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Taxonomic Notes on the Korean *Philostephanus* Species (Heteroptera: Miridae: Mirinae)

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한국산 광택장님노린재속의 분류학적 정리 (노린재아목: 장님노린재과)

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ABSTRACT : A newly recorded species of *Philostephanus* Distant, 1909 from Korea, *P. ulmi* (Kerzhner, 1979), is reported with brief taxonomic notes on the Korean *Philostephanus* species. Morphological keys of the Korean *Philostephanus* species are provided with the photos of adults and female genitalia for each species.

KEY WORDS : *Philostephanus glaber*, *Philostephanus rubripes*, *Philostephanus ulmi, Philostephanus*, *Arbolygus*, Miridae

초 록 : *Philostephanus ulmi* (Kerzhner, 1979)의 국내분포를 처음으로 확인하고 한국산 *Philostephanus*속의 검색표와 형태적 특징 등 종 동정에 필요한 정보를 관련 사진과 함께 간략히 기술하였다.

검색어 : *Philostephanus glaber*, *Philostephanus rubripes*, *Philostephanus ulmi*, *Philostephanus, Arbolygus*, 장님노린재과

The genus *Philostephanus* Distant, 1909 of the subfamily Mirinae had been considered as a local genus of the Oriental regions for a long time until Yasunaga and Schwartz (2007) proposed the East Asian genus *Arbolygus* Kerzhner, 1979 as a junior synonym of the former. They considered the structure of female genitalia as important characters to support their idea such as asymmetrical general shape, the genital chamber usually accompanied by strong sclerotization (SPGC, Fig. 1. D-F), and the inner processes projecting into the genital chamber (MPGC, Fig. 1. D-F). Presently, 23 species are recognized from the eastern Palearctic and the Oriental regions including Korea, Japan, China, the southern part of the Russian Far East, the southern slopes of the Himalayas (the northern part of India and Nepal), Thailand, and Sumatra. Most members are known to be closely associ-

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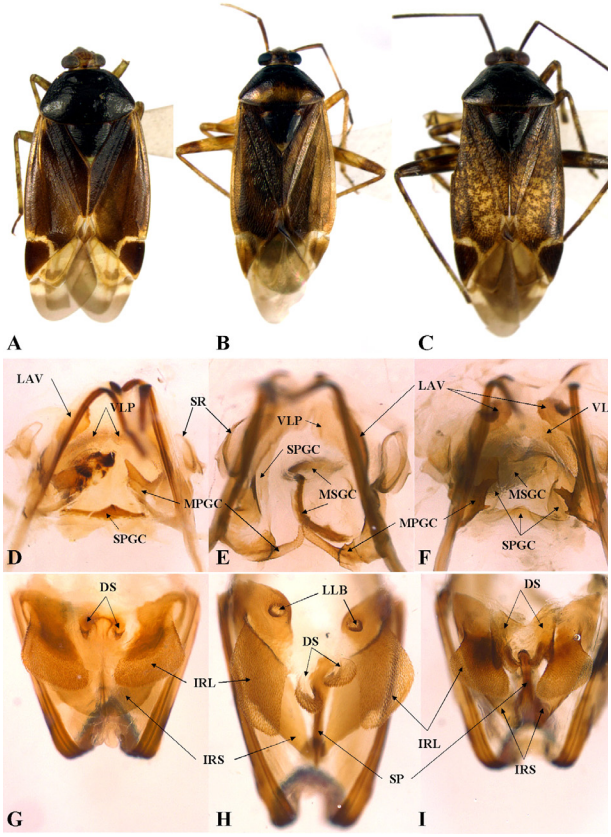

Fig. 1. Specimens and female genitalia of Korean *Philostephanus* species. A, D, G: *P. glaber*. B, E, H: *P. rubripes*. C, F, I: *P. ulmi*. A-C: female in dorsal view (A, C: abdomen removed); D-F: genital chamber and adjunct structures (seminal depository removed) in ventral view - LAV: strongly sclerotized lateralmost portion of anterior wall of vestibulum, MPGC: median process projecting into genital chamber from sclerotized portion of posterolateral margin of combined common oviduct and roof of genital chamber, MSGC: medial sclerite of combined common oviduct and roof of genital chamber, SPGC: sclerotized perimeter of combined common oviduct and dorsal wall of genital chamber, SR: sclerotized rings, VLP: ventral labiate plate; G-I: posterior wall of bursa copulatrix in anterodorsal view − DS: dorsal structures, IRL: interramal lobes, IRS: interramal sclerites, LLB: lateral sclerites, SP: sigmoid process.

ated with deciduous trees, and they are considered predominantly predaceous although the breeding host plants of several species are confirmed (Yasunaga and Schwartz, 2007). During our study on the family Miridae in Korea, we found one newly recorded species, *Philostephanus ulmi* (Kerzhner, 1979). The species is easily distinguished from other Korean congeners by its hemelytra which are distinctively speckled with pale portions.

