台灣農業研究 (J. Taiwan Agric. Res.) 73(2):71–87 (2024)
https://doi.org/10.6156/JTAR.202406_73(2).0001

Research Article

Taxonomic Review of the Genus *Asiophrida* Medvedev, 1999 in Taiwan (Insecta: Coleoptera: Chrysomelidae: Galerucinae: Alticini), with Notes on Biology

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Abstract

Lee, C. F., S. F. Yu, and M. H. Tsou. 2024. Taxonomic review of the genus *Asiophrida* Medvedev, 1999 in Taiwan (Insecta: Coleoptera: Chrysomelidae: Galerucinae: Alticini), with notes on biology. J. Taiwan Agric. Res. 73(2):71–87.

Asiophrida Medvedev and *Podontia* Dalman belonging to the *Blepharida*-genus group could be found in Taiwan. *Asiophrida scaphoides* (Baly) and *A. spectabilis* (Baly) are redescribed and the illustrations of the penises, gonocoxae, spermathecae, abdominal ventrites VIII in females, and tarsomres I–III and the abdominal ventrites V of both sexes are provided. Detailed biological information, including larval and adult feeding behaviors, host plants, and life cycles is provided. Lectotypes are designated for *Podontia scaphoides* Baly, 1865, *Ophrida binduta* Maulik, 1926, and *P. spectabilis* Baly, 1862.

Key words: Flea beetles, Taxonomy, Anacardiaceae, *Rhus succedanea* var. *succedanea*, *Rhus chinensis* var. *roxburghii*.

INTRODUCTION

The genus *Asiophrida* Medvedev includes large-sized species within the *Blepharida*-genus group. Members of the group are recognized easily by the following combination of characters: emarginate anterior margin of the metatibial apex; elongate-oval eye shape, converging dorsally (except *Podontia*); the convex, chrysomeline appearance of the body; *Blepharida* morpho-group form of the hind femoral spring; and closed procoxal cavities in adults. These genera are also well defined by their biology, especially their shared host plant families, Anacardiaceae and Burseraceae, and their larval feeding habits (external leaf-feeding) (Furth & Lee 2000). Genera of the Oriental region were revised by Medvedev (1999), and 3 new genera were described: *Blepharella*, *Furthia*, and *Asiophrida*. *Asiophrida* comprises 18 species, most of which were originally grouped in *Ophrida* Chapuis. Two of these, *O. scaphoides* (Baly, 1865) and *O. spectabilis* (Baly, 1862), were recorded from Taiwan. Medvedev's definition of *Asiophrida* in a Russian journal is insufficiently detailed, and a number of subsequent papers overlooked or did not follow his nomenclatural acts, including Lee & An (2001), Park & Lee (2001), Lee & Cho (2006), Lee & Cheng (2007), Zhang & Yang (2008), and Aston (2009).

Both *Asiophrida scaphoides* and *A. spectabilis* were described from North China and were recorded from Taiwan during the 1930s (see below). They were briefly redescribed by Kimoto & Takizawa (1997) and Lee & Cheng (2007). In the current study, we provide additional infor-

Received: January 14, 2024; Accepted: February 17, 2024.
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mation regarding generic delimits and species identities of both species and describe their feeding biology and life cycles in Taiwan.

MATERIALS AND METHODS

For rearing studies, larvae were placed in small glass containers (diameter 142 mm × height 50 mm) with cuttings from host plants. When mature larvae began searching for pupation sites, they were transferred to smaller plastic containers (diameter 90 mm × height 57 mm) filled with moist soil to about 80% of container volume.

We examined morphology of over 200 dry-mounted adult specimens. For delimiting the variability of diagnostic characters, at least one pair from each locality was examined. Length was measured from the anterior margin of the eye to the elytral apex, and width at the greatest width of the elytra. Type specimens available for study and voucher specimens were deposited at The Natural History Museum, London, UK (BMNH), the National Museum of Natural Science, Taichung, Taiwan (NMNS), and the Applied Zoology Division, Taiwan Agricultural Research Institute, Taichung, Taiwan (TARI). Terminology of the grooves on pronota follows Medvedev (1999).

Exact label data are cited for all type specimens of described species; a double slash (//) divides the data on different labels and a single slash (/) divides the data in different rows. Other comments and remarks are in square brackets: [p]- preceding data are printed, [h]- preceding data are handwritten, [w]- white label, and [b]- blue label.

