

New record of *Pilaria* crane flies (Diptera: Limoniidae) from Korea

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This study is based on crane fly specimens collected during more than 80 years, starting from 1938 through 2019, in the Republic of Korea and Democratic People's Republic of Korea and are in collections maintained at the United States National Museum, Smithsonian Institution, Washington DC, USA; the Snow Entomological Museum, University of Kansas, Lawrence, KS, USA; and the National Institute of Biological Resources, Incheon, South Korea. *Pilaria* crane flies are aquatic and semiaquatic, developing in fast running and stagnant water bodies and in wet muddy places at the margins of water pools. Such habitats usually prevail at lower altitudes, but these areas most often are used for agriculture and human settlement, making natural habitats scarce and fragmented. *Pilaria* crane flies are rare, thus it is not surprising that genus was left unnoticed by previous researchers. The genus *Pilaria* Sintenis, 1889 with two species *P. melanota* Alexander, 1922 and *P. simulans* Savchenko, 1983, is a new record for the Korean Peninsula. We present general information on the genus, redescriptions of species based on Korean specimens, illustrations of both sexes, elevation range, period of activity, habitat information, general distribution, and a distribution map for the Korean Peninsula for each species.

Keywords: habitat, larva, new record, North Korea, pupa, South Korea, taxonomy

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INTRODUCTION

Investigations into Korean short-palped crane flies, family Limoniidae (Diptera), started more than a century ago with the first specimens collected as early as 1915 (Podenas *et al.*, 2019). The first publication on this group of insects, with four descriptions of new species, was written by Ch. P. Alexander (Alexander, 1934). He described 49 species from Korea, most of them from the northern part of the peninsula, now North Korea (Podenas, 2013). Nearly 80 years later, in 2012, further investigations into Limoniidae crane flies on the Korean Peninsula were initiated by the authors of this publication and researchers from the National Institute of Biological Resources in Incheon, South Korea. Prior to those studies, 95 species of Limoniidae were recorded from North and South Korea (Podenas, 2013), the new findings summarized in the National List of Species of Korea a few years later (Cho, 2019), this already including 144 species.

Pilaria crane flies are aquatic and semiaquatic, developing in fast running and stagnant water bodies, in wet muddy places at the margins of water pools, in swampy areas or

along slow running channels and streams, on sandy bottom of fast streams and springs. This genus has 42 extant species and no recognized subgenera. It has a worldwide distribution, but most species are recorded from the Northern Hemisphere. The highest diversity, 13 species, is known to occur in North America. The East Palaearctic, Oriental, and Afrotropic Regions have nine species each, West Palaearctic six, Neotropics two, and a single species was recorded from Australia (Oosterbroek, 2021). Five fossil species are known from the Eocene, Oligocene, and Miocene of Europe (Evenhuis, 2014).

Because of wide range of habitats suitable for this genus, we would expect a higher diversity on the Korean Peninsula. On the other hand, only nine species are recorded from the Eastern Palaearctic. Despite *Pilaria* crane flies being collected for more than 80 years on the Korean Peninsula, only 35 specimens were located in scientific collections. Since they are so rare, it is not surprising that *Pilaria* was left unnoticed by Korean entomologists. An additional 58 specimens were added to the collection of the National Institute of Biological Resources by authors of this publication.

Since 2012, crane flies have been collected annually in different localities, at different times, and using different methods throughout the country. Despite original and subsequent descriptions of East Palearctic species over a long period of time, some of these species were known only from the original descriptions and no illustrations were available. The aim of our study was to document, re-describe, illustrate and prepare keys for all Korean crane fly species identified to date. In this article, we provide photographs of important taxonomical details, such as antennae, wings, male and female terminalia. We also include distribution maps and a key for all species of the Korean Peninsula. This publication is a continuation of our previous work on short-palped crane flies (Limoniidae) from Korea.

MATERIALS AND METHODS

Crane flies available for this study (Table 1) are preserved in the following scientific collections:

Specimens collected in 1938 and 1939 in the northern part of the Korean Peninsula (now Democratic People's Republic of Korea (North Korea)) by A. M. Yankovsky are

deposited in the collections of the United States National Museum (USNM), Smithsonian Institution, Washington DC, USA;

Specimens collected in 1954 in the southern part of the Korean Peninsula (now Republic of Korea (South Korea)) by Dr G. W. Byers, are deposited in the Snow Entomological Museum, University of Kansas (SMEK), Lawrence, KS, USA and in USNM;

Specimens collected in 2014–2019 in South Korea are deposited in the collections of the National Institute of Biological Resources (NIBR), Incheon, South Korea.

