving very wide cell a_1 at wing margin. Anal angle small, but comparatively wide. Halter elongate. Length of male halter 2.10-2.90 mm, that of female 1.75-2.55 mm. Stem pale yellow, base whitish, knob darkened, brownish. Coxae and trochanters light yellow, distal margin of trochanter blackened. Femur yellow to brownish yellow with broadly dark brown distal end. Tibia yellow with narrowly darkened distal end. Two basal tarsomeres yellow with narrowly darkened distal ends of segments, remaining three segments dark brown. Legs covered with minute setae. Male femur I: 8.2-11.2 mm long, II: 8.3-12.1 mm, III: 9.9-13.0 mm; tibiae I: 10.3-14.1 mm, II: 9.6-13.42 mm, III: 10.4-13.0 mm; tarsus I: 9.0-12.6 mm, II: 7.4-10.2 mm, III: 5.0-7.2 mm long. Female femur I: 7.0-10.5 mm long, II: 7.4-11.6 mm, III: 8.3-12.3 mm; tibiae I: 9.2-13.4 mm, II: 8.7-11.3 mm, III: 9.4-13.0 mm; tarsus I: 8.8-12.4 mm, II: 7.0-9.8 mm, III: 5.3-7.1 mm long. Claw with few spines on basal half.

First abdominal tergite dark brown, sparsely covered with pruinosity, succeeding tergites yellow with three longitudinal brown stripes. Usually median line complete, reaching to posterior end of eigth tergite, in lighter colored specimens it could disappear before end of abdomen. Basal sternites obscure yellow with lateral longitudinal stripes, median stripe indistinct. Distal segments (6-8) dark brown to black on both dorsal and ventral sides. Male genitalia (Fig. 8C) yellow. Ninth tergite simple, transverse, with small median emargination on posterior margin. Gonocoxite elongate, wider at base, narrower towards apex, bearing long and narrow setose ventro-median lobe. Outer gonostylus strongly sclerotised, long and narrow, slightly arched, rod-like. Inner gonostylus with large rostral prolongation armed with two long spines arising from same tubercle and with additional lobe bearing four or five long powerful setae on apex. Paramere long and narrow. Penis simple, long, getting narrower towards apex. Ninth sternite simple, posterior margin nearly straight. Basal part of ovipositor (Fig. 8I) brownish yellow. Cercus and hypovalvae dark brown, semi-polished. Cercus bifid at tip. Hypovalvae long and narrow, nearly reaching tip of cercus, distal end slightly enlarged.

Elevation range in Korea. Specimens are known to occur at altitudes from over 200 m to nearly 1950 m.

Period of activity. Adults were flying from late July through November in Korea. Specimens collected by the author in spider webs in early spring, most probably,

remained there since previous fall.

Habitats. The species was collected by the author in back-yard of small hotel surrounded by mixed forest and shrubs on steep slope to medium-sized mountainous stream.

General distribution. The species was known from Far East of Russia, Japan and Korea.

Examined materials (Fig. 10M): 1♂, 3♀♀ (pinned), Corea, Ompo, 800′, XI-3, 1937, Yankovsky (USNM); 2♂♂ (pinned), N. Korea, Pontani Paiktusan, 5000-6000 ft., VII-26, 1940, coll. Yankovsky (USNM); 2♀♀ (pinned), N. Korea, Pontani Paiktusan, 6000 ft., VIII-2, 1940, coll. Yankovsky (USNM); 1♂, 1♀ (pinned), N. Korea, Pontani Paiktusan, 5500-6372 ft., VIII-5, 1940, coll. Yankovsky (USNM); 1♂, 2♀♀ (pinned), N. Korea, Pontani Paiktusan, 6300 ft., VIII-8, 1940, coll. Yankovsky (USNM); 8♂♂, 9♀♀ (pinned), [S.] Korea, #37, Hill 1468, 16 mi. NW Chunchon, N38.00000, E127.50000, altitude 4300 ft., 1954.09.16, George W. Byers (KU); 1♂ (pinned), [S.] Korea, #38, Hill 1468, 16 mi. NW Chunchon, N38.00000, E127.50000, altitude 4300 ft., 1954.09.17, George W. Byers (KU); 1♂, 1♀ (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26586, E127.58090, altitude 448 m, 2012.04.27, S. Podenas (collected from spider web) (NIBR); 4♂♂ (in ethanol), 2♂♂, 1♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naedong-ri, N35.26580, E127.58128, altitude 378 m, 2013.05.09-11, S. Podenas (collected from spider web) (NIBR); 1♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan National Park, St. 1, N37.71822, E128.54175, altitude 800 m, 2013.10.30-11.28, Park S.-J., Oh S.-B. (malaise trap) (NIBR); 1♂, 3♀♀ (in ethanol), S. Korea, Gangwon-do, Pyeongchang-gun, Jinbu-myeon, Dongsan-ri, Odaesan National Park, St. 2, N37.76583, E128.57727, altitude 768 m, 2013.10.30-11.28, Park S.-J., Oh S.-B. (malaise trap) (NIBR).

