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Authors: Lee, Wonhoon, Kim, Hyojoong, and Lee, Seunghwan

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TWO NEW SPECIES OF *AULACORTHUM* (HEMIPTERA: APHIDIDAE) FROM KOREA

WONHOON LEE, HYOJOONG KIM AND SEUNGHWAN LEE*

Insect Biosystematics Laboratory, Research Institute for Agricultural and Life Sciences, Department of Agricultural Bio-Technology, Seoul National University, Seoul 151-921, Korea

*Corresponding author; e-mail seung@snu.ac.kr

ABSTRACT

Two new species of the genus *Aulacorthum*, *Aulacorthum asteriphagum* **sp. nov.** and *Aulacorthum corydalicola* **sp. nov.**, are recognized from Korea on *Aster scaber* Thunb. and *Corydalis* spp. (*C. pallida* Pers. and *C. speciosa* Maxim.), respectively. They are described and illustrated in comparison with the closely related species *Aulacorthum solani* Kaltenbach 1843. *Aulacorthum asteriphagum* is mainly characterized by many secondary rhinaria (4-12) on Antenna III, and *A. corydalicola* is distinguished by short antennae (2.30-2.75 mm) including dark Antenna III. A revised key to the identification of the Korean species of *Aulacorthum* is presented.

Key Words: Macrosiphini, *Aulacorthum*, *Corydalis*, *Aster*, new species, Korea

RESUMEN

Dos nuevas especies de afidos (pulgonos) del genero *Aulacorthum*, *Aulacorthum asteriphagum* sp. nov. y *Aulacorthum corydalicola* sp. nov., son reconocidos de Corea, sobre *Aster scaber* Thunb. y *Corydalis* spp. (*C. pallida* Pers. y *C. speciosa* Maxim.), respectivamente. Estos son descritos e ilustrados en comparación con la especie cercanamente relacionada, *Aulacorthum solani* Kaltenbach 1843. Entre las especies aliadas, se caracteriza *Aulacorthum asteriphagum* sp. nov. principalmente por tener muchas rinarias (sensorias) secundarias (4-12) sobre Ant.III (tercer segmento del antena); se distingue *Aulacorthum corydalicola* sp. nov. por la corta longitud de su antena (2.30-2.75 mm), incluyendo el segmento Ant. III oscuro. Una clave para la identificación de las especies de *Aulacorthum* de Corea es incluida.

The genus *Aulacorthum* Mordvilko 1914 is a Palaearctic and Oriental genus with 40 species known in the world (Remaudière & Remaudière 1997; Lee 2002; Eastop & Blackman 2005; Lee & Kwon 2006). This genus consists of 2 subgenera: the nominotypical *Aulacorthum* (38 species) and *Perillaphis* Takahashi 1965 (2 species). Morphologically, the genus *Aulacorthum* is well characterized by "head with well developed antennal tubercles, inner sides of tubercles nearly parallel; median tubercle on frons hardly developed; head usually granulate in apterous; first tarsal chaetotaxy 3:3:3; siphunculi cylindrical, or slightly swollen, normally broad at base, rather long with usually a few row of flat hexagonal cells at apex under broad distal flange; cauda tongue-shaped with 4-8 setae, mostly 7 setae." (Heie 1994). They are not host-alternating, and are mostly monoecious holocyclic.

Previously, 12 species of the genus *Aulacorthum* have been reported from Korea. Since Shinji (1941) recorded *A. nipponicum* (Essig & Kuwana 1918). Paik (1965, 1972) reported 7 species, as follows: *A. asteris* Takahashi 1965, *A. cirsicola* (Takahashi 1923), *A. ibotum* (Essig & Kuwana 1918), *A. magnoliae* (Essig & Kuwana 1918), *A. nepetifolii* Miyazaki 1968, *A. perillae* (Shinji 1965) and *A. solani* (Kaltenbach 1843). Lee & Seo (1990) added *A. glechomae* Takahashi 1965.

Recently Lee (Lee 2002; Lee & Kwon 2006) described 2 new species, *A. ligularicola* Lee 2002 and *A. albimagnoliae* Lee and Kwon 2006, and Lee et al. (2008) recorded *A. muradachi* (Shinji 1928).

In this present paper, 2 new species are described and compared with the most closely related species, and a revised key to species of *Aulacorthum* of the Korean Peninsula is provided.

MATERIALS AND METHODS

Aphid samples for this study were collected in 1970-1971, 1999-2000, and 2006 on *Aster scaber* and *Corydalis* spp. (*C. pallida* and *C. speciosa*) in South Korea. Each sample of aphid colonies was preserved in 80% alcohol, and mounted specimens were prepared in Canada balsam, following methods by Blackman & Eastop (2000) and Martin (1983). Illustrations for each species were taken by digital camera, Diagnostic Instruments, Inc. 14.2 Color Mosaic attached on the microscope, Leica DM 400B at a resolution of 600 dpi. Measurements for each specimen are taken from the digital images by the software, Image Lab version 2.2.4.0 by MCM Design (Ltd.).