RESULTS

Genus *Asiophrida* Medvedev

Asiophrida Medvedev, 1999:180 (type species: *Ophrida marmorea* Wiedemann, 1819); Löbl & Smetana 2011:51 (catalogue).

Diagnosis. Pronotum (Fig. 1A) with anterolateral area (AL) centrally depressed, delimited by longitudinal (LAL) and transverse (TAL) punctures; LAL basally connecting with longitudinal punctures (AAL); basal margin with longitudinal lateral grooves (LG); central longitudinal line (CL) reduced except basally; additional groove (PG) near lateral margin behind middle. Prosternal process widely rounded. Mesoventrite (Fig. 1B) with saddle-like process for reception of metasternal process. Hind femora with angular processes at posterior margins near apices. Claws bifid. Tarsomeres I of front and middle legs more swollen in males than in females.

Remarks. Adults of *Asiophrida* differ from those of *Podontia* (Lee & Yu 2021) by their pronotal LAL, TAL, and AAL consisted of punctures (lacking punctures in *Podontia*), widely rounded prosternal process (bifurcate prosternal process in *Podontia*), basal margin of at least abdominal ventrite V in males expanded posteriorly (basal margins of abdominal ventrites not modified in males of *Podontia*), posterior margin of hind tibia smooth and without angular process (posterior margin of hind tibia with one angular process in *Podontia*), spermatheca with spermathecal duct and gland (lacking spermathecal duct and gland in *Podontia*), receptacle apically connected with spermathecal duct (receptacle subapically connected with spermathecal duct), gonocoxae well developed, lobe-like (gonocoxae less developed, usually consisted of one process with dense setae in *Podontia*). Immature stages of *Asiophrida* also display significant differences from those of *Podontia*: egg mass covered by faecal material (egg mass exposed in *Podontia*), old instar larvae dark brown or purple (old instar larvae yellow in *Podontia*).

Asiophrida scaphoides (Baly)

Podontia scaphoides Baly, 1865:430 (China); Gemminger & Harold 1876:3522 (catalogue).

Ophrida scaphoides: Miwa 1931:192 (Taiwan); Chen 1933:216 (Vietnam; key); Chen 1934:271 (redescription; China: Gansu, Jiangsu, Zhejiang, Sichuan, Yunnan, Guizhou); Chûjô 1935:465 (Taiwan); Gressitt & Kimoto

1963:787 (China: Hubei, Guangdong); Kimoto 1970:214 (Taiwan); Kimoto 1987:191 (Taiwan); Kimoto 1989:262 (Taiwan); Kimoto 1991:19 (Taiwan); Takizawa *et al*. 1995:14 (Taiwan); Kimoto & Takizawa 1997:519 (larval morphology, host plant); Kimoto 2000:227 (Thailand); Lee & Cheng 2007:142 (host plant); Aston 2009:4 (China: Hong Kong).

Ophrida binduta Maulik, 1926:233 (India); synonymized by Scherer (1969). **Synonym confirmed.**

Asiophrida scaphoides: Medvedev 1999: 182; Löbl & Smetana 2011:51 (catalogue); Yang *et al*. 2015:354 (China; catalogue).

Types. *Podontia scaphoides* (Figs. 2A–D). Lectotype ♀ (BMNH), here designated to preserve stability of nomenclature since synonyms exist, labeled: "Type / H. T [p, w, circle label with red border] // N. China [h, w] // Baly Coll. [p, w] // SYN- / TYPE [p, w, circle label with blue border] // *Podontia* / *scaphoides* / Baly / N. China [h, b] // Type [h, underside of the previous card] // MNBH(E) / #1024879 [p, w]". Paralectotype: 1♂ (BMNH): "Baly Coll. [p, w] // SYN- / TYPE [p, w, circle label with blue border]".

Ophrida binduta (Figs. 2E–H). Lectotype ♀ (BMNH), here designated to preserve stability of nomenclature since synonyms exist, labeled: "Type [p, w, circle label with red border] // Assam. / W. F. Badgley. / 1906—185. [p, w] // *Ophrida* / *binduta*, M. [h] / Det. Maulik. [p] / Type. 1925 [h, w]". There should be 3 syntypes based on the original description, but only one was found at the BMNH.