***Libnotes* (*Libnotes*) *puella* Alexander, 1925**

Libnotes puella Alexander, 1925: 434.

General coloration light brown. Lateral surface of thorax pale with three distinct narrow dark brown longitudinal stripes. Body length of male 8.0 mm, female 7.5 mm. Wing length of male 9.5 mm, female 8.4 mm.

Head light grayish brown, slightly darkened dorsally, covered with gray pruinosity. Area along eye margin light gray. Sparse erect setae brownish frontally, whitish posteriorly. Anterior vertex very narrow, slightly rised between eyes, covered with yellowish pruinosity. Eyes large, ventrally nearly reaching each other. Length of male antennae 1.70 mm, if bent backwards, ending far from wing base. Antenna of female 1.45 mm long. Scape elongate, nearly cylindrical, obscure yellow, dorsally covered with sparse erect brownish setae. Pedicel short, narrower at base wider at apex, dark brown, covered with few short brown setae. Flagellum 12-segmented, dark brown to black. Basal segments of flagellum oval with short apical pedicels, distal segments elongate. Apical flagellomere elongate, longer but narrower than preceding segment. Verticils nearly 1.5 times as long as respective segments. Pubescence, covering segments, very short, grayish, uniformly dense on all sides of flagellum. Rostrum light brown, covered with sparse grayish pruinosity. Palpus obscure yellow, covered with erect brown setae. Mouth parts same color as rostrum.

Thorax grayish light brown. Cervical sclerites grayish light brown. Pronotum elongate, grayish brown frontally and laterally, yellowish posteriorly. Mesonotal prescutum grayish light brown, with three brown stripes. Median stripe wide and separated longitudinally by narrow light line, which is visible depending on angle. Lateral stripe darker before the suture, confluent with median stripe frontally and distinctly separated from it posteriorly by yellowish area. Area between median and lateral stripes bears few erect brown setae, which are slightly longer above pseudosutural fovea. Distinct narrow dark brown line extends along lateral margin of prescutum. Central part of scutal lobe brown, margins pale. Scutellum entirely pale. Mediotergite with pale longitudinal line, which is very wide frontally and narrow posteriorly. Sides of mediotergite dark brown. Pleura frontally greenish light brown, posteriorly pale, whitish. Two distinct narrow dark brown lines extend longitudinally. Dorsal line extends from cervical sclerites to posterior margin of anepimeron. It is right above frontal coxae. Ventral line extends along middle of fore coxae through dorsal margin of katepisternum, dorsal angle of middle coxae and reaches abdomen right above posterior coxae. Middle coxae on the middle of frontal face has brown spot. Generally thorax in lateral view has three distinct longitudinal lines, dorsal, that extends along lateral margin of presctum and two ventral on pleura. Wing (Fig. 7G) pale grayish-yellowish, patterned with lots of small brown and gray spots. Brown spots are at both ends of *Rs*, on cord, tip of *Sc* and *R*. They surround only branching points of veins, but not extend into lines. Lots of small gray dots are on all veins, they are especially dense beyond cord, and in all cells. Veins yellow, but brown in darkened areas. Venation similar in both sexes: *Sc* long, Sc_1 reaching wing margin far beyond branching point of *Rs*, Sc_2 close to Sc_1 tip. *Rs* very short, straight and transverse. Vein R_1 short, nearly transverse; R_2 nearly transverse, it ends approximately at same level as R_1 in both sexes. Both branches of *Rs* very long, parallel to each other and distinctly arcuated towards posterior wing margin, thus cell r_1 very wide at wing margin. Cross-vein