Adult crane flies were collected in various ways, including by insect nets, with Malaise traps, LED light traps, black light traps, Mosquito Magnet[®] traps (Pro Model, Woodstream Corp., Lititz, PA), New Jersey traps, and at light sources. *Pilaria* species however were captured only by entomological nets and at light sources. Some specimens were preserved dry in envelopes in the field and were later mounted at the laboratory on their side on a paper point, with legs generally surrounding the insect pin. Other specimens were preserved in 96% ethanol (ETOH). Some specimens were slide mounted in Euparal; the genitalia of males and ovipositors of females were cleared overnight in approximately 10% potassium hydroxide (KOH) and

Table 1. Collecting sites in Korea.

Locality	Year	N*	E*	Collector	Method	Collection
N. Korea, Seren Mts. (Hamgyeongbuk-do, Gyeongsung-gun)	1938	41.68730	129.30918	A. M. Yankovsky	Net	USNM
N. Korea, Kankyo Nando, Puksu Pyaksan (now, Yanggang-do, Pungseo-gun, Mt. Buksubaeksan)	1939	40.69985	127.71601	A. M. Yankovsky	Net	USNM
S. Korea, #6, #10, Hwy #13, 6 mi. E of Seoul, 1 mile West of Han River (Gyeonggi-do, Namyangju-si, Joan-myeon, Sambong-ri)	1954	37.59600	127.33250	G. W. Byers	Net	USNM, SMEK
S. Korea, #14, Oho-ri, east coast	1954	38.33333	128.50000	G. W. Byers	Net	SMEK
S. Korea, #17, #23, #26, Central National Forest, 18 mi. NE Seoul (Gyeonggi-do, Namyangju-si, Sudong-myeon, Naebang-ri)	1954	37.74813	127.29364	G. W. Byers	Net	SMEK
S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol valley	2014	35.26590	127.58096	S. Podenas	Net, at light	NIBR
	2015	35.25257	127.58981			
	2016	35.25825	127.58208			
	2019	35.27177	127.57146			
		35.27333	127.56924			
		35.26586	127.58090			
		35.26586	127.58093			
	35.27448	127.56378				
S. Korea, Gyeonggi-do, Gunpo-si, Suri-dong	2017	37.35022	126.91527	S. Podenas	Net	NIBR
S. Korea, Jeju-do, Seogwipo-si, Saekdal-dong	2019	33.36044	126.46275	S. Podenas	Net	NIBR

*Coordinates for old collecting sites are approximate

preserved in microvials filled with glycerol on the same pin as the dry insect, or on a separate pin if the crane fly was preserved in ETOH, male aedeagal complex was slide mounted in glycerin jelly, with edges of cover glass coated with nail polish.

Information on the examined material is given exactly as it is on the labels regardless of style, measurement unit or other information. For specimens collected by S. Podenas and his colleagues, the collecting date on the label is followed by a number in brackets. Different localities where insects were collected on the same date were given separate numbers and all information from those localities, whether in the field notes and databases, photographs or other locality information, were marked with the specific number. Specimens are arranged according to the collecting date.

Crane flies were observed using an Olympus SZX10 dissecting microscope. Photographs were taken with a Canon EOS R5 digital camera through a Canon MP-E 65 mm macro lens and through Mitutoyo M Plan Apo 10× and 20× lenses mounted on same camera.

The terminology of adult morphological features generally follows that of Cumming and Wood (2017), de Jong (2017) for terminology of wing venation.

General distribution of species is given according Oosterbroek (2021).

TAXONOMY

Pilaria Sintenis, 1889

Pilaria Sintenis 1889: 398. - Ishida 1959: 2 (in key). - Alexander 1948: 523, 524, fig. 10. - Savchenko, Krivolutsкая 1976: 57 (in key), 70. - Savchenko 1983: 49 (in key), 61; 1986: 326–331, figs. 167–171; 1989: 108–109, figs. 35.3, 53, 54.

Limnophila (Eulimnophila) Alexander 1919: 917 (in key).

Limnophila (Pilaria) Edwards 1938: 63 (in key), 87, text figs. 12a, 13c, 14d, Pl. III figs. 11, 21.

Type species - *Limnophila pilicornis* Zetterstedt, 1851 (= *meridiana* (Staeger, 1840)) (Holarctic).

Adult.

Medium-sized crane flies with body length 7.0–11.5 mm, wing length 7.5 mm to 9.0 mm. General body coloration from brownish yellow to brown and dark brown.

Head: Rounded posteriorly without neck-like extension. Eyes widely separated in both sexes, width of vertex approximately equals length of both basal antennomeres taken together. Male antenna long, reaching from base of wing to middle of abdomen, if bent backwards, female antenna shorter. If antenna shorter, then length of verticils up to four times that of respective segments, but if longer, then verticils missing and flagellomeres covered with dense erect whitish pubescence. Scape short, subequal to ped-

icel. Flagellum 14-segmented, flagellomeres elongate, nearly cylindrical. Rostrum short.