Specimens examined (*n* = 136). CHINA. Fujian: 1♂ (BMNH), Foochow (= Fuzhou, 福州), 1923, leg. C. R. Kallogg; **Guangxi:** 1♀ (TARI), Dayaoshan (大瑤山), 17.VI.2016, leg. I. T. Zhao; 1♂ (TARI), same but with "25.VII.2016"; 1♀ (TARI), same but with "14.IX.2017"; 1♀ (TARI), Laoshan Forest Farm (老山林場), 9.IX. 2020, leg. I. T. Zhao; **Sichuan:** 3♀ (BMNH), Gongga Shan mts. (貢嘎山), 14–19.VI.1999, leg. V. Siniaev & A. Plutenko; **Yunnan:** 2♀ (TARI), Luteshan (綠德山), 10.V.2019, leg. Y. T. Wang; 1♂ (TARI), Wudian (武甸), 20.IX.2018, leg. Y. T. Wang; **LAOS. Hua Phan:** 3♂, 4♀ (BMNH), Ban Saleui, Phou Pan (Mt.), 3–30. IV.2014, leg. C. Holzschuh; **TAIWAN. Chiayi:** 1♂, 2♀ (NMNS), Tapu (大埔), 25.III.1998, leg. W. T. Yang; **Hsinchu:** 2♂ (TARI), 1♀ (BMNH), Shinchiku (= Hsinchu, 新竹), 1–30.VII.1918, leg. J. Sonan & K. Miyake; 1♀ (TARI), Tahunshan (大混山), 24.II.2009, leg. M. H. Tsou; 3♂ (TARI), same but with "1.III.2009"; 1♀ (TARI), Talu trail (大鹿林道), 21.V.2011, leg. Y. L. Lin; 1♀ (TARI), same locality, 16. II.2023, leg. Y. F. Hsu; **Kaohsiung:** 2♂ (TARI), Rokkiri (= Liukuei, 六龜), 14.V.1941, leg. Y. Yano; 1♂ (TARI), Tengchih (藤枝), 6. VIII.2013, leg. B. X. Guo; 1♀ (TARI), Tienchih (天池), 1.IV.2015, leg. C. F. Lee; 4♂, 2♀ (TARI), Tou Noo (多納), 3.VI.1989, leg. K. Baba; 4♂, 3♀ (TARI), same locality (= Tona), 7.VII.2016, leg. B. X. Guo; 2♀ (TARI), same locality, 24.VII.2016, leg. U. Ong; **Miaoli:** 1♂ (TARI), Hsuehchien (雪見), 12.X.2021, leg. C. F. Lee; **Nantou:** 1♀ (TARI), Aowanta (奧萬大), 10.VII.2010, leg. Y. T. Wang; 1♂ (NMNS), Chunyang (春陽), 23–24.IX.1997, leg. C. S. Lin & W. T. Yang; 1♂, 3♀ (TARI), same but with "12.VIII.–8.IX.1998"; 1♀ (NMNS), same but with "11.VI.–9.VII.2002"; 1♀ (NMNS), same but with "15.X.–12.XI.2002"; 1♀ (NMNS), same but with "11.VI.–8.VII.2003"; 1♀ (NMNS), same but with "5.VIII.–9.IX.2003"; 1♂, 2♀ (NMNS), same but with "9.IX.–7. X.2023"; 1♂, 1♀ (NMNS), same but with "4.XI.–15.XII.2003"; 1♂ (NMNS), same but with "10.VIII.–8.IX.2004"; 2♀ (NMNS), same but with "8.VI.–14.VII.2017"; 1♂, 2♀ (TARI), same locality, 25.X.2009, leg. Y. T. Wang; 1♀ (TARI), same locality, 20.IV.2011, leg. W. T. Liu; 1♂ (NMNS), same locality but with "No: II Sampling plots, 9.I.–6.II.2007"; 1♂, 1♀ (NMNS), same but with "6.VI.–14.VII.2007"; 1♂, 1♀ (NMNS), same but with "14.VII.–7.VIII.2007"; 1♀ (NMNS), Huisun Forest (惠蓀林場), 17–19. I.1996, leg. W. T. Yang; 1♂ (NMNS), same locality, 11.XI.1998, leg. M. L. Chan; 1♀ (NMNS), same locality, 6.VI.2011, leg. Liang, Tang, Shen; 1♂ (NMNS), same locality, 1.X.2011, leg. H. H. Liang; 1♂ (TARI), 17.XI.2008, same