r-m distinct, at base of discal cell. Discal cell long and narrow, slightly less than 3.5 times as long as wide. Longitudinal veins issuing from it distinctly turned towards posterior wing margin. Basal deflection of CuA_1 its own length beyond branching point of *M*. A_1 long and nearly straight, A_2 shortened and slightly sinuous. Cell a_1 very wide at wing margin. Anal angle small, medium wide. Halter elongate. Length of male halter 1.15 mm, that of female 1.25 mm. Stem pale, base yellowish, knob infuscated, blackish. Ground color of frontal coxae greenish-grayish yellow, middle and posterior coxae yellow. Frontal and middle coxae marked with brown as mentioned above. Frontal troxanter darkened, middle and posterior obscure yellow. Distal margin of trochanter narrowly blackened. Femur yellow with rather broad but indistinct subterminal brown ring. Apex of femur yellow, but yellow area narrower than brown ring. Tibia obscure yellow with narrowly darkened distal end. Two basal tarsomeres obscure yellow with narrowly darkened distal ends, remaining three segments dark brown. Legs covered with short blackish setae. Male femur I: 7.7 mm long, II: 8.6 mm, III: 9.3 mm; tibiae I: 9.4 mm, II: 8.3 mm, III: 9.3 mm; tarsus I: 8.2 mm, II: 8.5 mm, III: 7.2 mm long. Female femur I: 5.9 mm long, II: 6.2 mm, III: 7.1 mm; tibiae I: 7.0 mm, II: 6.1 mm, III: 6.6 mm; tarsus I: 7.5 mm, II: 6.0 mm, III: 5.6 mm long. Claw black with big spine at middle and few small subbasal spines.

Abdomen generally obscure brownish yellow. First abdominal tergite dark brown, second and third tergites brownish. Basal sternite dark brown. Remaining tergites and setrnites obscure yellow. Lateral margins of all tergites and sternites with narrow dark brown line. Male genitalia (Fig. 8D) brownish. Ninth tergite simple, transverse, posterior margin widely rounded with small median emargination. Gonocoxite elongate, bearing wide, nearly rounded setose ventro-median lobe. Outer gonostylus strongly sclerotised, darkened, long and narrow, arched and rod-like. Inner gonostylus rounded with long and narrow rostral prolongation armed with two subbasal spines on posterior margin. Spines arising from same tubercle. Additional lobe posteriorly to rostral prolongation, bearing few long setae on apex. Paramere long, wide at base, narrow at apex, distal end hook-like. Penis long, apex composed of two rounded lobes. Ovipositor (Fig. 8J) comparatively short. Cercus straight and narrow, dark brown, without subapical branch. Hypovalvae dark brown at base, yellow at middle, tip infuscated. It is wide at base, turning narrower towards apex, reaching to about middle of cercus.

Elevation range in Korea. Specimens were found only at altitude close to 500 m.

Period of activity. Adults were collected only in late August. Specimen found by the author in spider web in May, most probably, remained there since previous fall.

Habitats. The species was collected by the author in back-yard of small hotel surrounded by mixed forest and shrubs on steep slope to medium-sized mountainous stream.

General distribution. The species was known only from Japan.

Examined materials (Fig. 10N): 1 specimen of unclear sex (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26590, E127.58096, alt. 446 m, 2013.05.11, S. Podenas (collected from spider web); 1♂, 1♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26590, E127.58096, alt. 446 m, 2014. 08.25, S. Podenas.

Trentepohlia Bigot, 1854

Trentepohlia Bigot, 1854: 456, 473.
Mongomioides Brunetti, 1911: 296.
Type species - *Limnobia limnobioides* Bigot, 1854 (syn. of *Trentepohlia* (*Trentepohlia*) *trentepohlii* (Wiedemann, 1828)).

Original description of genus *Trentepohlia* by Bigot (1854) covers that recently recognized as nominative subgenus. Edwards (1911) decided, that genus *Mongoma* Westwood 1881 was synonym of *Trentepohlia*, but retained that name for subgenus "including those species with four posterior cells".

Trentepohlia are medium-sized slender crane flies with body length not exceeding 10 mm, wing length 7.0-12.5 mm. General body coloration yellowish to brownish. Wing elongate, narrow, anal angle small because of shortened vein A_2, but widely rounded. Wings usually unpatterned translucent and strongly iridescent. Wing venation peculiar and is used for separation of genus: *Rs* branching into two veins R_{2+3+4} and R_5, but R_{2+3+4} further divides into separate branches, thus totally three branches of radial sector enter the wing margin R_3, R_4 and R_5, what is unusual for Limoniinae. Vein R_5, unusually for all crane flies, is fused with M_{1+2} and forms the anterior border of the discal cell. Discal cell present or absent. Abdomen strongly elongate. Male genitalia with median interruption of ninth sternite, with well developed parameres, and with ventral bridge.