Thorax: Frontal margin of pronotum with wide but shallow emargination. Prescutum with small tubercular pits at frontal margin, pseudosutural fovea large and distinct, closer to anterior margin of sclerite, longitudinal stripes on prescutum and presutural scutum missing. Pleuron uniformly colored, often distinctly lighter than dorsum, katapisternum setoseless. Meron small, thus middle and posterior coxae close together. Wing (Figs. 1B, 2A) long and narrow, iridescent, brownish or yellowish, patternless or with darker areas surrounding cross-veins, stigmal area covered with macrotrichiae. Arculus present. Vein *Sc* long, reaching wing margin before branching point of *Rs*, *sc-r* close to the tip of *Sc*. *R*₁ elongate, *R*₃ and *R*₄ strongly diverging, *R*₂ at branching point of *R*₃ and *R*₄ or short distance on *R*₃. Cell *r*₃ with long stem, that approximately equals to length of *R*₃. Cell *m*₁ usually present and has long stem which is close to the half length of cell itself, but cell *m*₁ missing in type species. Discal cell elongate. Cross-vein *m-cu* close to the middle of discal cell. Vein *CuP* and anal vein diverging, both slightly arched before wing margin. Anal vein reaching wing margin beyond the level of *Rs* base. Anal cell long and narrow with widely rounded posterior margin. Calypter with few long setae. Halter long. Legs with well developed tibial spurs, single on fore, paired on middle and posterior leg. Claw simple, without spines. Arolium long and slender, reaching to about middle of claw.

Abdomen: Abdominal tergites without paired transverse sutures. Male terminalia approximately as wide as rest of the abdomen, slightly elongate. Ninth segment fused into complete genital ring. Ninth tergite shallowly emarginate at posterior margin, gonocoxite elongate, simple, without additional lobes. Two pairs of terminal gonostyli. Outer gonostylus long and narrow, strongly sclerotized, claw-shaped, inner gonostylus elongate, fleshy and setose. Interbase elongate, extended posteriorly, curved frontally. Aedeagus distinctly differs among species, straight, or strongly curved, seminal vesicle varies from very small to large. Ovipositor long with long and narrow cerci and hypovalvae.

Last instar larva.

Body: Covered with very short yellowish setae, which gives body a golden color.

Head capsule: Elongate oval in shape, depressed dorsoventrally and much reduced, especially on ventral side. Clypeolabrum large, as long as wide, pale, not sclerotized, square-shaped. Frons separated from clypeolabrum, sclerotized, fused into spatulate plate, widest posteriorly. Basal segment of antenna short, apical papilla elongated. Mandible two segmented with joint near mid-length. Maxilla elongated, slightly narrowing toward tip with apical part directed outward. Cardo reduced. Hypopharyngeal part of

head capsule membranous. Posterior part of head capsule consists of one pair of rod-shaped internolateralia which are fused with frons and two pairs of rod-shaped externolateralia which are joined by membrane.

Terminal segment: Last abdominal segment (anal) constricted; penultimate abdominal segment inflated. Four cushions of long stout setae on posterior margin of sternite of penultimate segment, equidistant from each other. Spiracular field surrounded by four flattened elongate and sclerotized lateral and ventral lobes, dorsal lobe vestigial. Pigmentation of ventral lobe discontinuous, with transverse striations, coloration more continuous toward apex or reduced to narrow line. Spiracular field entirely fringed with setae. Apical setae of lobes more or less similar in length to other marginal setae. Spiracles large and circular. Anus surrounded by four short, oval-shaped white and fleshy anal papillae (Gelhaus and Podeniene, 2019).

Pupa.

Body: Coloration brown.

Head and thorax much darker than the abdomen, pronotal horns light brown. Cephalic crest consists of several lobes. Pronotal horn elongate, tip split into flattened lobes. Abdominal segments II–VII with three or four pairs of naked tubercles. Terminal segment of male pupa blunt and narrow, that of female elongate (Alexander, 1920).

Check list of Korean *Pilaria* crane flies

Pilaria melanota Alexander, 1922

Pilaria simulans Savchenko, 1983

Key to Korean species of the genus *Pilaria* Sintenis

1. Dorsum of thorax dark brown to black. Wing stigma present. Seminal vesicle of male terminalia elongate *Pilaria melanota* Alexander, 1922
- Dorsum of thorax light brown to brownish yellow. Wing stigma missing. Seminal vesicle of male terminalia globular *Pilaria simulans* Savchenko, 1983

Pilaria melanota Alexander, 1922

Pilaria melanota Alexander, 1922: 185; Savchenko, 1989: 111.

Limnophila (Pilaria) melanota Edwards, 1926: 269 (identification not certain).

Pilaria tokionis melanota Savchenko, Krivolutskaya, 1976: 71.

General: Body coloration polished dark brown to black dorsally, light brown to yellowish laterally and ventrally. Body length of male 4.7–8.2 mm, of female 7.0–11.5 mm. Wing length of male 6.3–9.2 mm, of female 6.2–10.7 mm.

