

Unknown Morphs of *Periphyllus allogenens* Szelegiewicz, 1981 (Hemiptera: Aphididae: Chaitophorinae)

Jun Hyeok Ko and Wonhoon Lee^{1*}

Department of Plant Medicine, Gyeongsang National University, Jinju 52828, Korea

¹Institute of Agriculture & Life Science, Gyeongsang National University, Jinju 52828, Korea

개성진사진딧물(*Periphyllus allogenens* Szelegiewicz, 1981) (노린재목: 진딧물과: 털진딧물아과)에 대한 알려지지 않은 형태 보고

고준혁 · 이원훈^{1*}

경상국립대학교 식물외과, ¹경상국립대학교 농업생명과학연구원

ABSTRACT: To date, *Periphyllus allogenens* is known only in Korean peninsula, has been reported with morphological characteristics about only the aptera viviparous generation. In this study, we collected fundatrix and alate viviparous female individuals of *P. allogenens* samples from Gapyeong-gun, and Hongcheon-gun in Korea between 2021 and 2022. Herein, we provide new descriptions, measurements, distributions, host plants, and photographs of unknown morphs, fundatrix and alate viviparous generations of *P. allogenens*.

Key words: *Periphyllus allogenens*, Chaitophorinae, fundatrix, alate viviparous female, Korea

초록: 현재까지 전세계적으로 *Periphyllus allogenens* (개성진사진딧물)은 무시성충세대에 대한 형태학적 정보만이 보고되었다. 본 연구에서는 2021년부터 2022년까지 한국 가평군, 홍천군에서 그동안 *P. allogenens*의 알려지지 않았던 간모, 유시성충 세대를 채집하여, 이들에 대하여 형태학적 정보, 분포지역, 기주식물, 생태 사진을 처음으로 보고한다.

검색어: 개성진사진딧물, 털진딧물아과, 간모, 유시성충, 한국

Periphyllus allogenens Szelegiewicz, 1981 is an insect pest that exclusively damages *Acer triflorum* and its distribution is only recorded in Korea. To date, aptera viviparous generation of *P. allogenens* has been described worldwide (Szelegiewicz, 1981).

The genus *Periphyllus* is a highly polymorphic group comprising 52 monoecious and holocyclic species worldwide; however, not all morphs of *Periphyllus* spp. have been identified (Blackman and Eastop, 2022; Sugimoto, 2013; Wiczorek

et al., 2017). For example, fundatrix generations have only been reported in approximately 10 *Periphyllus* species, and alate viviparous female generations have only been reported in approximately 31 species worldwide (Blackman and Eastop 2022; Essig and Abernathy, 1952; Lubiarz and Mackoś-Iwaszko, 2015). Recently, oviparous female and alate male generations of *Periphyllus koeleruteriae* have been identified (Junkiart and Wiczorek, 2019). However, before 2019, only apterous viviparous females, alate viviparous females, and aestivating nymph generation of *P. koeleruteriae* were described (Essig and Abernathy, 1952).

Identification of unknown morphs and knowledge of their life cycle type are important for effective control measures. In

*Corresponding author: wonhoon@gnu.ac.kr

Received July 27 2023; Revised August 24 2023

Accepted August 28 2023

this study, the fundatrix and alate viviparous generations of *P. allogenes* are newly described, and their distribution, host plants, and photographs are also presented.

Materials and Methods

Samples of *P. allogenes* were collected from *Acer triflorum* Kom, 1901. Samples were preserved in 95% ethanol and mounted on Canada balsam following the method described by Blackman and Eastop (2000). Images and measurements were taken using LEICA (DM3000 LED) and LEICA (CTR6 LED). Live specimens were obtained using NICON D 850. All specimens were deposited at the Institute of Agriculture and Life Sciences, Gyeongsang National University.

The following abbreviations are used for morphological features in this study: BL, body length from the head to the end of cauda; BW, body width across abdomen; Ant.I-VI, antennal segments; BD.III, basal articular diameter of Ant.III; Ant.VIb, antennal segment base of Ant.VI; PT, processus terminalis; LS Ant.III, length of the longest seta of Ant.III; LS HEAD, length of the longest seta of head; URS, Ultimate rostrum segment; HT.I, first tarsal segment of hind leg; HT.II, second tarsal segment of hind leg; HTB, Hind Tibia; FEMORA, hind femur; ABDT, abdominal tergite; ABDT.I-VI, length of the longest seta of Abdominal tergite I-VI, respectively; ABDT.VII-VIII, length of the longest seta of Abdominal tergite VII-VIII, respectively; and SIPH, Siphunculi. Following abbreviations are used for the provinces: GW, Gangwon; GG, Gyeonggi; JB, Jeonbuk; JJ, Jeonju; HC, Hongcheon; and GP, Gapyeong.