Larva of *Trentepohlia* is cylindrical, only slightly narrowed behind, covered with numerous fine setae. Spiracular lobes are almost reduced. Spiracles are small, elongate, situated in the upper part of spiracular disc. Tracheal gills four in number, large, constricted into three or four parts. Head capsule moderate in size, compact and not reduced, what is typical for most of Limoniinae. The head is wholly retracted within prothorax (Alexander, 1920a; Oosterbroek and Theowald, 1991). Pupal body is large at the anterior end, tapering posteriorly. Thorax is

smooth, yellowish brown. Abdomen brighter than thorax and bears numerous tubercles. Pronotal breathing horns leaf like, broad, dorsally flattened with scaly apical part. Last abdominal segment of body terminating in two short, chitinized hooks curved outward (Alexander, 1920a; Oosterbroek and Theowald, 1991). Larvae and pupae develop in water that gathers in the leaf axils of tropical bromeliads (Picado, 1913), they are also reported from decaying plant material (Meijere, 1911; Gerlach, 2009).

The genus *Trentepohlia* accounts for 296 described species worldwide (Oosterbroek, 2015) (not 313 + 1 according to Mederos-López, Gelhaus, 2014). They are currently divided into seven subgenera based on the wing venation. Totally 9 fossil species of *Trentepohlia* are described, one of them belongs to subgenus, that is not represented in recent fauna (Evenhuis, 2014).

Key to Korean species of the genus *Trentepohlia* Bigot, 1854

1. Wing with discal cell, basal part of cell A_2 not darkened (Fig. 9A) ····· *Trentepohlia* (*Mongoma*) *pennipes* (Osten Sacken, 1888)
− Wing without discal cell, basal part of cell A_2 distinctly darkened (Fig. 9D) ····· ····· *Trentepohlia* (*Trentepohlia*) *septemtrionalis* Alexander, 1921

***Trentepohlia* (*Mongoma*) Westwood, 1881**

Mongoma Westwood, 1881: 364.

Trentepohlia (*Mongoma*): Edwards, 1911; Alexander, 1919: 141, 1920a: 712, 944, 1938: 354; Starý and Freidberg, 2007: 350; Mederos-López and Gelhaus, 2014: 137.

Type species - *Mongoma fragillima* Westwood, 1881.

Separation of this subgenus is based on the combination of some characters of the wing venation, as follows: three branches of *Rs* ending in the wing margin (R_3, R_4 and R_5 which is fused with M_{1+2} and forms the anterior border of the discal cell), two Medial veins (M_{1+2} and M_3) ending in the wing margin, discal cell present and four veins issuing from it (R_5, M_{1+2}, M_3 and CuA_1), CuA_2 intersecting A_1, closing cell *cup*, what is unusual not only for crane flies, but for all Nematocera.

Subgenus *Mongoma* is the most species-rich among subgenera of *Trentepohlia*, with 141 described species. It is very well represented in the Oriental Region, of which 71 species are listed. Species have also been reported from other regions, as Afrotropics (22 species), Australasian/Oceanian (46 species), East Palaearctic (3 species), and Neotropical (3 species) (Mederos-López, Gelhaus, 2014; Oosterbroek, 2015). 2 fossil species are ascribed to *Mongoma* from Eocene/Oligocene of England (Evenhuis, 2014).

***Trentepohlia* (*Mongoma*) *pennipes* (Osten Sacken, 1888)**

Mongoma pennipes Osten Sacken, 1888: 204.

Trentepohlia (*Mongoma*) *pennipes*: Edwards, 1911; Alexander, 1920a: 712, 1929: 532.

General body color light grayish-yellowish brown. Male body length about 7 mm, female 7.5 mm. Wing length of female 7.1 mm.

Head light gray with darker dorso-median line and yellow posterior margin. Vertex covered with long brown erect setae. Length of female antenna 2.25 mm, if bent backwards reaches beyond base of abdomen. Scape yellow, cylindrical, covered with scarce brown setae. Pedicel grayish brown, short, widened distally, covered with scarce brown setae. Flagellum 14-segmented, same color as pedicel. Flagellomeres elongate, nearly cylindrical. Apical segment just slightly shorter than preceding flagellomere. Verticils short, 2-3 times as short as respective segments. Pubescence, covering flagellomeres scarce, whitish to brownish, depending on angle at which light falls on them. Rostrum yellow, but covered with light gray pruinosity. Palpus grayish brown, just basal part of first segment yellow. Labella yellow.