In this study, we provide taxonomic information on *P. ulmi* and review the Korean *Philostephanus* species with morphological keys and photos of specimens and female gentitalia. All specimens examined are deposited in National Academy of Agricultural Science [NAAS]. All measurements are given in millimeters. The following abbreviations are used in measurements and localities for each specimen. Terms of the female genitalia follow those of Yasunaga and Schwartz (2007).

[Measurements] MBL (Maximum body length): from apex of tylus to apex of hemelytra in lateral view; BL (Body length): from apex of tylus to apex of abdomen in lateral view; MBW (Maximum body width): maximum width across lateral margins of hemelytra in dorsal view; HW (Head width): maximum width across eyes in dorsal view; PW (Pronotum width): maximum width across humeral angles in dorsal view; Ant I, II, III, IV (Antennal segment lengths): maximum length between base and apex of each segment in lateral view; HFL (Hind femur length): maximum length between base and apex in lateral view; HTL (Hind tibia length): maximum length between base and apex in lateral view. [Localities] GG: Gyeonggi-do, GW: Gangwon-do, JN: Jeollanam-do, GN: Gyeongsangnam-do,.

Systematic Accounts

Genus *Philostephanus* Distant, 1909

Philostephanus Distant, 1909: 449. Type species by monotypy: *Philostephanus vitaliter* Distant, 1909; Kerzhner and Josifov, 1999: 136; Yasunaga and Schwartz, 2007: 101.

Arbolygus Kerzhner, 1979: 24 (as subgenus of *Lygocoris*; upgraded by Miyamoto, 1987: 582; synonymized by Yasunaga and Schwartz, 2007: 102, 109). Type species by original designation: *Calocoris rubripes* Jakovlev, 1876; Kerzhner and Josifov, 1999: 69.

Remarks. *Philostephanus* is characterized with the combination of following characters; body oval to elongate oval, rather large, usually shining, brown to fuscous or blackish brown; vertex with a longitudinal

sulcus and weak basal transverse carina; pronotum generally glabrous; hemelytra usually speckled with irregular pale portions (but unspeckled in six species including *P. glaber* and *P. rubripes*) and clothed with dense silky pubescence; vesica with three to six lobes or sclerites; anterior wall with a pair of subtriangular sclerites (LAV, Fig. 1. D-F); dorsal part of genital chamber with a variety of sclerotization (MPGC, MSGC, SPGC, Fig. 1. D-F), sclerotized rings on dorsal labiate plate separated from each other; posterior wall with asymmetrical sclerites. The female genitalia is asymmetrical and shows distinctive interspecific variation for each structure, which is very uncommon in other genera of Mirinae. Particularly, its asymmetry is considered as an apomorphic character supporting the monophyly of this genus with the above stated characters of female genitalia. Interspecific variation of the female genitalia is useful in species discrimination (Yasunaga and Schwartz, 2007).

Key to the Korean *Philostephanus* species

1. Hemelytra densely clothed with silky reclining setae 2
   Hemelytra almost glabrous, sparsely clothed only with very short setae ..... *P. glaber*
2. Hemelytra distinctly speckled with pale portions ..... *P. ulmi*
   Hemelytra not speckled, entirely fuscous ..... *P. rubripes*

Philostephanus glaber (Kerzhner, 1988) 고운고리장님노린재

Lygocoris (*Arbolygus*) *glaber* Kerzhner, 1988: 30 (desc.); Lee and Kwon, 1991: 29 (list; first record in Korea).

Arbolygus glaber: Miyamoto and Yasunaga, 1989: 159 (list).

Philostephanus glaber: Yasunaga and Schwartz, 2007: 119 (redesc.).