Head: Semi-polished dark brown to black, sparsely

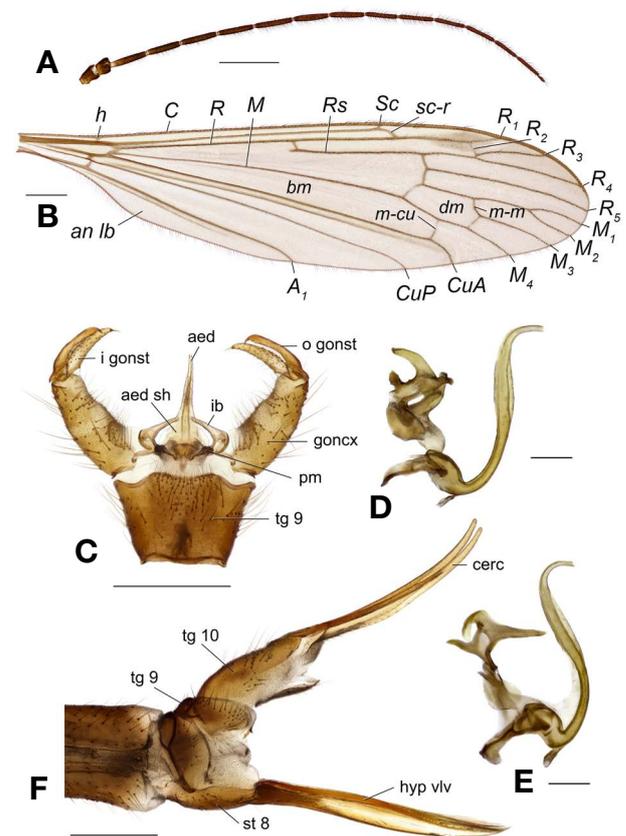


Fig. 1. *Pilaria melanota* Alexander, 1922. A. male antenna. B. female wing. C. male genitalia, dorsal view. D. aedeagal complex, in ETOH, lateral view. E. aedeagal complex, slide-mounted, lateral view. F. ovipositor, lateral view. Scale bars 0.5 mm (A–C, F), 0.1 mm (D, E). Abbreviations: A₁ - first branch of anal vein; aed - aedeagus; aed sh - aedeagal sheath; an lb - anal lobe; bm - basal medial cell; C - costal vein; cerc - cercus; CuA - anterior branch of cubital vein; CuP - posterior branch of cubital vein; dm - discal medial cell; goncx - gonocoxite; h - humeral vein; hyp vlv - hypogynial valve; ib - interbase; i gonst - inner gonostylus; M - medial vein, or media; M₁ - first branch of media; M₂ - second branch of media; M₃ - third branch of media; M₄ - fourth branch of media; m-cu - medial-cubital crossvein; m-m - medial crossvein; o gonst - outer gonostylus; pm - paramere; R - radius, or radial vein; R₁ - anterior branch of radius; R₂ - second branch of radius; R₃ - lower branch of second branch of radius; R₄ - upper branch of third branch of radius; R₅ - lower branch of third branch of radius; Rs - radial sector; Sc - subcostal vein; sc-r - subcostal-radial crossvein; st - sternite; tg - tergite.

dusted with gray, denser along eye margin, sparsely covered with dark brown setae. Eyes widely separated in both sexes, distance between eyes in male and female approximately equals to the length of both basal antennomeres taken together. Antenna (Fig. 1A) 3.2–4.7 mm long in male, 2.1–2.7 mm in female, reaching nearly to the middle of abdomen in male, but just to the base of abdomen in female if bent backwards. Scape elongate, light brown, darker dorsally. Pedicel subequal to the scape, brown to dark brown with light brown base. Flagellum dark brown,

just base of first flagellomere narrowly pale, bases of second and third flagellomeres indistinctly paler. Flagellomeres elongate, subcylindrical, apical flagellomere very short, much smaller than preceding. All flagellomeres covered with erect dense whitish pubescence, that is approximately twice as long as width of segment. Single long seta present distally on dorsal surface of some flagellomeres, but usually missing, length of seta approximately equals half the length of respective segment or slightly exceeds that in male. Female flagellum with long verticils, longest verticils 1.5 times exceeding length of respective segments. Rostrum brown, paler ventrally, mouth parts darker brown. Palpus dark brown, setose.