Taxonomic Accounts

Periphyllus allogenes (Szelegiewicz, 1981)(Figs. 1-3; Table 1)

Periphyllus allogenes Szelegiewicz, 1981: 37

Periphyllus triflorumi Lee and Seo, 1992: 254, 262.

Fundatrix (based on three specimens) (Figs. 1, 3A; Table 1)

Colour. In life: Whole body dark, ABDT.I-III dark red; In mounted specimens: Head, Ant.III basal-middle part pale, Ant.I-III, apical part of Ant.VI, SIPH, genital plate, cauda,

whole leg dark black; ABDT variably sclerites. **Morphological characters.** Body oval and large 2.787-3.250 mm (Fig. 1A), BW 1.689-1.955 mm; Head flat, HW 0.595-0.640 mm (Fig. 1B), dorsum head with 8-10 pairs setae, LS HEAD 0.141-0.189 mm; Antenna 1.282-1.481 mm (Fig. 1C), $0.451-0.455 \times BL$, $0.757-0.759 \times BW$, Ant.I 0.101-0.106mm with 6-9 setae, Ant.II 0.078-0.094 mm with 3-4 setae, Ant.III 0.434-0.529 mm with 11-15setae, Ant.IV 0.248-0.250 mm with 4-5 setae, Ant.V 0.212-0.231 mm with 1-4 setae, BASE 0.139-0.166 mm with one seta, PT 0.070-0.105 mm, Ant.VIb clearly longer than PT, $PT 0.503-0.632 \times BASE$, LS Ant.III 0.128-0.171 mm, $3.764-4.384 \times BD.III$; Whole legs pointed, long and numerous setae; FEMORA 0.675-0.779 mm; HTB 1.184-1.306 mm (Fig. 1D) with rows of spinules to apical part; HT.I 0.060-0.069 mm with first tarsal chaetotaxy 6:6:6; HT.II 0.179-0.190 mm; URS 0.129-0.142 mm (Fig. 1E), reaching middle coxae, 0.720-0.747

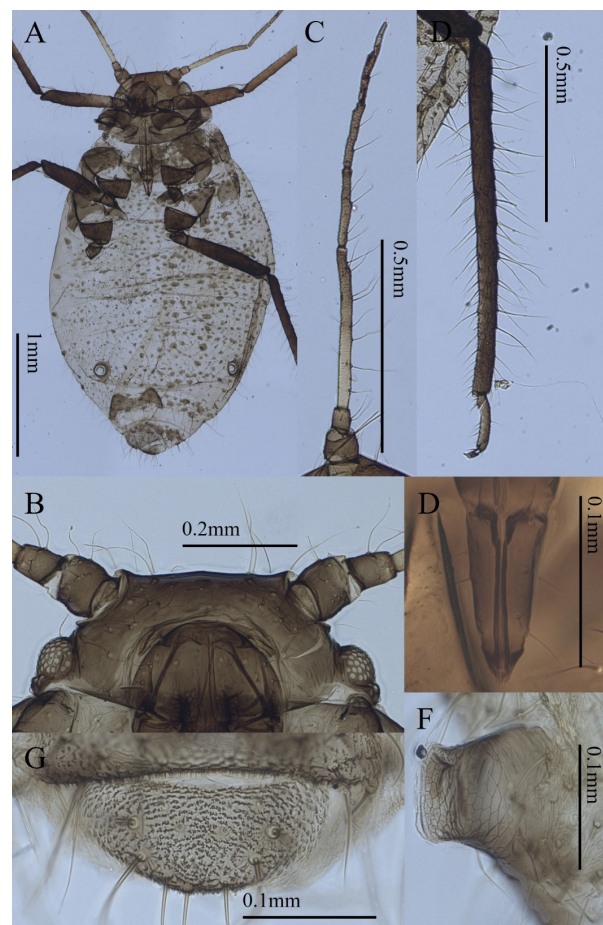


Fig. 1. *Periphyllus allogenes* fundatrix: A, Whole body; B, Head; C, Antenna, D, URS; E, HTB; F, SIPH; G, Cauda.