Description. Dorsum elongate oval, shining, blackish brown or fuscous. Head oblique, shining, pale brown or yellowish brown, partly fuscous; frons with a median fuscous longitudinal stripe and several rows of fuscous transverse bands; mandibular and maxillary plates and clypeus partly fuscous. Antennae fuscous or sanguineous; segment I partly pale or brown; basal 1/3 of segment II slightly pale; base of segments III and IV always yellowish brown. Labium pale brown, reaching hind coxa; apical part of segment IV fuscous. Pronotum almost glabrous, blackish brown, shallowly punctate; collar brown or yellowish brown; calli glabrous, slightly swollen; posterior margin narrowly yellowish brown, and sometimes anterolateral margins brown or yellowish brown. Scutellum rugose, almost glabrous, blackish brown with yellowish brown posterior apex; sometimes anterior corners with two brown spots. Thoracic pleurites brown or pale brown, partly fuscous; evaporatory area brown or pale brown, partly fuscous. Hemelytra shining, fuscous, punctate, sparsely clothed with very short and weak whitish setae; basal part and inner margin of corium sometimes pale brown; anterior margin and posterior apex of cuneus pale brown; membrane translucent grayish pale brown, partly darkened. Legs pale brown; femurs with two or three obscure fuscous rings near apex and at middle; tibiae with two or three fuscous rings near base and apex and at middle, but sometimes entirely sanguineous; knees of tibiae fuscous or reddish brown; tibial spines brown; tarsal segments fuscous without pale basal part of segment I. Abdomen shining, fuscous, with silky reclining setae; ventral medial part brown or pale brown.

Materials examined. [NAAS] **GG** 1♀, Gyeonggido Forest Environment Research Institute, Sucheong, Osan, 26.v.2000 (BL trap, #L1BN01402); **JN** 1♀, Pear Research Station, Godong, Geumcheon, Naju, 7.vi.2002, J.-Y. Choi.

Measurements. (♀) MBL: 6.6-7.6, MBW: 3.0-3.5, PW: 2.6, BL: 5.5, HW: 1.3, VW: 0.5, Ant. I: 0.9, Ant. II: 2.0, Ant. III: 1.1, Ant. IV: 0.6, HFL: 2.6, HTL: 3.4.

Distribution. Korea (North, Central, South), Japan (Hokkaido, Honshu, Kyushu), China (Sichuan), Russia (Primorsky).

Remarks. This species is easily distinguished from other Korean congeners by its almost glabrous hemelytra. Other Korean congeners have distinctive, rather dense, and long pubescence on hemelytra. *Quercus dentata* and *Q. acutissima* are known as host plant of this species (Yasunaga and Schwartz, 2007).

Philostephanus rubripes (Jakovlev, 1876) 광택장님노린재

Calocoris rubripes Jakovlev, 1876: 115.

Lygocoris (*Arbolygus*) *rubripes*: Kerzhner, 1979: 25 (key); Lee and Kwon, 1991: 30 (list).

Arbolygus rubripes: Miyamoto, 1987: 582.

Philostephanus rubripes: Yasunaga and Schwartz, 2007: 139 (redesc.).

Description. Dorsum elongate oval, shining, blackish brown or fuscous. Head oblique, shining, brown, widely fuscous. Antennae brown or fuscous; segment I partly pale; subbasal part of segment II pale; base of segments III and IV always yellowish brown. Labium pale brown, reaching hind coxa; apical part of segment IV fuscous. Pronotum shining, blackish brown, shallowly punctate, densely clothed with silky reclining setae; collar brown; calli glabrous, slightly swollen; posterior margin narrowly brown or yellowish brown. Scutellum shining, slightly rugose, blackish brown with three yellowish brown spots at anterior corners and posterior apex. Thoracic pleurites brown, widely fuscous; evaporatory area pale brown, partly fuscous; ostiolar peritreme always fuscous. Hemelytra fuscous, shallowly punctate, densely clothed with silky reclining setae; anterior margin of cuneus pale brown; membrane translucent, grayish brown, partly darkened. Legs pale brown; fore and middle femurs with one or two obscure fuscous rings near apex; hind femur with two or three obscure fuscous rings near apex and at middle; tibiae sometimes entirely sanguineous; knees of tibiae fuscous; tibial spines brown; apical half of tarsal segments III fuscous. Abdomen shining, fuscous, with silky reclining pubescence; ventral medial part widely pale brown.

Materials examined. [NAAS] **GG** 2♀, Mt. Myeongjisan, Gapyeong, 18.viii.1999, G.-S. Lee and S.-H. Lee (Light trap); **GW** 3♂, 2♀, Mt. Hambaeksan, Taebaek, 11.viii.1999, J.-Y. Choi (Light trap); 2♂, Mt. Cheongtaesan, Sabgyo, Dunnae, Hoengseong, 20-21.vii.2000, G.-S. Lee; 22♂, 2♀, Mt. Cheongtaesan, Sabgyo, Dunnae, Hoengseong, 20-21.vii.2000, H.-G. Goh; JN 1♀, Sisamjae, Mt. Jirisan, 30.viii.1995, S.-H. Lee; **GN** 1♂, Baenaegol, Eonyang, Icheon, Sangbuk, Ulsan, 13.vii.2000, J.-Y. Choi & M.-O. Yeom (Light trap).