locality, leg. M. H. Tsou; 2♀ (NMNS), Jiantai Forest District (尖台林區), 17.VII.2019, leg. J. F. Tsai; 1♂, 1♀ (BMNH), Lushan (廬山), 8.VIII. 2008, leg. H. Mendel, U. Ong, M. V. L. Barclay & R. Ewers; 1♀ (TARI), Musha (= Wushe, 霧社), V.18.–VI.15.1918, leg. T. Okuni; 1♀ (NMNS), Nanshanchi (南山溪), 17.VI.1965, leg. B. S. Chang; 1♂ (NMNS), same but with "21. VI.1965"; 1♂ (NMNS), Sungkang (松崗), 10. VII.2000, leg. C. C. Lo; 1♂ (TARI), Tungpu (東埔), 19–23.VII.1982, leg. L. Y. Chou & T. Lin; 1♂ (NMNS), Yuanfeng (鳶峰), 2.VIII.–8.IX.2005, leg. C. S. Lin & W. T. Yang; **New Taipei City:** 1♀ (TARI), Fushan (福山), 17.VI.2008, leg. W. H. Hu; **Pingtung:** 2♂, 1♀ (TARI), Tahanshan (大漢山), 24.VI.2007, leg. C. F. Lee; 1♀ (TARI), same locality, 22.I.2009, leg. M. H. Tsou; 4♂, 6♀ (TARI), same but with "18–21. IV.2009"; 1♂, 1♀ (TARI), same locality, 17.VII.2007, leg. S. F. Yu; 1♀ (TARI), same but with "8.II.2008"; 1♂ (TARI), same but with "22.I.2009"; 1♀ (TARI), same locality, 3.IV.2013, leg. Y. T. Chung; 1♀ (TARI), same but with "10.V.2013"; 1♂ (TARI), same but with "6.VI.2015"; 1♂ (TARI), same locality, 25.X.2014, leg. W. C. Liao; 1♂ (TARI), same but with "22.III.2015"; **Taichung:** 1♂, 2♀ (NMNS), Bojinjiashan (波津加山), 8.X.1987, leg. I. C. Hsu; 1♀ (NMNS), Chungchemg Campsite (中正露營區), 24.V.2010, leg. H. H. Liang; 1♂, 1♀ (NMNS), Guguan (谷關), Shaolai Trail (捎來步道), 25.IX.2021, leg. J. F. Tsai; 1♂ (NMNS), Tachien (達見), 2.IX.1987, leg. I. C. Hsu; 1♂, 3♀ (NMNS), Tangmatanshan (唐麻丹山), 4.X.1987, leg. I. C. Hsu; **Taitung:** 1♂, 4♀ (TARI), Wulu trail (霧鹿林道), 26.IX.2007, J. F. Tsai; **Taoyuan:** 2♀ (NMNS), Junghua (榮華), 2.V.1971, leg. B. S. Chang; 1♂ (NMNS), Paling (巴陵), 23.IV.1972, leg. B. S. Chang; 1♂ (NMNS), Szuling (四稜), 17.IX.2011, leg. Y. T. Wang.

Redescription. Length 8.5–10.0 mm, width 4.2–5.3 mm. General color (Figs. 3A–C) yellowish-brown to reddish-brown; antenna apically and gradually darkened from antennomere V; mesothoracic ventrite blackish-brown or black; tibiae and base of hind femur black, tarsi yellow; elytra with white dots between strial punctures arranged regularly and characteristically. Antennae filiform in males (Fig. 4A), but antennomere I moderately bent, length ratios of male antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.5 : 0.6 : 0.6 : 0.6 : 0.6 : 0.6 : 0.5 : 0.7, length to width ratios of antennomeres I–XI 4.1 : 1.8 : 2.4 : 2.5 : 2.6 : 2.4 : 2.7 : 2.8 : 2.8 : 2.3 : 2.9; shorter in females (Fig. 4B), antennomeres III–X straight, length ratios of female antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.5 : 0.5 : 0.5 : 0.5 : 0.5 : 0.5 : 0.5 : 0.7, length to width ratios of antennomeres I–XI 3.5 : 1.8 : 2.4 : 2.6 : 2.9 : 2.6 : 2.2 : 2.3 : 2.3 : 2.1 : 2.8. Pronotum transverse, 1.8–1.9× wider than long, lateral margin moderately rounded from apex to middle, then parallel-sided from middle to base; apical margin medially and moderately concave, basal margin medially and slightly convex. Elytra parallel-sided, 1.4–1.5× longer than wide. Tarsomeres I of front and middle legs strongly swollen in males (Fig. 4H); less swollen in females (Fig. 4I). Apical margin of abdominal ventrite V in males trilobed (Fig. 4J), notches shallow, basal margins of all abdominal ventrites not modified; apical margin of abdominal ventrite V broadly rounded in females, basal margin not modified. Penis (Figs. 4C–D) elongate, 4.8× longer than wide; parallel-sided, apically narrowed from apical 3/10, apex rounded; slightly bent at middle at lateral view; ostium membranous with one median elongate sclerite. Gonocoxae (Fig. 4G) well developed, combined with deep median notch on apical margin, dense, long setae along apical margin, basal membranous with median basally pointed sclerotization. Ventrite VIII (Fig. 4E) membranous except apical margin and spiculum, with one cluster of short setae at sides of apical margin; spiculum extremely elongate. Receptacle of spermatheca (Fig. 4F) strongly swollen, apically connected with distal spermathecal duct and basally connected with pump, inseparable between distal spermathecal duct, receptacle, and pump; pump strongly curved, apex with one small process; distal spermathecal duct long and apically connected with receptacle.