× HT.II with 3-4 pairs setae; ABDT variably developed spinal, pleural, and marginal sclerite part with pointed, short and numerous setae, stout and longest setae in ABDT.I-VI 0.221-0.254 mm, ABDT.VI between with 56-71 setae; Stout and longest setae in ABDT.VII-VIII 0.228-0.265 mm; SIPH (Fig. 1F) length 0.077-0.109 mm, SIPH width 0.142-0.218 mm, SIPH width longer than SIPH length, SIPH with rows of reticulation, clearly developed whole part; Cauda width 0.183-0.233 mm (Fig. 1G), in generally rounded with 15-24 setae.

Alate viviparous female (based on six specimens) (Figs. 2, 3C; Table 1)

Colour. In life: ABDT dark red; thorax, whole leg, head and Ant.I-VI black; wing vein brown. In mounted specimens: head, whole antenna, thorax, SIPH, genital plate, cauda, whole leg dark brown; wing vein brown. *Morphological characters.*

Body elongate and large 2.259-2.873 mm (Fig. 3A), BW 1.018-1.306 mm; Head flat, HW 0.509-0.574 mm (Fig. 3B), dorsum head with 9-13 pairs setae, LS HEAD 0.135-0.186mm; thorax sclerotized; Antenna 1.423-1.714 mm (Fig. 3C), $0.596-0.629 \times$ BL, $1.312-1.397 \times$ BW, Ant.I 0.074-0.096 mm with 6-9 setae, Ant.II 0.064-0.077 mm with 3-4 setae, Ant.III 0.526-0.631 mm with 8-18 setae and 26-34 secondary rhinaria, Ant.IV 0.238-0.303 mm with 4-8 setae and 6-10 secondary rhinaria, Ant.V 0.220-0.245 mm with 2-5 setae, Ant.VI 0.154-0.172 mm with 1-2 setae, PT 0.147-0.190 mm, PT slightly longer than Ant. VI, PT $0.954-1.105 \times$ BASE, LS ANT.III 0.128-0.146 mm, $4.294-4.413 \times$ BD.III; Whole legs pointed, long setae; FEMORA 0.628-0.771 mm; HTB 1.177-1.365 mm (Fig. 3D) with rows of spinules to apical part; HT.I 0.049-0.067 mm with first tarsal chaetotaxy 7:7:6; HT.II 0.184-0.199 mm; URS (Fig. 3E) 0.118-0.143 mm, slightly reaching the middle coxae, $0.641-0.718 \times$ HT.II with 2-3 pairs setae; ABDT spinal and pleural sclerite