Measurements. (♂/♀) MBL: 6.8-7.0/7.1-7.5, MBW: 2.9/2.9-3.1, PW: 2.4-2.5/2.4-2.8, BL: 5.6-5.9/6.2-6.3, HW: 1.3/1.2-1.3, VW: 0.4-0.5/0.5, Ant. I: 1.1/1.0-1.1, Ant. II: 2.8/2.4-2.7, Ant. III: 1.4/1.3, Ant. IV: 0.6/0.6, HFL: 2.8-3.0/2.8-3.0, HTL: 4.1-4.2/3.8-4.0.

Distribution. Korea (North, Central, South), Japan (Hokkaido, Honshu, Shikoku, Kyushu), China (Hebei, Shanxi), Russia (Amur, Khabarovsk, Primorsky, Sakhalin).

Remarks. This species is similar with *P. ulmi*, but it can be considerably distinguished from the latter by unspeckled hemelytra. The hemelytra of *P. ulmi* is distinctively speckled with pale portions. This species is known to be closely associated with several deciduous trees, *Alnus* spp., *Quercus dentata*, *Q. mongolica*, *Morus bombycis*, *Populus* spp., *Salix* spp., and *Sorbus commixta*. Adults and nymphs were observed to prey on other insects in laboratory tests (Yasunaga and Schwartz, 2007).

Philostephanus ulmi (Kerzhner, 1979) 얼룩광택장님노린재 (신칭)

Lygocoris (*Arbolygus*) *ulmi* Kerzhner, 1979: 30 (desc.).

Arbolygus ulmi: Yasunaga *et al*., 1993: 155.

Philostephanus ulmi: Yasunaga and Schwartz, 2007: 147 (redesc.).

Description. Dorsum elongate oval, shining, blackish brown or fuscous. Head oblique, shining, brown, widely fuscous. Antennae fuscous; subbasal part of segment II slightly pale; base of segments III and IV always yellowish brown. Labium brown, partly fuscous, reaching hind coxa; apical part of segment IV always fuscous. Pronotum shining, blackish brown, shallowly punctate, sparsely clothed with short silvery setae; collar brown; calli

glabrous, slightly swollen; posterior margin narrowly brown or pale brown, and sometimes anterolateral parts near calli with one or two small brown spots. Scutellum rugose, blackish brown, uniformly clothed with silky reclining seate; posterior apex with brown or pale brown spot; anterior corners sometimes with two brown spots. Thoracic pleurites brown, widely fuscous; evaporatory area brown, widely fuscous. Hemelytra fuscous, densely clothed with silky reclining setae, speckled with brown or pale brown portions; anterior margin and apex of cuneus brown; membrane translucent grayish fuscous, partly darkened. Legs brown; femurs with two or three obscure fuscous rings near apex and at middle; tibiae with three or four fuscous rings near base and apex and at middle; knees of tibiae fuscous; tibial spines brown; apical parts of each tarsal segments fuscous. Abdomen shining, fuscous, partly pale, densely clothed with silky reclining setae.

Materials examined. [NAAS] **GW** 1♂, 1♀, Mt. Cheongtaesan, Sabgyo, Dunnae, Hoengseong, 20-21.vii. 2000, H.-G. Goh (#L1BN01429, #L1BN01430).

Measurements. (♂/♀) MBL: 7.4/7.7, MBW: 2.8/3.1, PW: 2.4/2.6, BL: 5.8/5.9, HW: 1.3/1.3, VW: 0.3/0.4, Ant. I: 1.0/1.0, Ant. II: 2.7/2.4, Ant. III: 1.2/1.2, Ant. IV: 0.6/-, HFL: 2.7/2.8, HTL: 4.1/4.2.

Distribution. Korea (Central; new record), Japan (Hokkaido, Honshu), China (Heilongjiang), Russia (Primorsky, Sakhalin).

Remarks. This species is easily distinguished from other Korean congeners by hemelytra which are distinctively speckled with pale portions (Fig. 1. C). The host plant is known as elm, *Ulmus japonica* (Ulmaceae), and it was also observed on willows (*Salix* spp.) and a popular (*Populus maximovitshii*; Salicaceae) in Japan. Adults and nymphs were observed to prey on other insects in laboratory tests (Yasunaga and Schwartz, 2007).

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