Variation. Specimens from populations in mainland China are larger and have entirely black hind femora.

Diagnosis. Adults of *Asiophrida scaphoides* are separated easily from those of *A. spectabilis* by their distinct color patterns. In addition, genitalic characters are also diagnostic for species identities. The ventral surface of the penis is flat (Fig. 4D) in *A. scaphoides*, but convex at apical 1/3 (Fig. 6D) in *A. spectabilis*. The apical margin of the gonocoxae is widely rounded in *A. scaphoides* (Fig. 4G), but bilobed in *A. spectabilis* (Fig. 6G). Abdominal ventrite VIII in females of *A. scaphoides* possesses an elongate spiculum, with apical marginal setae restricted to the central part (Fig. 4E). In females of *A. spectabilis* abdominal ventrite VIII has the spiculum subapically widened, and the entire apical margin bears setae (Fig. 6E).

Host plants. Anacardiaceae: *Rhus verniciflua* Stokes (Aston 2009); *R. succedanea* var. *succedanea* L. (Kimoto & Takizawa 1997; Lee & Cheng 2007).

Biology. Although the larval morphology of *Asiophrida scaphoides* was studied by Kimoto & Takizawa (1997), its life history was previously unknown. Based on our observations, this species is univoltine in Taiwan. Overwintered females started depositing egg masses on February 20, 2009, as observed by the senior author. Each egg mass contained ten eggs and was covered with faeces (Fig. 5A). Egg masses were deposited on twigs in the field (Fig. 5B). Larvae hatched after 10 d. Neonate larvae were pale yellow with black heads (Fig. 5C). They cut leaf veins first to stop fluid transport in the veins. Later instar larvae turned purple and fed by scraping the abaxial surface of the lamina (Fig. 5D), while older larvae fed by cutting the leaf lamina. They appeared sticky and coated with faeces (Fig. 5E). Larval durations varied from 14–16 d. Mature larvae crawled into the soil and constructed underground chambers for pupation. Pupal stage (Fig. 5F) duration was approximately 30 d (Fig. 5G). Adults fed by cutting the leaf lamina. They jumped promptly when disturbed. Unlike larvae, adults preferred to remain on the adaxial side of leaves (Fig. 5H).

Distribution. China, India, Laos (new record), Taiwan, Thailand, and Vietnam. This species is widespread in lowlands of Taiwan.

Asiophrida spectabilis (Baly)

Podonita spectabilis Baly, 1862:452 (China).

Ophrida spectabilis: Gemminger & Harold, 1876:3523 (catalogue); Chen 1933:216 (key); Chen 1934:270 (redescription; China: Zhejiang, Jiangsu, Guizhou, Yunnan; Taiwan); Chen 1939:34 (China: Guangxi); Chûjô 1935:465 (Taiwan); Chûjô 1963:400 (Taiwan); Gressitt & Kimoto 1963:787 (China: Tibet, Sichuan, Hubei); Kimoto 1965:489 (Taiwan); Kimoto 1970:214 (Taiwan); Wang *et al*. 1998:26 (biology and control); Lee & An 2001:146 (South Korea); Park & Lee 2001:257 (larval morphology, biology); Lee & Cho 2006:57 (host plants); Lee & Cheng 2007:140 (biology).

Podontia rufoflava Fairmaire, 1889:73 (China); synonymized by Gressitt & Kimoto (1963).

Asiophrida spectabilis: Medvedev 1999:183; Yang *et al*. 2015:354 (China; catalogue); Cho & An 2020:15 (Korea; catalogue); Löbl & Smetana 2011:51 (catalogue).