The type specimens, including holotype, are deposited in the College of Agriculture and Life

Sciences, Seoul National University (CAL SNU), Seoul, Korea and some paratypes in the National Institute of Agricultural Sciences and Technology (NIAS T), Suwon, Korea.

Abbreviations used for descriptions and table are as follows: al. - alate viviparous female, alata; apt. - apterous viviparous female, aptera; Ant. - antennae; Ant.I, Ant.II, Ant.III, Ant.IV, Ant.V, Ant.VI, and Ant.VIb - antennal segments I, III, IV, V, VI, and base of VI, respectively; BDAnt.III - basal diameter of antennal segment III; BL - length of body; GP - genital plate; 2HT - second segment of hind tarsus; PT - processus terminalis; SIPH - siphunculi; URS - ultimate rostral segment (segment IV + V).

SYSTEMATIC ACCOUNTS

Genus *Aulacorthum* Mordvilko 1914

Subgenus *Aulacorthum* sensu stricto

Aulacorthum Mordvilko 1914, Faude de la Russie Ins. Hemipt., 1(1): 68.

Dysaulacorthum Börner 1939.

Melanosiphon Börner 1944.

Neomacrosiphum van der Goot 1915.

Type species: *Aphis solani* Katenbach 1843.

Aulacorthum corydalicola Lee, Kim & Lee **sp. nov.**
(Figs. 1-3, Table 1)

Description: Apterous Viviparous Female.

Color (alive): Body including head, thorax, and abdomen pale green. Antenna fuscous. Leg pale except distal 1/5 of femora, distal 1/5 of tibiae including tarsi black. SIPH and cauda pale. Color (macerated specimens): Head pale. Ant.I-II entirely pale but Ant.III-VI dusky excluding Ant.III pale at base. Rostrum a little dusky except very end of URS dark brown. Thorax and abdomen pale. Cauda and SIPH pale except extreme end of SIPH dusky. Legs pale except distal 1/5 of femora, distal 1/9 of tibiae, and tarsi dark brown.

Morphology: Body spindle shaped. Head: spinulose on whole surface of dorsum and ventrum, 3 pairs of acuminate setae on dorsum. Antennal tubercle well developed with 2-3 setae on both side, frons U-shaped with 4 setae on vertex. Ant.I spinulose ventrally; Ant.II spinulose; Ant.III weakly imbricate with short setae, bearing 1-2 secondary rhinaria at base; Ant.IV imbricate with 8-17 setae; Ant.V imbricate with 5-10 setae, primary rhinarium ciliate, longest diameter shorter (0.75-0.87 times) than middle width of Ant.V; Ant.VI imbricate with 3-5 short setae on Ant.VIb. Rostrum attaining posterior margin of mesocoxa; clypeus with 4 setae; URS longest seta

0.58-0.63 times as long as apical primary ones. Thorax: pronotum smooth with 2 spinal setae and 1 marginal seta on anterior margin. Hind coxa weakly spinulose with 10-13 acuminate setae; hind trochanter wide at base, 1.42-1.58 times as long as apical width, bearing 3 setae; hind femur smooth on basal 2/3, spinulose on apical 1/3 ventrally, bearing short setae, longest seta 0.26-0.30 times as long as basal width of segment; hind tibia smooth with short setae, longest seta as long as middle width of segment; first segment of each tarsus smooth with three setae at apex; 2HT imbricate with 9-12 setae. Abdomen: dorsum smooth, membranous with 8 setae on tergite III, spinal 4 setae minute (less than ca. 0.15 times basal width of hind femur), marginal setae 0.22-0.27 times basal width of hind femur. SIPH cylindrical, basal 1/2 weakly spinulose except smooth base, distal 1/2 imbricate, irregularly reticulated on distal end, apex well flanged. Cauda elongate, triangular, ventral spinules strong, dense, in groups of 1 or 2; dorsal ornamentation composed of ribbed imbrication.

Alate Viviparous Female

Color (alive): Pale green with antennae black. Head and thorax black. Abdomen with black patches on tergite III-VI. Color (macerated specimens): Antenna entirely dark except basal Ant.III pale. Thorax dark brown. Abdomen with irregular transverse dark band on each segment. Wings pale with veins bordered by narrow dark pigmentation.

Morphology: Antennae with 1-7 secondary rhinaria in a line on whole Ant.III. Cauda triangular, pointed at apex. SIPH strongly imbricated and weakly reticulated at apex. Otherwise like apterous viviparous female.

Host and Distribution: So far collected and observed on *Corydalis pallida* and *Corydalis speciosa* in Namhae-gun, Gyeongsangnam-do and Gwanak-arboretum, Gyeonggi-do, Korea.

Etymology: The species name is derived from the genus name of host plants (*Corydalis* spp.) and the Latin suffix, -cola (dweller, inhabitant).