Thorax darker dorsally and frontally, lighter ventrally and posteriorly. Cervical sclerites yellow with posterodorsal dark gray line, which do not reaches frontal margin. Pronotum uniformly light grayish-yellowish brown with transverse line of erect brown setae. Mesonotal prescutum polished, light brown with darker brown median stripe. Scutal lobes light brown, turning paler posteriorly. Scutellum pale frontally, light brown posteriorly. Mediotergite strongly polished, light brown with pale frontolateral part. Pleura frontally, including katepisternum and episternum yellowish brown, posteriorly pale, even whitish. Wing (Fig. 9A) hyaline, unpatterned, strongly iridescent, just cell *sc* slightly darkened. Stigma pale. Veins grayish brown. Venation: *Sc* long, Sc_1 reaching far beyond branching point of *Rs*, at the level of R_2. Sc_2 some distance from Sc_1 tip, but far beyond branching point of *Rs*. *Rs* branches into R_{2+3+4} and R_5, but further R_2, R_3 and R_4 split apart, thus three branches of *Rs* reach wing margin. R_2 oblique, twice as long as R_{3+4} (in female from India, identified by Ch. P. Alexander, it is twice as short as R_{3+4}). R_3 and R_4 strongly diverging, thus cell r_3 very wide at wing margin. R_5 is fused with M_{1+2} and forms the anterior border of the discal cell. Discal cell strongly elongate, three times as long as wide, narrower towards wing base and getting wider distally. Four veins issuing from it R_5, M_{1+2}, M_3 and CuA_1. Position of basal deflection of CuA_1 slightly varies on both wings of same specimen from Korea. It is short distance before base of

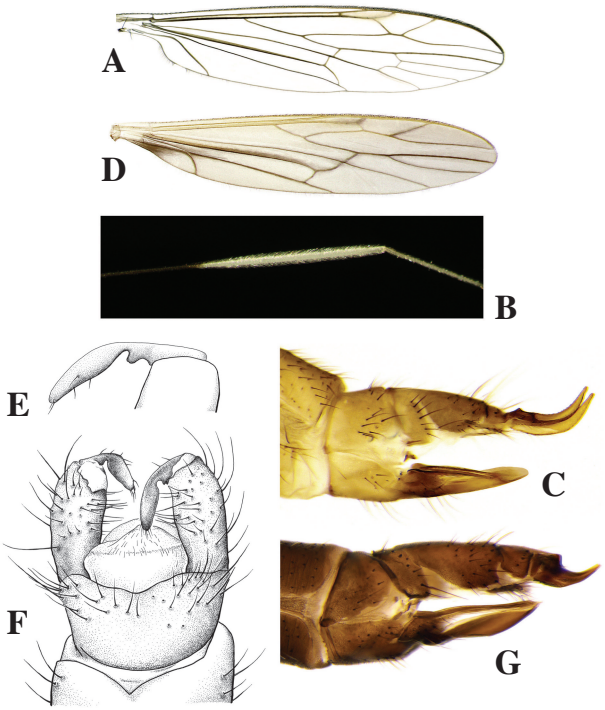

Fig. 9. *Trentepohlia*. A-C. *T.* (*Mongoma*) *pennipes*. A. wing. B. distal part of middle tibia, female. C. ovipositor, lateral view. D-G. T. (*Trentepohlia*) *septemtrionalis*. D. wing. E. male gonostylus, dorsal view. F. male genitalia, dorsal view. G. ovipositor, lateral view.

discal cell. CuA_2 intersecting A_1 short distance from wing margin, closing cell *cup*. A_1 slightly sinuous, A_2 very short and strongly bent towards posterior wing margin, like in *Trichocera*, thus cell a_1 very wide at wing margin. Anal angle small, with rounded posterior margin. Length of female haltere 1.00 mm. Haltere brownish gray with pale basal part of stem. Frontal coxa light brown, medial and posterior coxa light brownish gray. Trochanters light grayish brown with narrowly dark brown distal margin. Femorae light grayish brown, bases slightly lightened distal ends whitened. Frontal femur with 3-4 strong short spines on basal part of ventral surface and 12-14 longer setae beyond middle. Tibiae light grayish brown with distinctly white distal part. White part of middle tibiae slightly widened and provided on each side with a short fringe of white setae in both sexes (Fig. 9B). Basal tarsomere white with slightly darkened base, remaining tarsomeres turning brown towards distal end. Female femur I: 10.0 mm long, II: 11.4 mm, III: 11.4 mm; tibiae I: 12.8 mm, II: 11.6 mm, III: 11.5 mm; tarsus I: 9.6 mm, II: 8.1 mm, III: 6.8 mm long. Claw dark brown with very small indistinct subbasal bump.