Types. *Podolia spectabilis* (Figs. 2I–L). Lectotype ♀ (BMNH), here designated to preserve stability of nomenclature since synonyms exist, labeled: “Type / H. T. [p, w, circle with red border] // Baly Coll. [p, w] // SYN- / TYPE [p, w, circle label with blue border] // Podonita / spectabilis / Baly / N. China [h, b] // Type [h, underside of the previous card] // BMNH(E) / #1024845 [p, w]”. Paralectotype: 1♀ (BMNH): “Baly Coll. [p, w] // SYN- / TYPE [p, w, circle label with blue border]”.

Podontia rufoflava. Fairmaire’s collection is at the Muséum national d’Histoire naturelle (MNHN) in Paris. Nonetheless, a recent search through both the MNHN general collection and Fairmaire’s collection for types has been unsuccessful (A. Mantilleri, in litt.).

Specimens examined (*n* = 56). CHINA. Fujian: 1♀ (BMNH), Foochow (= Fuzhou, 福州), 2.IX.??, leg. M. S. Yang; **Guanxi:** 1♂ (TARI), Cenwanglaoshan (岑王老山), 27.VII.2020, leg. Y. Q. Lu; **Zhejiang:** 1♀ (BMNH), Hangchow (= Hangzhou, 杭州), 3.VI.1928, leg. P. H. Tsai; 1♂ (TARI), same locality, 14.VIII.1928, leg. C. C. Tao; **KOREA.** 1♀ (TARI), Keizyo, Keikido, 3.VIII.1937, leg. T. Kusanagi; 1♀ (TARI), Keizyo, Keikido, Mt. Hokugaku-zan, 7.VIII.1937, leg. M. Yamada; **TAIWAN. Chiayi:** 1♀ (TARI), Arisan (= Alishan, 阿里山), VI.1914, leg. M. Maki; 1♀ (TARI), 2–23.X.1918, same locality, leg. J. Sonan & M. Yoshino; 1♂, 1♀ (TARI), Taihorin (= Talin, 大林), VI.1908, leg. T. Shiraki; **Hsinchu:** 1♂ (TARI), Litungshan (李棟山), 6.VI.2010, leg. Y. L. Lin; **Hualien:** 2♀ (BMNH), Costal Range (海岸山脈), SE of Fuli (富里), 12–16.XI.2008, leg. L. Dembický; **Hualien:** 2♂, 3♀ (NMNS), Hsipao (西寶), 5.XII.1991, leg. Y. C. Shiau; **Ilan:** 1♀ (TARI), Piyahau (= Pihau, 碧猴), 16.X.1937, leg. Y. Miwa; 1♀ (TARI), Riyohen (= Chinyuehtsun, 金岳村) – Rato (= Lotung, 羅東), 5.IX.1929, leg. R. Takahashi; 1♀ (TARI), Taiheizan (= Taipingshan, 太平山), VII.1930, leg. Y. Minowa; **Nantou:** 1♀, Horisha (= Puli, 埔里), 20.V.1919, leg. H. Kawamura; 1♂, 1♀ (TARI), same locality (= Hori), VII.1937, leg. K. Nakamura; 3♂, 1♀ (NMNS), Nanshanchi (南山溪), 21.V.1965, leg. B. S. Chang; 1♀ (NMNS), same but with "1.VI.1965"; 2♂ (NMNS), same but with "8.VI.1965"; 2♂ (NMNS), same but with "17.VI.1965"; 1♂ (TARI), Takeya (= Chienchityu, 乾溪子), 8.VII.1940, leg. M. Chujo; **New Taipei City:** 1♀ (NMNS), crossroads between Beiyi Highway (北宜公路) and Shuangfeng Road (雙峰路), 4.X.1992, leg. W. I. Chou; 2♂ (TARI), Shinten (= Hsintien, 新店), 24.X.1929, leg. M. Chujo; **Taichung:** 2♀ (TARI), Hakumo (= Paimao, 白毛), 12.VI.1926, leg. R. Takahashi; **Taipei:** 1♂, 1♀ (TARI), Peitou (北投), 2.X.2006, leg. S. F. Yu; 1♂, 3♀, Sozan (= Yangmingshan, 陽明山), 25.X.1936, leg. M. Chujo; 1♂, 4♀, same locality, 13.VI.1943, collector unknown; 1♀ (TARI), Sishoushan (四獸山), 19.VIII.2014, leg. H. T. Cheng; 1♀ (TARI), Taihoku (= Taipei, 臺北), IX.1911, leg. I. Nitobe; **Taitung:** 1♂ (TARI), Lichia (利嘉), 9.V.2010, leg. M. L. Jeng; **Taoyuan:** 1♂, 1♀ (TARI), Kalaho (嘎拉賀), 20.IX.2009, leg. Y. T. Wang.