Specimens Examined: Holotype: apterous viviparous female, Coll#.990331-SH-3/ap.16, Idong-myeon, Namhae-gun, Gyeongsangnam-do, Korea, 31-III-1999, on *Corydalis pallida* Pers., leg. Seunghwan Lee. Paratypes: 44 apterous viviparous females, 2 alates viviparous females, same date as holotype; 10 apterous viviparous females, Coll#.060408-SH-9, Jingyo-myeon, Hadong-gun, Gyeongsangnam-do, Korea, 8-IV-2006, on *C. pallida*, leg. Seunghwan Lee; 19 apterous viviparous females, 2 alate viviparous females, Coll#.060509-WH-1, Gwanak arboretum, Manan-gu, Anyang-si, Gyeonggi-do, Korea, 9-V-2006, on *Corydalis speciosa* Maxim., leg. Wonhoon Lee.

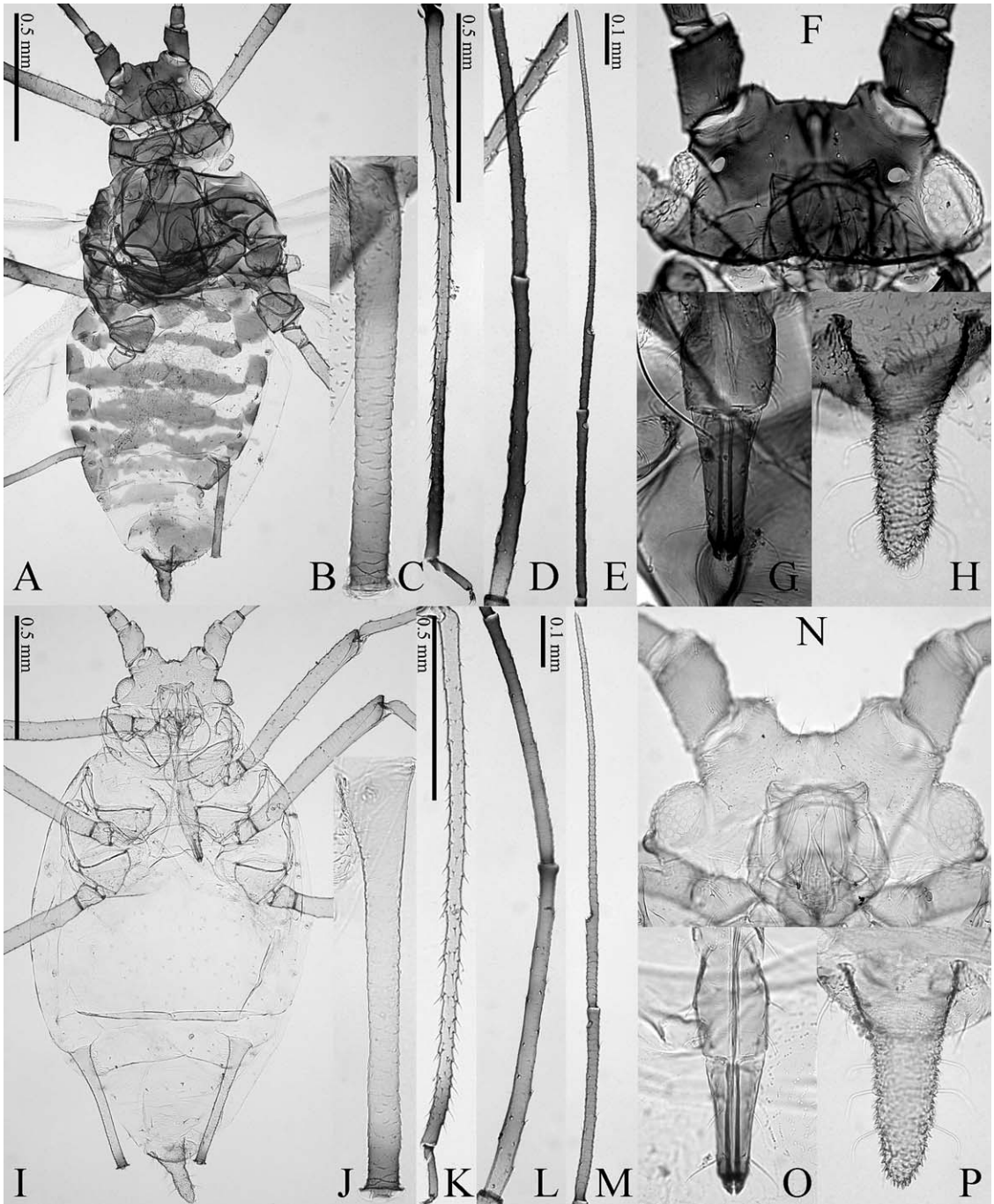


Fig. 1. Alate viviparous female (A-H) and apterous viviparous female (I-P) of *Aulacorthum corydalicola* sp. nov. A, whole body of alate vivipara. B, siphunculus. C, hind tibia and tarsus. D, antennal segments III-IV. E, antennal segments V-VI. F, head focused on dorsum. G, ultimate rostral segment. H, cauda. I, whole body of apterous vivipara. J, SIPH. K, hind tibia and tarsus. L, antennal segments III-IV. M, antennal segments V-VI. N, head focused on dorsum. O, ultimate rostral segment. P, cauda.