Thorax: Cervical sclerites grayish dark brown. Thorax polished, dark brown to black dorsally, brownish yellow laterally and ventrally. Pronotum brownish yellow. Prescutum and presutural scutum polished dark brown to black dorsally, without longitudinal stripes, brownish along lateral margin. Tubercular pits small and close to each other at the frontal margin of sclerite, pseudosutural fovea distinct, surrounded by yellowish area. Postsutural scutum with each lobe polished dark brown to black, area between lobes brownish yellow. Scutellum dark brown, yellowish fronto-medially. Mediotergite dark brown, sparsely dusted with gray. Pleuron obscure yellow to brownish yellow dorsally, getting paler ventrally, setoseless. Wing (Fig. 1B) iridescent, translucent, with brownish tinge, yellowish at base, without any darker spots except stigma, which is indistinct, elongate, brownish and setose. Veins brown, pale at wing base. Venation: *Sc* long, reaching wing margin slightly before branching point of *Rs*, *sc-r* beyond tip of *Sc*, oblique. *Rs* long, angulate and short spurred at base. Free end of *R*₁ elongate, *R*₂ close to branching point of *R*₃ and *R*₄. *R*₃ and *R*₄ diverging towards wing margin, *R*₄ and *R*₅ parallel to each other. Cell *r*₃ with long stem which approximately equals to the free end of *R*₃. Discal cell elongate, 1.5 times as long as wide. Stem of cell *m*₁ longer than cell itself. Cross-vein *m-cu* at about two-thirds of discal cell length. *CuA* arched before wing margin, *CuP* nearly straight for the entire length, just slightly arched at wing margin, anal vein slightly sinuous. Anal angle long and narrow. Calypter with few long setae. Length of male halter 1.0–1.4 mm, of female 1.0–1.5 mm. Stem of halter pale, yellowish at base, knob dark brown. Coxae pale yellow, just fore coxa brownish frontally. Meron small, thus second and third pairs of coxae close to each other. Trochanters obscure yellow. Fore and middle femora dark brown with narrowly pale base, hind femur brown with narrowly dark brown apex and pale base. Tibiae and tarsi dark brown. Male femur I: 4.0–6.2 mm long, II: 5.4–6.5 mm, III: 5.0–7.2 mm, tibia I: 5.2–7.7 mm, II: 5.8–7.0 mm, III: 5.5–8.0 mm, tarsus I: 5.2–6.8 mm, II: 4.3–6.5 mm, III: 3.5–4.6 mm. Female femur I: 3.8–6.1 mm long, II: 4.1–6.8 mm, III: 5.0–7.8 mm, tibia I: 4.5–7.8 mm, II: 5.8–7.7 mm,

III: 5.4–8.2 mm, tarsus I: 4.7–7.5 mm, II: 4.2–6.2 mm, III: 3.8–5.2 mm. Claw simple, without spines. Arolium reaching to about middle of claw.

Abdomen: Tergites dark brown with grayish posterior margin, covered with sparse erect yellowish setae, sternites yellow, pregenital sternite brownish. Male terminalia (Fig. 1C) yellow with dark brown ninth tergite. Posterior margin of ninth tergite setose, slightly extended posteriorly with shallow wide central emargination between two wide low lobes. Gonocoxite elongate, three times as long as width at base, simple, without additional lobes. Outer gonostylus long, narrow, slightly arched with spine-shaped curved apex and small serration distally along slightly inflated mesal margin. Inner gonostylus fleshy and setose, slightly longer than outer gonostylus, wider at about one-fourth from base, narrower towards apex which is armed with single acute apical denticle. Interbase with long narrow, blunt-apexed distal arm and strongly arched basal branch articulating with gonocoxite apodeme. Parameres membranous, uniform. Aedeagus very long, narrows towards distal end, which is slightly curved downwards (Fig. 1D, 1E). Aedeagal sheath slightly expanded basally, narrowing towards apex. Seminal vesicle small. Ovipositor (Fig. 1F) brown, just tip of cercus paler. Cercus long and narrow, distal part raised upwards. Hypoalva straight, narrowing towards apex, reaching to about two-thirds of cercus, inner surface in distal half covered with long filaments.

Elevation range in Korea: Altitudes from sea level to slightly above 1,100 m.

Period of activity in Korea: Adults are active and flying from late April through late August.

Habitats: Slopes to mountainous rivers and streams covered with dense mixed forest, deciduous shrubs, some muddy areas along margins, rocks covered with wet mosses along springs falling into the river, sparse grassy vegetation along margins, some areas densely covered with dwarf bamboo *Sasa borealis* (Hack.) groves. Females are coming to light only in rare occasions.

General distribution: Japanese islands Honshu and Shikoku, Sakhalin Island of the Far East of Russia, records from Borneo and Sarawak, Malaysia need confirmation. Recorded from Korean Peninsula for the first time.