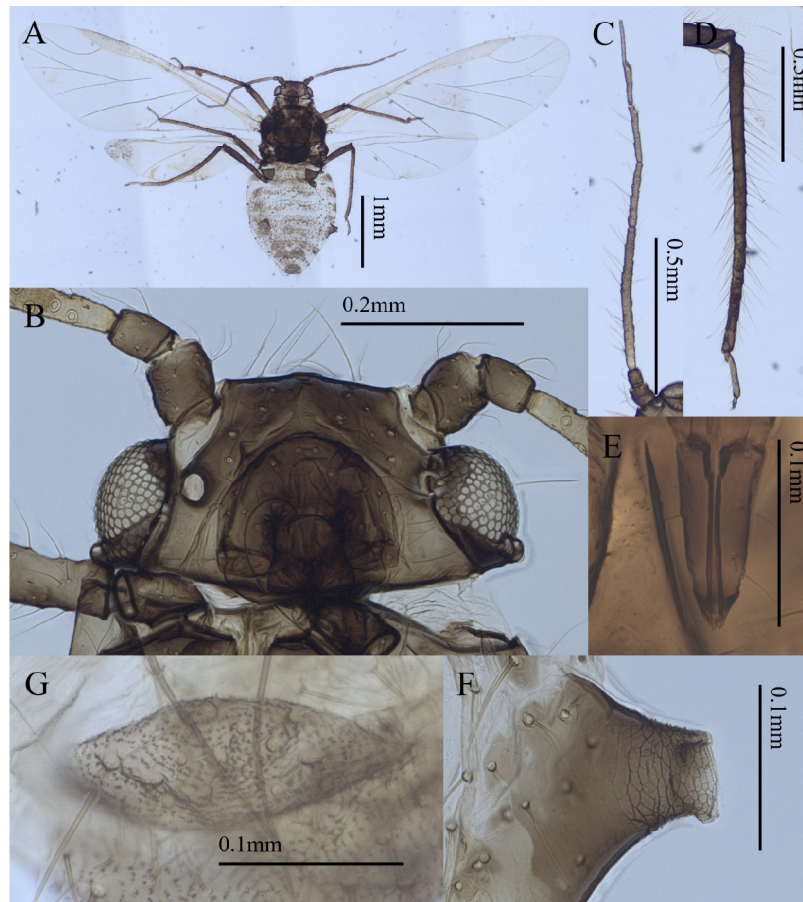


Fig. 2. *Periphyllus allogenes* alate viviparous female: A, Whole body; B, Head; C, Antenna, D, URS; E, HTB; F, SIPH; G, Cauda.

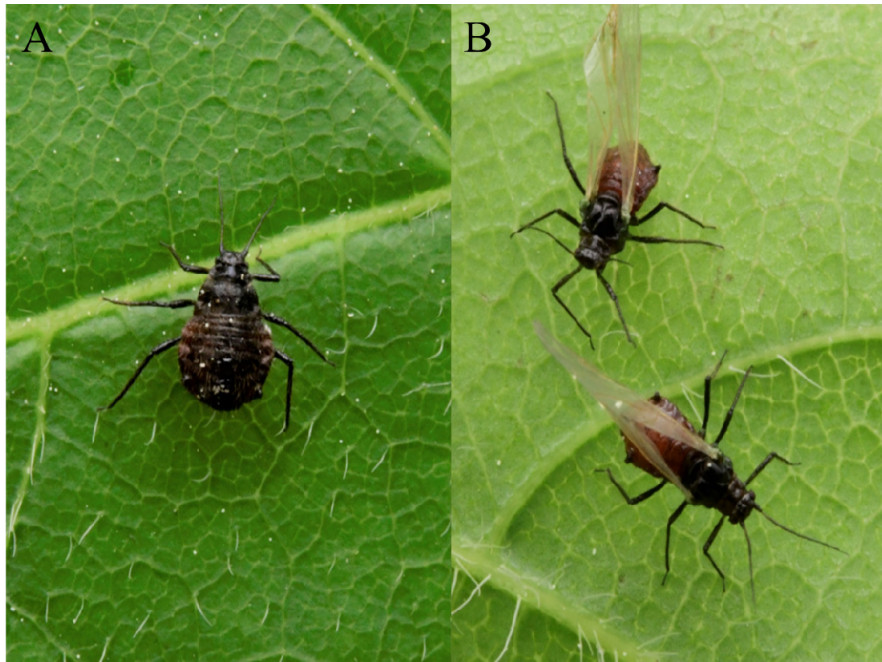


Fig. 3. Fundatrix and alate viviparous of *Periphyllus allogenes* on *Acer triflorum*.

Table 1. The biometric measurement of the fundatrix and alate viviparous females of *P. allogenes* in Korea

Character	Fundatrix (n=3)	Alate viviparous female (n=6)
BL	2.787-3.250(3.029)	2.259-2.873(2.606)
BW	1.689-1.955(1.801)	1.018-1.306(1.176)
HW	0.595-0.640(0.621)	0.509-0.574(0.547)
ANT. I	0.101-0.106(0.104)	0.074-0.096(0.087)
ANT.II	0.078-0.094(0.084)	0.064-0.077(0.071)
ANT.III	0.434-0.529(0.496)	0.526-0.631(0.569)
ANT.IV	0.248-0.250(0.249)	0.238-0.303(0.274)
ANT.V	0.212-0.231(0.221)	0.220-0.245(0.234)
BASE	0.503-0.362(0.154)	0.154-0.172(0.164)
PT	0.070-0.105(0.090)	0.147-0.190(0.170)
LS ANT.III	0.128-0.171(0.153)	0.128-0.146(0.137)
1length LS HEAD	0.141-0.189(0.166)	0.135-0.186(0.152)
URS	0.129-0.142(0.137)	0.118-0.143(0.133)
FEMORA	0.675-0.779(0.723)	0.628-0.771(0.701)
HTB	1.184-1.306(1.244)	1.177-1.365(1.279)
HT.I	0.060-0.069(0.065)	0.049-0.067(0.056)
HT.II	0.179-0.190(0.186)	0.184-0.199(0.189)
Siphunculus length	0.077-0.109(0.092)	0.083-0.152(0.108)
Siphunculus width	0.142-0.218(0.174)	0.133-0.218(0.184)
Cauda width	0.183-0.233(0.202)	0.164-0.204(0.185)
ABDT.I-VI	0.221-0.254(0.238)	0.181-0.261(0.215)
ABDT.VII-VIII	0.228-0.265(0.248)	0.217-0.282(0.251)
BD.III	0.033-0.038(0.036)	0.030-0.033(0.031)