Biology: Colonies of individual aphid were observed on the young leaves, flowers, or seed pad of the host plants. Many samples were collected

from underside of leaves. Considering the early establishment of colonies on *Corydalis* spp. from the end of Mar, this new species seems to be mo-



Fig. 2. Photograph of *Aulacorthum corydalicola* **sp. nov.** apterous viviparous female.

noecious holocyclic on *Corydalis* spp. However, it has not been determined where the summer generation survives, when the host plant loses leaves, and how the aphids overwinter on the host plant.

Remarks: In the general body shape and the coloration of live apterous females, this species is similar to *Aulacorthum solani* from which it differs by short antenna 2.30-2.75 mm (vs long antenna 2.92-3.56 mm for *solani*), 0.96-1.19 times as long as BL (vs 1.16-1.33 times for *solani*); Ant.I strongly spinulose (vs Ant.I smooth or weakly spinulose for *solani*); Ant.III-VI dark (vs Ant.III-VI pale excluding each dark junction of Ant.III-VI for *solani*), URS 0.93-1.07 times as long as Ant.VIb (vs URS 1.06-1.27 times for *solani*), and short hind tibia 1.28-1.71 mm (vs long hind tibia 1.64-2.05 mm for *solani*), and living only on *Corydalis* spp.

Aulacorthum asteriphagum Lee, Kim & Lee **sp. nov.**
(Fig. 4, Table 1)

Description: Apterous Viviparous Female.

Color (macerated specimens): Head pale except dusky outside of antenna tubercle. Ant.I-III fuscous, Ant.IV-VI pale excluding each dark junction of Ant.IV-VI. Rostrum pale except very end of URS dark brown. Thorax and abdomen pale. Cauda and SIPH pale except extreme end of SIPH dusky. Legs pale except distal 1/3-1/5 of femora, distal 1/10 of tibiae, and tarsi dark brown.

Morphology: Body spindle shaped. Head: spinulose on whole surface of dorsum and ventrum, 3 pairs of acuminate setae on dorsum. Antennal tubercle well developed with 2 setae, frons U-shaped with 2 pairs of setae on vertex. Ant.I spinulose dorsally and ventrally; Ant.II granulate; Ant.III imbricate with minute setae, bearing 4-12 secondary rhinaria in a line at regular dis-



Fig. 3. Photograph of *Aulacorthum corydalicola* sp. nov. alate viviparous female.

tances; Ant.IV imbricate with 8-13 setae; Ant.V imbricate with 4-8 setae, primary rhinarium ciliate, longest diameter shorter (0.78-0.86 times) than middle width; Ant.VI imbricate with 3-5 short setae on Ant.VIb. Rostrum attaining posterior margin of hindcoxa; clypeus with 4 setae; URS longest seta 0.58-0.76 times as long as apical primary ones. Thorax: pronotum smooth with 2 short blunt spinal setae and 1 anterior marginal setae. Hind coxa weakly spinulose with 8-9 acuminate setae; hind trochanter wide at base, 1.43-1.67 times as long as apical width, bearing 3 setae; hind femur smooth on basal 1/2, spinulose on apical 1/2 ventrally, bearing short setae, longest seta 0.18-0.31 times as long as basal width of segment; hind tibia smooth with short setae, longest seta as long as middle width of segment; first segment of each tarsus smooth with 3 setae at apex; 2HT imbricate with 8-10 setae. Abdomen: dorsum smooth, membranous with 8 setae on tergite III, spinal 4 setae minute (less than ca. 0.01 times basal width of hind femur), marginal setae 0.01 times basal width of hind femur. SIPH cylindrical, imbricate except weakly spinulose at base, irregularly reticulated on distal end, apex well flanged. Cauda elongate, triangular, ventral

spinules strong, dense, in groups of 1 or 2; dorsal ornamentation composed of ribbed imbrications.

Host and Distribution: So far collected only on *Aster scaber* in Bongpyeong-myeon, Pyeongchang-gun, Gangwon-do, Korea.

Etymology: The species name is derived from the genus name of host plants (*Aster scaber*).