Abdomen light brown. Basal tergites grayish, distal yellowish. Posterior margins of tergites narrowly pale. Frontal sternites yellowish, distal brownish. Abdomen covered with scarce semi-erect setae with brown on dorsal side of abdomen and pale on ventrally. Basal part of ovipositor same color as posterior abdominal segments, tenth tergite light greenish-grayish brown, cercus and hypovalvae polished, rusty brown. Cercus (Fig. 9C) with distal part distinctly curved upwards, point-apexed. Hypovalva straight, getting narrower towards apex, reaching to bending part of cercus.

Alexander (1920a) mentioned that *T. pennipes* had the habit of clinging to spider webs by means of the fore feet, or, if a fore foot was lacking, one of the middle legs was used. Often twenty or more of these flies were seen hanging close beside one another on a horizontally spun web, all seesawing rapidly up and down and at the same time swaying to and from, sometimes rhythmically, sometimes not. This ludicrous tight-rope dance was continued for a long time.

Larvae were collected in decaying plant stems (Meijere, 1911) and rotting palm (*Lodoica maldivica*) husks (Gerlach, 2009).

Elevation range in Korea. Specimens were collected nearly at 500 m altitude.

Period of activity. Adults are flying at the end of August in South Korea.

Habitats. The species was collected by the author on the slope of the medium-sized mountainnous river covered with deciduous forest.

General distribution. The species was known from China (Hainan and Zhejiang), Taiwan, Mozambique, Seychelles, India, Malaysia, Indonesia, Philippines, Sri Lanka, Indonesia, Papua New Guinea (Oosterbroek, 2015).

Examined materials (Fig. 10O): 1♀ (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Jirisan National Park, Piagol valley, N35.26590, E127.58096, altitude 446 m, 2014.08.24, coll. S. Podenas (NIBR).

***Trentepohlia* (*Trentepohlia*) Bigot, 1854**

Trentepohlia Bigot, 1854: 456, 473.
Mongomioides Brunetti, 1911: 296.
Type species - *Limnobia limnobioides* Bigot, 1854 (syn. of *Trentepohlia* (*Trentepohlia*) *trentepohlii* (Wiedemann, 1828)).

Separation of this subgenus is based on the combination of some characters of the wing venation, as follows: three branches of *Rs* ending in the wing margin (R_3, R_4 and R_5 which is fused with M_{1+2} for some distance, vein M_3 lacking, discal cell missing, CuA_2 intersecting A_1 for a short distance proximal to the apex closing cell *cup*.

Subgenus *Trentepohlia* (*Trentepohlia*) is one of the most species-rich among subgenera of *Trentepohlia*, with 88 described species. It is very well represented in the Afrotropics, of which 50 species are listed. The spe-