irregularly placed 1-2 pairs setae, stout and long setae in ABDT.I-VI 0.181-0.261 mm, ABDT.VI between setae with 41-54; Spinal, pleural part with numerous pointed setae, stout and long setae in ABDT.VII-VIII 0.217-0.282 mm; SIPH width 0.133-0.218 mm (Fig. 3F) longer than SIPH length 0.083-0.152 mm, 8-11 rows of reticulation, clearly developed except basal; Cauda width 0.164-0.204 mm (Fig. 3G), in generally rounded with 10-19 setae; Wing length 2.920-3.892 mm, Wing width 0.953-1.582 mm.

Specimens examined. 3 fundatrix from *Acer triflorum*, Coll.#220515JH37, GNU, Hongcheon-gun, GW, 15.V.2022; 5 apterous viviparous females from *A. triflorum*, Coll.# 210429 JH73, GNU, Jeonju-si, JB, 29.IV.2021; 5 alate viviparous females from *A. triflorum*, Coll.# 220515JH38, GNU, Hongcheon-gun, GW, 15.V.2022; 1 alate viviparous female from *A. triflorum*, Coll.# 220515JH50, GNU, Gapyeong-gun, GG, 14.V.2022

Host plant. *Acer triflorum* Kom. (Aceraceae).

Distribution. Korea

Statements for Authorship Position & Contribution

Ko, J.H.: Gyeongsang National University, Student in M.S;
Designed the research, wrote the manuscript and examined specimens

Lee, W.: Gyeongsang National University, Professor, Ph.D;
Examined specimens and designed the research

All authors read and approved the manuscript.

Acknowledgments

This research was supported by the ‘Cooperative Research Program for Agriculture Science and Technology Development [Project No. PJ016285022023]’, Rural Development Administration, Republic of Korea.

Literature Cited

- Blackman, R.L., Eastop, V.F., 2000. Aphids on the world's crops. An Identification and Information Guide 2nd ed. The Natural History Museum, London, pp. 363-365.
- Blackman, R.L., Eastop, V.F., 2022. Aphids on the World's Plants: An Identification and Information Guide. <http://www.aphidsonworldsplants.info/> (accessed 07 July 2022).
- Essig, E.O., Abernathy, F., 1952. The Aphid Genus *Periphyllus*. A systematic, biological, & ecological study. University of California Press, Berkeley and Los Angeles.
- Junkiart, L., Wiczorek, K., 2019. Description of the previously unknown morphs of *Periphyllus koelreuteriae* (Takahashi) (Hemiptera, Aphididae: Chaitophorinae), Zootaxa 4585, 360-368.
- Lee, W.K., Seo, H.Y., 1992. Description of two new species and notes on two unrecorded species (Drepanosiphidae: Chaitophorinae) from Korea. Korean J. Entomol. 22, 251-262.
- Lubiarz, M., Mackoś-Iwaszko, E., 2015. Morphology of fundatrices of the genus *Periphyllus* (Hemiptera: Aphididae) on *Acer platanoides* in Poland with the first description of fundatrices of two species. Zool. Anz. 258, 6-12.
- Sugimoto, S., 2013. Revision of three aphids described from a red-vein maple *Acer rufinerve* in Japan (Hemiptera: Aphididae). Insecta Matsumurana New Series 69, 27-40.
- Szelegiewicz, H., 1981. Two new Chaitophorids (Homoptera, Chaitophoridae) from the Korean Peninsula. Ann. Zool. 36, 37-43.
- Wiczorek, K., Lachowska-Cierlik, D., Kajtoch, L., Kanturski, M., 2017. The relationships within the Chaitophorinae and Drepanosiphinae (Hemiptera, Aphididae) inferred from molecular-based phylogeny and comprehensive morphological data. PLoS One 12, e0173608.