Specimens Examined: Holotype: apterous viviparous female, Coll#.000607-SH-9/ap.5, Heungjeong-ri, Bongpyeong-myeon, Pyeongchang-gun, Gangwon-do, Korea, 7-VI-2000, on *Aster scaber* Thunb., leg. N. S. Bong. Paratypes: 1 apterous viviparous females Coll#.5876, Seoul, Korea, 6-V-1970 on *A. scaber*, leg. Woonhah Paik; 4 apterous viviparous females Coll#.6891, Seoul, Korea, 3.xi.1971 on *A. scaber*, leg. Woonhah Paik; 1 apterous viviparous female, 2 nymphs, same date as holotype; 4 apterous viviparous females, Coll#.000727-SH-1, Bongpyeong-myeon, Pyeongchang-gun, Gangwon-do, Korea, 27-VII-2000 on *A. scaber*, leg. N. S. Bong; 1 nymph, Coll#.000927-SH-9, Bongpyeong-myeon, Pyeongchang-gun, Gangwon-do, Korea, 27-IX-2000, on *A. scaber*, leg. N. S. Bong.

Biology: Colonies were observed on undersides of leaves of host plants. Colonies of this species

TABLE 1. BIOMETRIC DATA OF *AULACORTHUM CORYDALICOLA* SP. NOV. AND *AULACORTHUM ASTERIPHAGUM* SP. NOV. IN COMPARISON WITH *AULACORTHUM SOLANI*.

Part	<i>A. corydalicola</i> sp. nov.			<i>A. asteriphagum</i> sp. nov.			<i>A. solani</i>		
	Apterous vivipara (n = 20)	Alate vivipara (n = 4)	Apterous vivipara (n = 6)	Apterous vivipara (n = 4)	Apterous vivipara (n = 6)	Apterous vivipara (n = 20)	Apterous vivipara (n = 4)	Apterous vivipara (n = 6)	Apterous vivipara (n = 20)
Length (mm)									
BL	2.35 (2.19-2.64)	2.20 (2.20-2.20)	2.39 (2.11-2.59)	2.20 (2.20-2.20)	2.39 (2.11-2.59)	2.62 (2.32-2.86)			
Whole antennae	2.51 (2.30-2.75)	2.55 (2.48-2.60)	3.37 (2.48-3.95)	2.55 (2.48-2.60)	3.37 (2.48-3.95)	3.26 (2.92-3.56)			
Ant.I	1.14 (0.13-0.15)	0.13 (0.12-0.13)	0.17 (0.15-0.18)	0.13 (0.12-0.13)	0.17 (0.15-0.18)	0.16 (0.15-0.17)			
Ant.II	0.09 (0.08-0.10)	0.09 (0.08-0.09)	0.10 (0.09-0.11)	0.09 (0.08-0.09)	0.10 (0.09-0.11)	0.09 (0.08-0.11)			
Ant.III	0.63 (0.54-0.72)	0.61 (0.59-0.64)	0.75 (0.69-0.84)	0.61 (0.59-0.64)	0.75 (0.69-0.84)	0.74 (0.59-0.81)			
Ant.IV	0.49 (0.40-0.53)	0.48 (1.46-0.50)	0.63 (0.46-0.75)	0.48 (1.46-0.50)	0.63 (0.46-0.75)	0.60 (0.46-0.71)			
Ant.V	0.37 (0.33-0.44)	0.37 (0.27-0.41)	0.56 (0.44-0.64)	0.37 (0.27-0.41)	0.56 (0.44-0.64)	0.53 (0.49-0.60)			
Ant.VIb	0.17 (0.15-0.19)	0.18 (0.17-0.19)	0.20 (0.18-0.23)	0.18 (0.17-0.19)	0.20 (0.18-0.23)	0.20 (0.15-0.24)			
PT	0.62 (0.55-0.67)	0.69 (0.68-0.69)	1.18 (1.06-1.31)	0.69 (0.68-0.69)	1.18 (1.06-1.31)	0.93 (0.85-1.02)			
URS	0.13 (0.12-0.14)	0.13 (0.12-0.13)	0.14 (0.14-0.15)	0.13 (0.12-0.13)	0.14 (0.14-0.15)	0.14 (0.13-0.15)			
Hind femur	0.82 (0.69-0.95)	0.76 (0.75-0.78)	1.08 (0.91-1.25)	0.76 (0.75-0.78)	1.08 (0.91-1.25)	1.00 (0.88-1.09)			
Hind tibia	1.48 (1.28-1.71)	1.44 (1.40-1.50)	2.08 (1.73-2.36)	1.44 (1.40-1.50)	2.08 (1.73-2.36)	1.85 (1.64-2.05)			
2HT	0.13 (0.12-0.13)	0.12 (0.12-0.12)	0.10 (0.08-0.11)	0.12 (0.12-0.12)	0.10 (0.08-0.11)	0.12 (0.12-0.13)			
SIPH	0.51 (0.44-0.61)	0.40 (0.39-0.41)	0.60 (0.51-0.72)	0.40 (0.39-0.41)	0.60 (0.51-0.72)	0.63 (0.57-0.69)			
Cauda	0.25 (0.22-0.28)	0.22 (0.22-0.22)	0.27 (0.25-0.29)	0.22 (0.22-0.22)	0.27 (0.25-0.29)	0.29 (0.25-0.32)			
Setae on Ant.II	0.013 (0.010-0.014)	0.014 (0.013-0.015)	0.009 (0.006-0.011)	0.014 (0.013-0.015)	0.009 (0.006-0.011)	0.011 (0.007-0.015)			
Setae on tergite III	0.008 (0.006-0.008)	0.008 (0.006-0.010)	0.006 (0.006-0.008)	0.008 (0.006-0.010)	0.006 (0.006-0.008)	0.006 (0.003-0.008)			
No. of hairs on									
Mandibular lamina	2 (1-2)	2 (2-2)	3 (2-3)	2 (2-2)	3 (2-3)	2 (2-4)			
Ant.I	6 (5-7)	6 (4-7)	7 (6-9)	6 (4-7)	7 (6-9)	7 (6-8)			
Ant.II	4 (3-5)	4 (3-5)	4 (3-4)	4 (3-5)	4 (3-4)	4 (3-5)			
Ant.III	24 (20-28)	18 (15-22)	17 (10-22)	18 (15-22)	17 (10-22)	25 (20-30)			
URS (subsidiary)	6 (6-7)	6 (6-6)	6 (6-6)	6 (6-6)	6 (6-6)	6 (6-6)			

