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

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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 pulgones (pulgones) del género 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 monoeocious holocyclic.

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 (CALS SNU), Seoul, Korea and some paratypes in the National Institute of Agricultural Sciences and Technology (NIAST), 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 Börner 1944.

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

Description: Apterous Viviparous Female.

Color (alive): Pale green with antennae black. Head and thorax black. Abdomen 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-arboretem, 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, leg. Seunghwan Lee; 19 alate viviparous females, 2 alate viviparous females, same date as holotype; 10 apterous viviparous females, 2 alate viviparous females, Coll#060408-SH-9, Jingyo-myeon, Hadong-gun, Gyeongsangnam-do, Korea, 19-IV-2006, on C. pallida, leg. Seungwhan Lee; 19 apterous viviparous females, 2 alate viviparous females, Coll#060509-WH-1, Gwanak arboretem, Munan-gu, Anyang-si, Gyeonggi-do, Korea, 9-V-2006, on Corydalis speciosa Maxim., leg. Wonhoo Lee.
**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-
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. 2. Photograph of *Aulacorthum corydalicola* sp. nov. apterous viviparous female.
stances; 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...
| Part                      | A. corydalica sp. no. | A. corydalica sp. nov. | A. asteriphagum sp. no. | A. solani |
|--------------------------|-----------------------|-----------------------|------------------------|----------|
|                          | Apterous vivipara     | Alate vivipara        | Apterous vivipara      | Apterous vivipara |
|                          | (n = 20)              | (n = 4)               | (n = 6)                | (n = 20)  |
| Length (mm)              |                       |                       |                        |           |
| BL                       | 2.35 (2.19-2.64)      | 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)       | 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)       | 0.16 (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 (0.08-0.11) |
| Ant.III                  | 0.63 (054-0.72)       | 0.61 (0.59-0.64)      | 0.75 (0.69-0.84)       | 0.74 (059-0.81) |
| Ant.IV                   | 0.49 (0.40-0.53)      | 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)       | 0.53 (0.49-0.60) |
| Ant.VIb                  | 0.17 (0.15-0.19)      | 0.18 (0.17-0.19)      | 0.20 (0.18-0.23)       | 0.20 (0.15-0.24) |
| PT                       | 0.62 (0.55-0.67)      | 0.69 (0.68-0.69)      | 1.18 (1.06-1.31)       | 0.93 (0.85-1.02) |
| URS                      | 0.13 (0.12-0.14)      | 0.13 (0.12-0.13)      | 0.14 (0.14-0.15)       | 0.14 (0.13-0.15) |
| Hind femur               | 0.82 (0.69-0.95)      | 0.76 (0.75-0.78)      | 1.08 (0.91-1.25)       | 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)       | 1.85 (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 (0.12-0.13) |
| SIPH                     | 0.51 (0.44-0.61)      | 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)       | 0.29 (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)    | 0.011 (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)    | 0.006 (0.003-0.008) |
| No. of hairs on          |                       |                       |                        |           |
| Mandibular lamina        | 2 (1-2)               | 2 (2-2)               | 3 (2-3)                | 2 (2-4)   |
| Ant.I                    | 6 (5-7)               | 6 (4-7)               | 7 (6-9)                | 7 (6-8)   |
| Ant.II                   | 4 (3-5)               | 4 (3-5)               | 4 (3-4)                | 4 (3-5)   |
| Ant.III                  | 24 (20-28)            | 18 (15-22)            | 17 (10-22)             | 25 (20-30) |
| URS (subsidiary)         | 6 (6-7)               | 6 (6-6)               | 6 (6-6)                | 6 (6-6)   |
| Part                                      | A. corydalica sp. no. Apterous vivipara (n = 20) | A. corydalica sp. nov. Alate vivipara (n = 4) | A. asteriphagum sp. no. Apterous vivipara (n = 6) | A. solani Apterous vivipara (n = 20) |
|------------------------------------------|-------------------------------------------------|-----------------------------------------------|------------------------------------------------|-------------------------------------|
| Tergite VI between SIPH                 | 6 (5-6)                                         | 6 (5-6)                                       | 5 (5-5)                                         | 4 (4-4)                             |
| Tergite VIII                            | 5 (4-6)                                         | 5 (4-6)                                       | 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)                             |
| No. of Rhinaria                         | Ant.III 1 (1-2)                                 | 5 (1-7)                                       | 8 (4-12)                                        | 2 (0-3)                             |
| 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/wid 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)                    |
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 *Aulacorthum 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

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.
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 corydalica 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 corydalica sp. nov. and solani), rostrum attaining posterior margin of hindcoxa (vs rostrum attaining posterior margin of mesocoxa for combined values of corydalica 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 corydalica 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)**

| Key | Description | Species |
|-----|-------------|---------|
| 1.  | SIPH pale, concolorous with abdominal tergite, at most dusky at apex | Aulacorthum asteriphagum sp. nov. |
| —   | —SIPH black, at least dusky wholly, not concolourous with abdominal tergite | Aulacorthum solani |
| 2.  | Antennal tubercles gibbous, convergent. Leg pale. Body including appendages pale yellow in life except nar—SIPH black, at least dusky wholly, not concolourous with abdominal tergite | Aulacorthum glechomae |
| —   | —Antennal tubercles divergent. Leg pale but dark at apex of femora or tibiae. Body pale green in life | Aulacorthum asteris |
| 3.  | Head spinulose dorsally. Dorsal surface of antennal tubercle entirely spinulose | Aulacorthum corydalica sp. nov. |
| —   | —Head smooth dorsally. Dorsal surface of antennal tubercle smooth, partly spinulose at most | Aulacorthum asteris |
| 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 | Aulacorthum corydalica sp. nov. |
| 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 asteris |
| —   | —Antenna 1.16-1.33 times as long as BL; Ant.III-VI pale excluding dark junction of Ant.III-VIb; 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 (Labiateae). In Korea and Japan | Aulacorthum nepetifolii |
| —   | —Abdominal tergum pale, not pigmented in apterae | Aulacorthum solani |
| 8.  | SIPH slightly swollen | Aulacorthum asteris |
| —   | —SIPH cylindrical, not swollen | Aulacorthum asteris |
| 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 magnolioae |
| 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. 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

—SIPH long, 3 times as long as cauda. Body pale, mottled with reddish brown on abdomen laterally and around SIPH in life

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.

—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

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