Redescription. Length 13.8–15.0 mm, width 6.9–8.0 mm. General color (Figs. 3D–F) yellowish-brown; antenna black, but four basal antennomeres yellowish-brown; elytra with white stripes arranged regularly and characteristically. Antennae filiform in males (Fig. 6A), but antennomere I moderately bent, length ratios of male antennomeres I–XI 1.0 : 0.3 : 0.5 : 0.6 : 0.7 : 0.6 : 0.6 : 0.6 : 0.6 : 0.5 : 0.6, length to width ratios of antennomeres I–XI 3.4 : 1.7 : 2.9 : 2.8 : 2.8 : 2.7 : 2.8 : 2.6 : 3.0 : 2.4 : 2.9; similar in females (Fig. 6B), antennomeres III–X straight, length ratios of female antennomeres I–XI 1.0 : 0.3 : 0.5 : 0.6 : 0.6 : 0.5 : 0.6 : 0.5 : 0.5 : 0.5 : 0.6, length to width ratios of antennomeres I–XI 3.6 : 1.6 : 2.7 : 2.9 : 3.0 : 2.6 : 2.5 : 2.6 : 2.6 : 2.2 : 3.0. Pronotum transverse, 1.7–1.8× wider than long, lateral margin moderately rounded from apex to middle, then parallel-sided from middle to base; apical margin medially and moderately concave, basal margin medially and slightly convex. Elytra parallel-sided, 1.5–1.6× longer than wide. Tarsomeres I of front and middle legs strongly swollen in males (Fig. 6H); less swollen in females (Fig. 6I). Apical margin of abdominal ventrite V in males trilobed (Fig. 6J), notches shallow, basal margins of all abdominal ventrites unmodified; apical margin of abdominal ventrite V broadly rounded in females, basal margin unmodified. Penis (Figs. 6C–D) elongate, 4.5× longer than wide; parallel-sided, apically narrowed from apical 3/10, apex rounded; slightly bent at middle at lateral view, ventral surface convex at apical 1/3; ostium membranous with one median elongate sclerite and one pair of lateral curved sclerites. Gonocoxae (Fig. 6G) well developed, lobe-like and combined, apical margin weakly emarginate on either side of middle, several

long setae along apical margin, and short setae near apices, base membranous with median basally pointed sclerotized area, and two pair of elongate weakly margined sclerotized areas. Ventrite VIII (Fig. 6E) membranous except apical margin and speculum, with short setae along apical margin, much denser at central part; spiculum extremely elongate and subapically widened. Receptacle of spermatheca (Fig. 6F) strongly swollen, apically connected with distal spermathecal duct and basally connected with pump, inseparable between distal spermathecal duct, receptacle, and pump; pump strongly curved, apex with one small process; distal spermathecal duct long and apically connected with receptacle.

Diagnosis. Adults of *Asiophrida spectabilis* are separated easily from those of *A. scaphoides* by their distinct color patterns. In addition, genitalic characters are diagnostic for species identities. The ventral surface of the penis is convex at the apical 1/3 in *A. spectabilis* (Fig. 6D) but flat in *A. scaphoides* (Fig. 4D). The apical margin of the gonocoxae is bilobed in *A. spectabilis* (Fig. 6G) but is widely rounded in *A. scaphoides* (Fig. 4G). In females of *A. spectabilis* abdominal ventrite VIII possesses a spiculum that is subapically widened, and an entire apical margin bearing setae (Fig. 6E). In females of *A. scaphoides* the spiculum is elongate, and setae of the apical margin are restricted to central part (Fig. 4E).

Host plants. Anacardiaceae: *Rhus verniciflua* Stokes (Park & Lee 2001); *R. trichocarpa* Miq. (Park & Lee 2001); *R. chinensis* Mill. (Wang *et al*. 1998; Park & Lee 2001); *R. chinensis* var. *roxburghii* (DC.) Rehder (Lee & Cheng 2007; = *R. javanica*, recorded by Lee & Cho 2006); *R. punjabensis* Stewart (Wang *et al*. 1998).