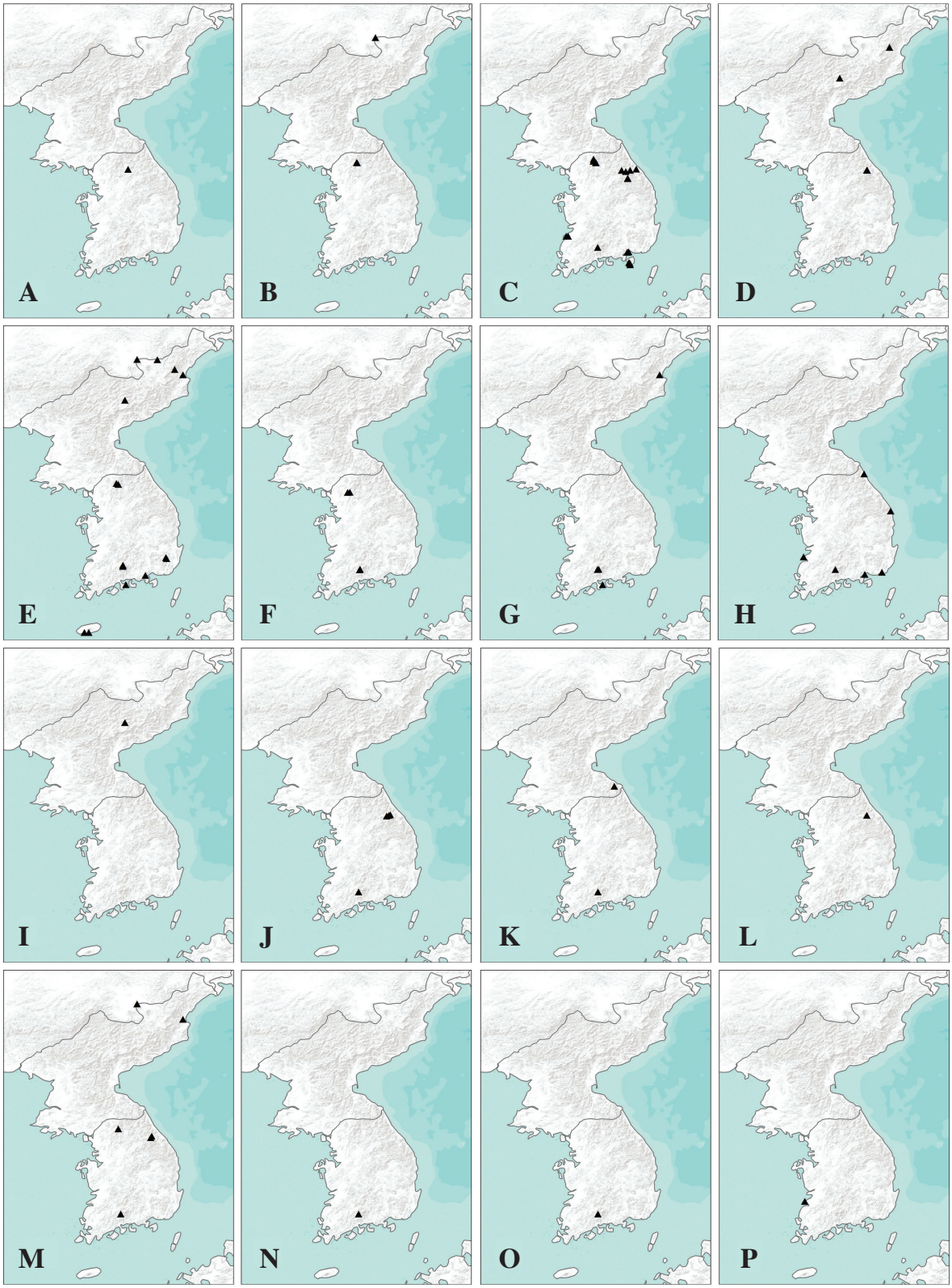

Fig. 10. Distribution maps. A. *Achyrolimonia basispina*. B. *Discobola annulata*. C. *Discobola margarita*. D. *Elephantomyia* (*Elephantomyia*) *edwardsi*. E. *Geranomyia gifuensis*. F. *Geranomyia multipuncta*. G. *Geranomyia neavocetta*. H. *Helius* (*Helius*) *nipponensis*. I. *Libnotes* (*Afrolimonia*) *ladogensis*. J. *Libnotes* (*Libnotes*) *amatrix*. K. *Libnotes* (*Libnotes*) *basistrigata*. L. *Libnotes* (*Libnotes*) *longistigma*. M. *Libnotes* (*Libnotes*) *nohirai*. N. *Libnotes* (*Libnotes*) *puella*. O. *Trentepohlia* (*Mongoma*) *pennipes*. P. *Trentepohlia* (*Trentepohlia*) *septemtrionalis*.

cies have also been reported from other regions, as Oriental (25 species), Australasian/Oceanian (14 species), East and West Palaearctic (each with 2 species), but it is missing in Neotropics and Nearctic Region (Oosterbroek, 2015). One species, belonging to that genus, is described from Eocenian Baltic amber (Alexander, 1931).

***Trentepohlia* (*Trentepohlia*) *septemtrionalis* Alexander, 1921**

Trentepohlia (*Trentepohlia*) *septemtrionalis* Alexander, 1921: 119.

Body, especially abdomen strongly elongate, wings comparatively short and narrow. General body color light brown. Male body length 8.5-9.2 mm, female 8.3-10.4 mm. Wing length of male 6.0-6.4 mm, female 5.8-6.4 mm.

Head dorsally brown with darker dorso-median line, sparsely grayish, ventral side yellowish. Vertex covered with short brown semi-erect setae. Few long erect setae on ventral side. Scape dark brown, elongate, slightly widening distally. Pedicel oval, yellowish brown, slightly darker dorsally. Basal flagellomeres dark brown, elongate-oval. Verticils short, about three times as short as respective segments. Pubescence, covering flagellomeres scarce, just slightly shorter than verticils. Rostrum dark brown dorsally, yellowish brown laterally and ventrally. Palpus dark brown, two basal and distal segments elongate, nearly cylindrical and nearly equal in length. Third segment distinctly shorter and wider. Palpomeres covered with sparce erect dark brown setae. Labella dark brown.