TABLE 1. (CONTINUED) BIOMETRIC DATA OF *AULACORTHUM CORYDALICOLA* SP. NOV. AND *AULACORTHUM ASTERIPHAGUM* SP. NOV. IN COMPARISON WITH *AULACORTHUM SOLANI*.

Part	<i>A. corydalicola</i> sp. no. Apterous vivipara (n = 20)	<i>A. corydalicola</i> sp. nov. Alate vivipara (n = 4)	<i>A. asteriphagum</i> sp. no. Apterous vivipara (n = 6)	<i>A. solani</i> Apterous vivipara (n = 20)
	Tergite VI between SIPH	6 (5-6)	6 (5-6)	5 (5-5)
Tergite VIII	5 (4-6)	5 (4-5)	6 (5-6)	6 (5-6)
Median of GP	2 (2-3)	2 (2-2)	2 (2-2)	2 (2-2)
Posterior margin of GP	9 (7-11)	9 (8-9)	11 (9-13)	10 (9-12)
Cauda	7 (6-7)	7 (7-7)	7 (7-7)	7 (7-8)
Ant. III	1 (1-2)	5 (1-7)	8 (4-12)	2 (0-3)
No. of Rhinaria				
Ratio (times)				
Whole Antennae/BL	1.07 (0.96-1.19)	1.16 (1.13-1.18)	1.51 (1.35-1.68)	1.25 (1.16-1.33)
PT/Ant. VIb	3.63 (3.06-4.07)	3.88 (3.59-4.06)	6.01 (5.37-7.24)	4.72 (3.57-5.85)
PT/Ant. III	0.98 (0.84-1.18)	1.13 (1.09-1.17)	1.57 (1.47-1.84)	1.27 (1.12-1.46)
URS/2HT	1.00 (0.93-1.07)	1.06 (1.02-1.09)	1.46 (1.29-1.67)	1.16 (1.06-1.27)
URS/Ant. VIb	0.76 (0.69-0.85)	0.71 (0.66-0.74)	0.71 (0.63-0.80)	0.71 (0.59-0.94)
SIPH/BL	0.22 (0.19-0.25)	0.18 (0.18-0.19)	0.25 (0.23-0.28)	0.24 (0.22-0.25)
SIPH/Hind femur	0.63 (0.58-0.69)	0.53 (0.50-0.54)	0.55 (0.52-0.57)	0.63 (0.57-0.70)
SIPH/Cauda	2.08 (1.84-2.44)	1.82 (1.75-1.87)	2.22 (2.02-2.66)	2.17 (1.92-2.62)
Cauda/with of cauda	1.72 (1.44-2.14)	1.67 (1.59-1.74)	1.95 (1.78-2.08)	1.96 (1.55-2.41)
Setae on Ant. III/Ant. IIIBD	0.36 (0.27-0.45)	0.45 (0.38-0.50)	0.24 (0.15-0.33)	0.28 (0.19-0.39)
Setae on tergite III/Ant. IIIBD	0.22 (0.15-0.27)	0.26 (0.18-0.32)	0.15 (0.11-0.23)	0.16 (0.07-0.25)