Examined material (Fig. 3A): 1 male, 1 female (pinned), North Korea, Seren, alt. 1,000–2,500 ft. [305–762 m], 1938.08.7–8, A. M. Yankovsky (USNM); 2 males, 1 female (pinned), North Korea, Seren, alt. 1,500–2,000 ft. [457–610 m], 1938.08.14–15, A. M. Yankovsky (USNM); 3 males, 1 female (pinned), North Korea, Seren, alt. 2,000 ft. [610 m], 1938.08.17–18, A. M. Yankovsky (USNM); 2 males (pinned), North Korea, Seren, alt. 2,000–2,500 ft. [610–762 m], 1938.08.21–22, A. M. Yankovsky (USNM); 1 female (pinned), S. Korea, #6, 6 mi. E of Seoul, 1954. 05.20, G. W. Byers (USNM); 6 females (pinned), S. Korea,

#6, Hwy. #13, 6 mi. E of Seoul, 1 mi. W. Han River, alt. 150 ft. [46 m], 1954.05.20, G. W. Byers (SMEK); 1 male, 2 females (pinned), S. Korea, #10, Hwy. #13, 6 mi. E of Seoul, 1 mi. W. Han River, alt. 150 ft. [46 m], 1954.06.03, G. W. Byers (SMEK); 1 male (pinned), Korea, #14, Ohori, east coast, alt. 10–15 ft. [3–5 m], 128°30'E, 38°20'N, 1954.06.11, G. W. Byers (SMEK); 1 male (pinned), Korea, #17, Central National Forest, 18 mi. NE Seoul, alt. 350–500 ft. [107–152 m], 1954.06.20, G. W. Byers (SMEK); 1 male (pinned), Korea, #23, Central National Forest, 18 mi. NE Seoul, alt. 350 ft. [107 m], 1954.07.27, G. W. Byers (SMEK); 1 male (pinned), Korea, #26, Central National Forest, 18 mi. NE Seoul, alt. 350 ft. [107 m], 1954.08.14, G. W. Byers (SMEK); 1 male (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.26590, E 127.58096, alt. 446 m, 2014.08.24 (1), coll. S. Podenas (NIBR); 1 male (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.25257, E 127.58981, alt. 304 m, 2015.04.28 (2), coll. S. Podenas (NIBR); 1 female (pinned), S. Korea, Jirisan National Park, Piagol Valley, N 35.25825, E 127.58208, alt. 310 m, 2015.05.02 (2), S. Podenas (NIBR); 1 female (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.26590, E 127.58096, alt. 446 m, 2015.06.26, coll. S. Podenas (NIBR); 1 female (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol valley, N 35.27177, E 127.57146, alt. 490 m, 2015.06.27 (1), S. Podenas (NIBR); 2 females (pinned), 4 males, 4 females (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27177, E 127.57146, alt. 490 m, 2015.06.28 (2), coll. S. Podenas (NIBR); 2 females (pinned), 2 males, 2 females (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27177, E 127.57146, alt. 490 m, 2015.06.29 (1), coll. S. Podenas (NIBR); 1 male (pinned), 2 males, 2 females (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27448, E 127.56378, alt. 593 m, 2015.07.01 (1), coll. S. Podenas (NIBR); 3 males (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.26586, E 127.58090, alt. 448 m, 2015.07.02 (1), coll. S. Podenas (NIBR); 1 male (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27177, E 127.57146, alt. 490 m, 2015.07.03 (1), coll. S. Podenas (NIBR); 1 male, 1 female (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27177, E 127.57146, alt. 490 m, 2016.06.03 (2), coll. S. Podenas (NIBR); 1 male, 1 female (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27333, E 127.56924, alt. 546 m, 2016.06.03 (3), coll. S. Podenas (NIBR); 1 female (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.26586, E 127.58090, alt.

448 m, 2016.06.03 (4), coll. S. Podenas, at light (NIBR); 4 females (pinned), 1 male, 1 female (in ethanol, antennae and wing of male slide-mounted in Euparal), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27333, E 127.56924, alt. 546 m, 2016.06.04 (3), coll. S. Podenas (NIBR); 2 males, 1 female (pinned), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.26586, E 127.58093, alt. 414 m, 2016.06.24 (1), S. Podenas (NIBR); 1 male, 2 females (pinned), 1 male, 3 females (in ethanol), S. Korea, Gyeonggi-do, Gunpo-si, Suri-dong, N 37.35022, E 126.91527, alt. 138 m, 2017.05.27 (1), coll. S. Podenas (NIBR); 1 female (in ethanol), S. Korea, Jeju-do, Seogwipo-si, Saekdal-dong, N 33.36044, E 126.46275, alt. 1,103 m, 2019.06.19 (1), coll. S. Podenas (NIBR); 3 males, 3 females (in ethanol), S. Korea, Jeollanam-do, Gurye-gun, Toji-myeon, Naeseo-ri, Piagol Valley, N 35.27333, E 127.56924, alt. 546 m, 2019.06.25 (1), coll. S. Podenas (NIBR).

Pilaria simulans Savchenko, 1983

Pilaria discicollis simulans Savchenko, 1983: 61–62; 1989: 111; Starý, Oosterbroek, 2008: 11.

Pilaria simulans Oosterbroek, 2021.

General: Body coloration light brown. Body length of male 5.7–7.2 mm, of female 6.5–7.5 mm. Wing length of male 6.7–8.3 mm, of female 6.5–7.5 mm.