Cervical sclerites strongly elongate, dorsally and ventrally dark brown, laterally yellowish brown. Pronotum dark brown. Mesonotal prescutum obscure brownish yellow with distinct brown median line and less distinct lateral lines. Scutal lobes dark brown, laterally obscure yellow, lobes separated by yellowish line. Scutellum dark brown with pale medio-frontal spot. Mediotergite dark brown with indistinct paler median line. Pleura yellowish testaceous, slightly infuscated above frontal coxa. Katepisternum extreemely enlarged, thus first and second pairs of legs widely separated. Thorax ventrally yellow with distinct narrow dark brown median line that extends from head to second pair of coxae in some specimens and reaches third pair in other. Wing (Fig. 9D) yellowish gray, except yellowish costal area. Stigma small brownish, at tip of R_1. Vein *Cu* seamed with brown, indistinct brownish seaming surrounds branching points of distal veins, brown cloud present in the base of anal angle. Veins pale brown, except pale yellow *Sc* and *R*. Venation: *Sc* long, Sc_1 reaching far beyond branching point of *Rs*. Sc_2 missing. *Rs* branches into R_{2+3+4} and R_5, but further R_2, R_3 and R_4 split apart, thus three branches of *Rs* reach wing margin. R_2 oblique, approximately as long as free tip of R_1 and three times as short as R_{3+4}. R_3 and R_4 strongly diverging, thus cell r_3 very wide at wing margin. R_5 is fused with M_{1+2} for a long distance, but they split apart and separately reach wing margin. Discal cell missing. Basal deflection of CuA_1 at branching point of *M* or short distance before it. CuA_2 short, transverse, intersecting A_1 short distance from wing margin, closing cell *cup*. A_1 straight, A_2 very short and strongly bent towards posterior wing margin, like in *Trichocera*, thus cell a_1 very wide at wing margin. Anal angle small, with rounded posterior margin. Length of male haltere 0.70-0.85 mm, that of female 0.65-0.70 mm. Haltere pale, knob slightly infuscated distally. Frontal coxa brownish yellow, median and posterior coxa obscure yellow. Trochanters testaceous, just frontal pair slightly infuscated. Distal margin of trochanter with narrow blackish rim. Femur yellow, the tip dark brown. Tibia white, both ends narrowly darkened, basal end brownish, distal blackish. Femur and tibia covered with very short adherent brownish setae. Basal tarsomere pale yellow, remaining tarsomeres turning brown towards distal end. Setae covering tarsomeres longer than on femur and tibia. Male femur I: 8.0 mm long, II: 9.0-9.3 mm, III: 8.3 mm; tibiae I: 9.6 mm, II: 8.9 mm, III: 8.7 mm; tarsus II: 6.8 mm, III: 6.1 mm long. Claw light brown with darkened apex, basal part of claw slightly enlarged, but without additional spine. Abdomen light brown, turning dark brown distally. Distal margins of tergites and sternites narrowly darkened. Darkenings more distinct towards posterior end of abdomen. Male genitalia (Fig. 9F) dark brown. Ninth tergite wider than longer, posterior margin with wide median incision. Gonocoxite elongate, nearly cylindric. Gonostyle (Fig. 9E) typical for most species of the genus, long with small subbasal bump on anterior margin. Tenth tergite of female abdomen blackish brown, cercus and hypovalvae reddish brown. Cercus (Fig. 9G) short, tip acute and turned upwards. Hypovalva wide with acute apex, reaching slightly beyond base of cercus.

Elevation range in Korea. Specimens were collected at few meters altitude only.

Period of activity. Adults are flying at the end of August in South Korea.

Habitats. The species was collected by the author in dense grassy vegetation on the edge of artificial water pond.

General distribution. The species was known from Honshu island, Japan.

Examined materials (Fig. 10P): 4♂♂, 2♀♀ (in ethanol), S. Korea, Jeollabuk-do, Buan-gun, Byeosan-myeon, Daehang-ri, Byeonsanbando National Park, Jiksocheon, N35.67249, E126.56445, alt. 26 m, 2014.08.26, coll. S. Podenas (NIBR).

Discussion. Korean *T. septemtrionalis* differs from

type specimen (single female) described from Japan by coloration of thorax. Japanese female has mesonotal prescutum with indistinct median line, while Korean specimens have three distinct prescutal lines. It is possible, that Korean and Japanese specimens belong to related but different species, but comparison of freshly collected specimens from Japan and Korea is necessary.

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