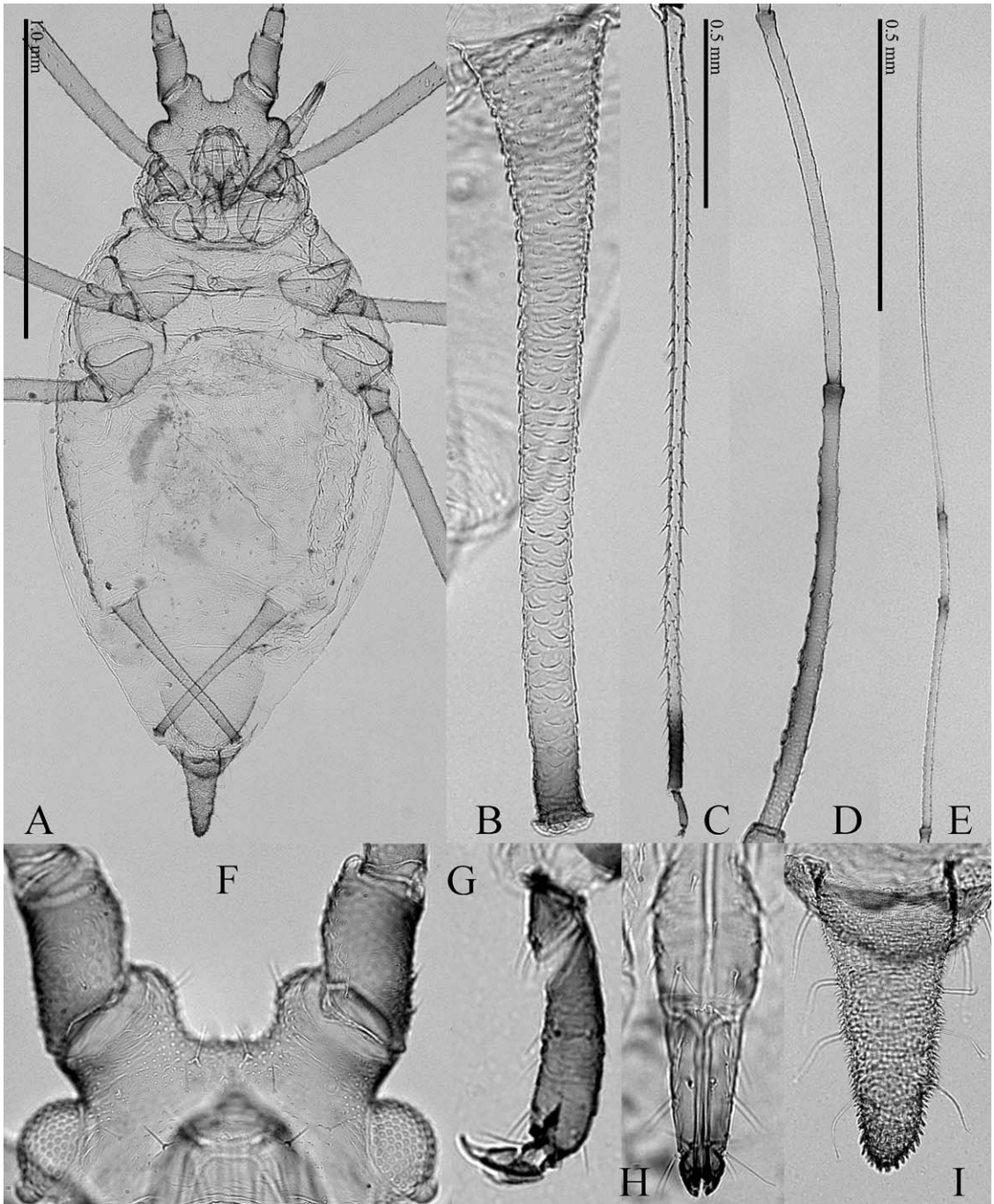


Fig. 4. Apterous viviparous female (A-I) of *Aulacorthum asteriphagum* sp. nov. A, whole body. B, siphunculus. C, hind tibia and tarsus. D, antennal segments III-IV. E, antennal segments V-VI. F, head focused on dorsum. G, tarsus. H, ultimate rostral segment. I, cauda.

seem to be very rare. After collecting the type, authors failed to collect any additional samples.

Remarks: In the general body shape, this species is similar to *Aulacorthum solani* and *Aula-*

corthum corydalicola sp. nov. from which it differs by head pale excluding outside of antennal tubercles dusky, Ant.I-II fuscous (vs head and Ant.I-II pale for combined values of *corydalicola*

sp. nov. and *solani*), 4-12 secondary rhinaria in a line at regular distances on whole Ant.III (vs 0-3 secondary rhinaria confined to basal half on Ant.III for combined values of *corydalicola* sp. nov. and *solani*); PT 1.06-1.31 mm, 5.37-6.61 times as long as Ant.VIb (vs PT 0.55-1.02 mm, 3.06-5.84 times for combined values of *corydali-*

cola sp. nov. and *solani*), rostrum attaining posterior margin of hindcoxa (vs rostrum attaining posterior margin of mesocoxa for combined values of *corydalicola* sp. nov. and *solani*), and URS 1.29-1.67 times as long as 2HT (vs URS 0.93-1.29 times for combined values of *corydalicola* sp. nov. and *solani*), living on *Aster scaber* (Asteraceae).