Head: Dark brown dorsally, yellowish posteriorly, light brown laterally, narrowly light gray along eye margin because of densier gray pruinosity. Sparse erect brownish setae densier and longer posteriorly. Eyes widely separated in both sexes, distance between eyes somewhat exceeds length of scape. Antenna 1.5–1.8 mm long in male, 1.4–1.7 mm in female, reaching base of wing if bent backwards. Scape slightly elongate, dark brown, with few erect dark brown setae dorsally. Pedicel subequal to the scape, brown. Flagellum brown, four basal antennomeres indistinctly yellowish at base. Two basal flagellomeres oval, third and fourth spindle-shaped, remaining flagellomeres elongate, apical segment elongate, about two thirds as long as preceding. Four basal flagellomeres covered with erect dense whitish pubescence ventrally, that is shorter than width of segment. Verticils on distal flagellomeres starting from fourth, 3.5–4.0 times as long as respective segments, only apical segment with two long setae on tip. Rostrum yellowish brown. Palpus dark brown, setose. Mouth parts brown.

Thorax: Cervical sclerites brown. Thorax semi-polished brown, darker dorsally, lighter ventrally. Pronotum yellowish brown to brownish yellow. Prescutum and presutural scutum brownish yellow, sparsely dusted with yellowish pruinosity, marginated with yellow laterally, few erect brown setae distributed on both sides of medial line, some specimens with indistinctly darker area along middle.

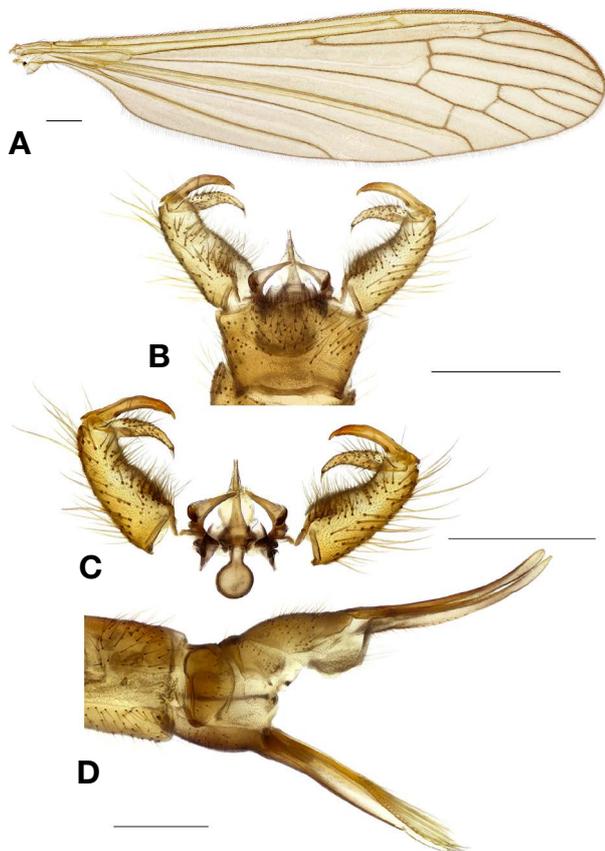


Fig. 2. *Palaria simulans* Savchenko, 1983. A. wing. B. male genitalia, dorsal view. C. male genitalia with ninth tergite removed, dorsal view. D. ovipositor, lateral view. Scale bars: 0.5 mm.

Tubercular pits small, indistinct, reaching each other, close to the frontal margin of sclerite, pseudosutural fovea distinct, closer to frontal margin of sclerite. Postsutural scutum with scutal lobe brownish medially, yellow laterally, area between lobes brownish yellow. Scutellum brownish yellow. Mediotergite yellow, indistinctly brownish laterally, sparsely dusted with yellow pruinosity. Pleuron obscure yellow, getting paler ventrally, with few erect yellowish setae on laterotergite. Wing (Fig. 2A) slightly iridescent, translucent, with brownish tinge, yellowish at base, without any darker spots. Stigma indistinct, nearly missing, few dark brown macrotrichiae in stigmal area. Veins brown, yellowish at wing base. Venation: *Sc* medium-long, reaching wing margin clearly before branching point of *Rs*, *sc-r* at tip of *Sc*. *Rs* long, arched at base. Free end of *R*₁ elongate, *R*₂ close to or at branching point of *R*₃ and *R*₄. *R*₃ and *R*₄ diverging towards wing margin, *R*₄ and *R*₅ parallel to each other. Cell *r*₃ with long stem which is shorter than free end of *R*₃. Discal cell elongate, twice as long as wide. Stem of cell *m*₁ shorter than cell itself. Cross-vein *m-cu* at about two-thirds of discal cell length. *CuA* slightly arched before wing margin, *CuP* straight for

the entire length, anal vein slightly sinuous. Anal angle long and narrow. Calypter with few long setae. Halter yellowish gray, paler at base, knob slightly infuscated, grayish. Length of male halter 1.0–1.2 mm, of female 1.0–1.1 mm. Coxae yellow, brownish dorsally. Meron small, thus second and third pairs of coxae close to each other. Trochanters pale yellow. Femur yellow, indistinctly darker at apex. Tibia yellow with brownish distal part. Basal tarsomere yellow with dark distal part, remaining tarsomeres dark brown. Male femur I: 4.4–5.3 mm long, II: 4.7–5.2 mm, III: 5.4–6.1 mm, tibia I: 5.2–6.0 mm, II: 5.0–5.8 mm, III: 5.8–7.2 mm, tarsus I: 4.4–4.7 mm, II: 4.5–5.5 mm, III: 4.0–4.5 mm. Female femur I: 3.5 mm long, II: 4.0–5.2 mm, III: 4.5–5.2 mm, tibia I: 4.5 mm, II: 4.5–5.7 mm, III: 4.3–5.5 mm, tarsus I: 4.4 mm, II: 3.7–4.5 mm, III: 2.7–3.8 mm. Claw dark brown, simple, without teeth or spines. Arolium reaching to about two-thirds of claw.

Abdomen: Tergites brown along middle, yellow laterally, with grayish posterior margin, covered with sparse erect yellowish setae. Sternites yellow with narrowly grayish lateral and posterior margins, pregenital segment brownish. Male terminalia (Fig. 2B) yellow. Posterior margin of ninth tergite setose, slightly extended posteriorly with shallow wide central emargination between two wide low lobes. Gonocoxite elongate, 2.8 times as long as width at base, simple, without additional lobes. Outer gonostylus long, narrow, slightly arched, claw-shaped, pre-apical area with microscopic dots and setae, apex obtuse. Inner gonostylus fleshy and setose, slightly longer than outer gonostylus, widest at base getting narrower towards blunt apex. Interbase wedge-shaped, at base with short lateral arm articulating with gonocoxal apodeme. Paramere membranous, flattened. Aedeagus arched at basal third, distal part slightly raised upwards. Aedeagal sheath widened at basal half. Seminal vesicle big and globular (Fig. 2C). Ovipositor (2D) light brown. Cercus long and narrow, blunt-apexed, distal part slightly raised upwards. Hypovalva straight, narrowing towards apex, reaching to about four-fifths of cercus. Distal part of hypovalva narrow, parallel-sided, dorsal margin, starting from middle, covered with long filaments.

Elevation range in Korea: Altitudes from 300 m to more than 1,500 m.

Period of activity in Korea: Adults are active and flying from late June through middle of September in Korea, beginning of July through end of September with the highest abundance in August in the Far East of Russia.

Habitats: Unknown in Korea. Wet meadows on the sea-coast, boggy areas in mixed and broad-leaved forests in the Far East of Russia (Savchenko, 1983).

General distribution: Southeastern corner of the Far East of Russia, close to the border with North Korea. Recorded from Korean Peninsula for the first time.

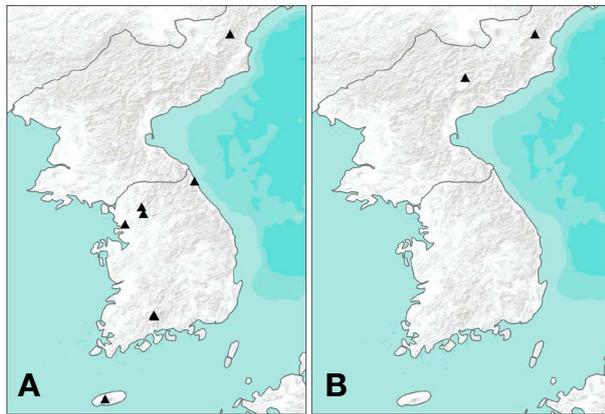


Fig. 3. Distribution maps of Korean *Pilaria*. A. *P. melanota*. B. *P. simulans*.

Examined material (Fig. 3B): 1 female (pinned), North Korea, Seren, alt. 2,500 ft. [762 m], 1938.08.7–8, A. M. Yankovsky (USNM); 2 males (pinned), North Korea, Seren, alt. 2,000–2,500 ft. [610–762 m], 1938.08.21–22, A. M. Yankovsky (USNM); 3 males, 2 females (pinned), North Korea, Seren, alt. 1,000–1,500 ft. [305–457 m], 1938.08.27–28, A. M. Yankovsky (USNM); 1 male (pinned), North Korea, Seren Mts., alt. 2,000 ft. [610 m] 1938.09.15, A. Yankovsky (USNM); 1 male (pinned), North Korea, Kankyo Nando, Pukso Pyaksan, alt. 5,000 ft. [1,524 m], 1939.06.21, A. Yankovsky (USNM).

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