KEY TO SPECIES OF *AULACORTHUM* IN KOREA, INCLUDING SOME POLYPHAGOUS SPECIES (BASED ON APTEROUS VIVIPAROUS FEMALE)

1. SIPH pale, concolorous with abdominal tergite, at most dusky at apex 2
—SIPH black, at least dusky wholly, not concolorous with abdominal tergite 7
2. Antennal tubercles gibbous, convergent. Leg pale. Body including appendages pale yellow in life except narrow dark band of joints between antennal segments. On the genus *Glechoma* (Labiatae). In Korea and Japan *Aulacorthum glechomae*
—Antennal tubercles divergent. Leg pale but dark at apex of femora or tibiae. Body pale green in life 3
3. Head spinulose dorsally. Dorsal surface of antennal tubercle entirely spinulose
—Head smooth dorsally. Dorsal surface of antennal tubercle smooth, partly spinulose at most 5
4. Head partly spinulose on ventrum. Antenna pale; Ant.I-II smooth; PT short (3.78-5.54 times as long as Ant.VIb). Femora entirely pale. Apical reticulation of SIPH developed (more than 3 rows of cells). On the genus *Magnolia* (Magnoliaceae). In Korea. *Aulacorthum albimagnolia*
—Head entirely spinulose on ventrum. Antenna pale excluding dark apices? of Ant.III-VIb; Ant.I-II spinulose or granulate; PT long (5.25-7.35 times as long as Ant.VIb). Femora pale except distal third dark brown. Apical reticulation of SIPH weakly developed (1-2 rows of cells). On the genus *Cirsium* (Asteraceae). In Korea and Japan *Aulacorthum cirsicola*
5. 4-12 secondary rhinaria on whole Ant.III; PT 5.37-7.24 times as long as Ant.VIb. URS 1.29-1.67 times as long as 2HT; Rostrum attaining posterior margin of hindcoxa. On *Aster scaber* Thunb. (Asteraceae) *Aulacorthum asteriphagum* **sp. nov.**
—0-3 secondary rhinaria confined to basal half on Ant.III; PT 3.06-5.85 times as long as Ant.VIb. URS 0.93-1.27 times as long as 2HT; Rostrum attaining posterior margin of mesocoxa 6
6. Antenna 0.96-1.19 times as long as BL; Ant.III-VI dark; PT 0.55-0.67 mm, 3.06-4.07 times as long as Ant.VIb. On *Corydalis pallida* Pers. and *Corydalis speciosa* Maxim. (Papaveraceae) *Aulacorthum corydalicola* **sp. nov.**
—Antenna 1.16-1.33 times as long as BL; Ant.III-VI pale excluding dark junction of Ant.III-VI.b; PT 0.85-1.02 mm, 3.57-5.85 times as long as Ant.VIb. On various plants. In almost world-wide countries *Aulacorthum solani*
7. Abdominal tergum dark, pigmented entirely or marginally in apterae. On the genus *Nepeta* (Labiatae). In Korea and Japan. *Aulacorthum nepetifolii*
—Abdominal tergum pale, not pigmented in apterae. 8
8. SIPH slightly swollen. 9
—SIPH cylindrical, not swollen 10
9. Abdomen with small distinct antesiphuncular sclerites. SIPH black, widest at base. Body usually small, less than 3.0 mm in length. On the genus *Paederia* (Rubiaceae). In Korea, Japan, China, Taiwan, Thailand, India *Aulacorthum nipponicum*
—Abdomen without antesiphuncular sclerite. SIPH pale, at most dusky, widest in middle. Body usually large, more than 3.5 mm in length. On the genus *Sambucus* and other plants. In Far East Asia (Korea, Japan, China), India, Siberia *Aulacorthum magnoliae*
10. Antennae with more than 17-29 secondary rhinaria on Ant.III. Body wholly pale yellow in life, except siphuculi, apex of femora and tibiae and antennae black partly. On the genus *Aster* (Asteraceae). In Korea and Japan *Aulacorthum asteris*

- Antennae with less than 17 secondary rhinaria on Ant.III. Body mottled with black or reddish brown on abdomen in life. 11
11. SIPH less than 2 times as long as cauda. Body pale yellow, mottled with dark green and black on abdomen laterally and around SIPH in life. On the genus *Ligustrum* (Oleaceae). In Korea and Japan *Aulacorthum ibotum*
- SIPH long, 3 times as long as cauda. Body pale, mottled with reddish brown on abdomen laterally and around SIPH in life 12
12. Head spinulose dorsally and ventrally. Ant.III pale, smooth with 5-17 secondary rhinaria. Hind tibiae pale except dark distal end. SIPH dusky. Abdominal tergite VIII with 6-8 setae. On the genus *Ligularia* (Asteraceae). In Korea. *Aulacorthum ligularicola*
- Head smooth, at least on dorsum. Ant.III dark brown at basal half with 1-3 secondary rhinaria. Hind tibiae dark brown or black on basal half. SIPH black. Abdominal tergite VIII with 4 setae. On the genus *Parabenzoin* and *Lindera* (Lauraceae). In Korea and Japan *Aulacorthum muradachi*

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