Biology. The larval morphology of *Asiophrida spectabilis* was studied by Park & Lee (2001). Its observed life history was similar in China (Hubei) (Wang *et al*. 1998), South Korea (Park & Lee 2001), and Taiwan (Lee & Cheng 2007). This species is univoltine and larvae from overwintered eggs started to hatch during mid-March in Taiwan but mid-April in South Korea. Egg mass contain approximately 15 eggs and are covered with faeces (Fig. 7B). Egg masses are deposited on twigs in the field (Fig. 7C). In the laboratory, larvae hatched in 5 d after being splashed with water. Neonate larvae are pale yellow with black heads (Fig. 7D). Later instar larvae turned purple and fed by scraping the adaxial surface of the lamina (Fig. 7E), while older larvae feed by cutting the leaf lamina. They appeared sticky and were coated with faeces (Fig. 7F). Larval durations varied from 25–30 d. Mature larvae crawled into the soil and constructed underground chambers for pupation. Larvae turned yellow inside the underground chambers. Pupal duration (Fig. 7G) was approximately 35 d in Taiwan and 45–50 d in China. Adults feed by cutting the leaf lamina. They jump promptly while disturbed. Adults (Fig. 7H) appear during middle June to early October in China and Taiwan but early August to late October in South Korea. Females start depositing egg masses during early September in China, middle September to middle October in South Korea, and late October in Taiwan (Fig. 7A).

Distribution. China, South Korea, Taiwan. This species is widespread in lowlands of Taiwan.

CONCLUSION

Medvedev (1999) proposed diagnostic characters of pronotum, pro- and mesosterna, hind femora, and claws for generic delimitation between *Podontia* and *Asiophrida*. More diagnostic characters can be observed on genitalic structures and immature stages. However, adults of *Asiophrida* are more similar to those of *Ophrida*, differing from the latter only by the well-developed Al area on the pronotum. The genus *Ophrida* require detailed study, especially of genitalic morphology and immatures to determine if the two genera are distinct or synonyms.

ACKNOWLEDGMENTS

We thank the Taiwan Chrysomelid Research Team for collecting materials, including Hsing-Tzung Cheng, Yi-Ting Chung, Bo-Xin Guo, Su-Fang Yu, and Mei-Hua Tsou; for taking photographs of specimens and live individuals in the field, including Hsing-Tzung Cheng, Su-Fang Yu, Mei-Hua Tsou, and Hseuh Lee. We thank Jan Bezděk and Yongying Ruan for providing valuable literature. We especially thank Chang Chin Chen for assisting our study in various ways. We thank Chris Carlton for reading the draft and editing for the American English style. This study was supported by the National Science and Technology Council NSTC 112-2313-B-055-001-MY3.

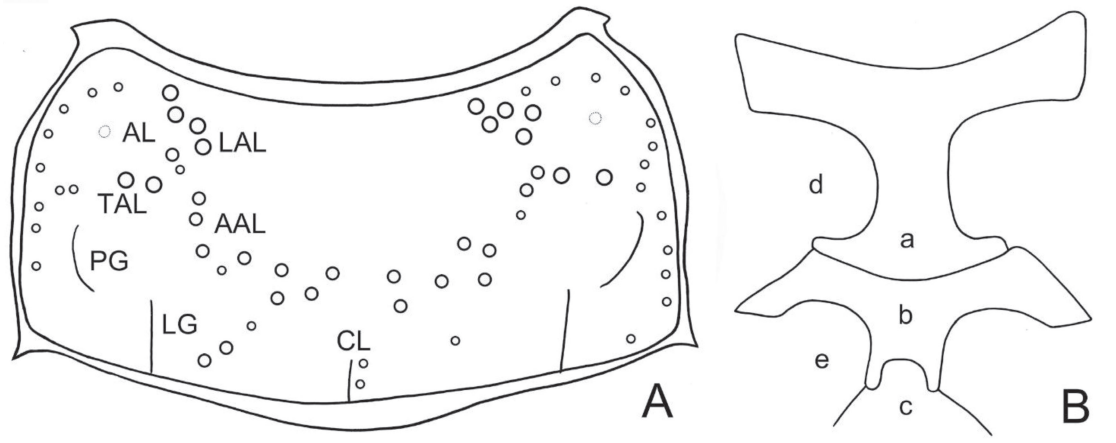

Fig. 1. Diagnostic characters of pronotum and thoracic ventrites, *Asiophrida scaphoides*. A. Pronotum, AAL: longitudinal groove behind middle, AL: anterolateral area, CL: central line, LAL: longitudinal groove above middle, LG: basal longitudinal groove, PG: posterior groove, TAL: transverse groove; B. Thorax, a: prosternum, b: mesoventrite, c: metaventrite, d: anterior coxa, e: middle coxa.

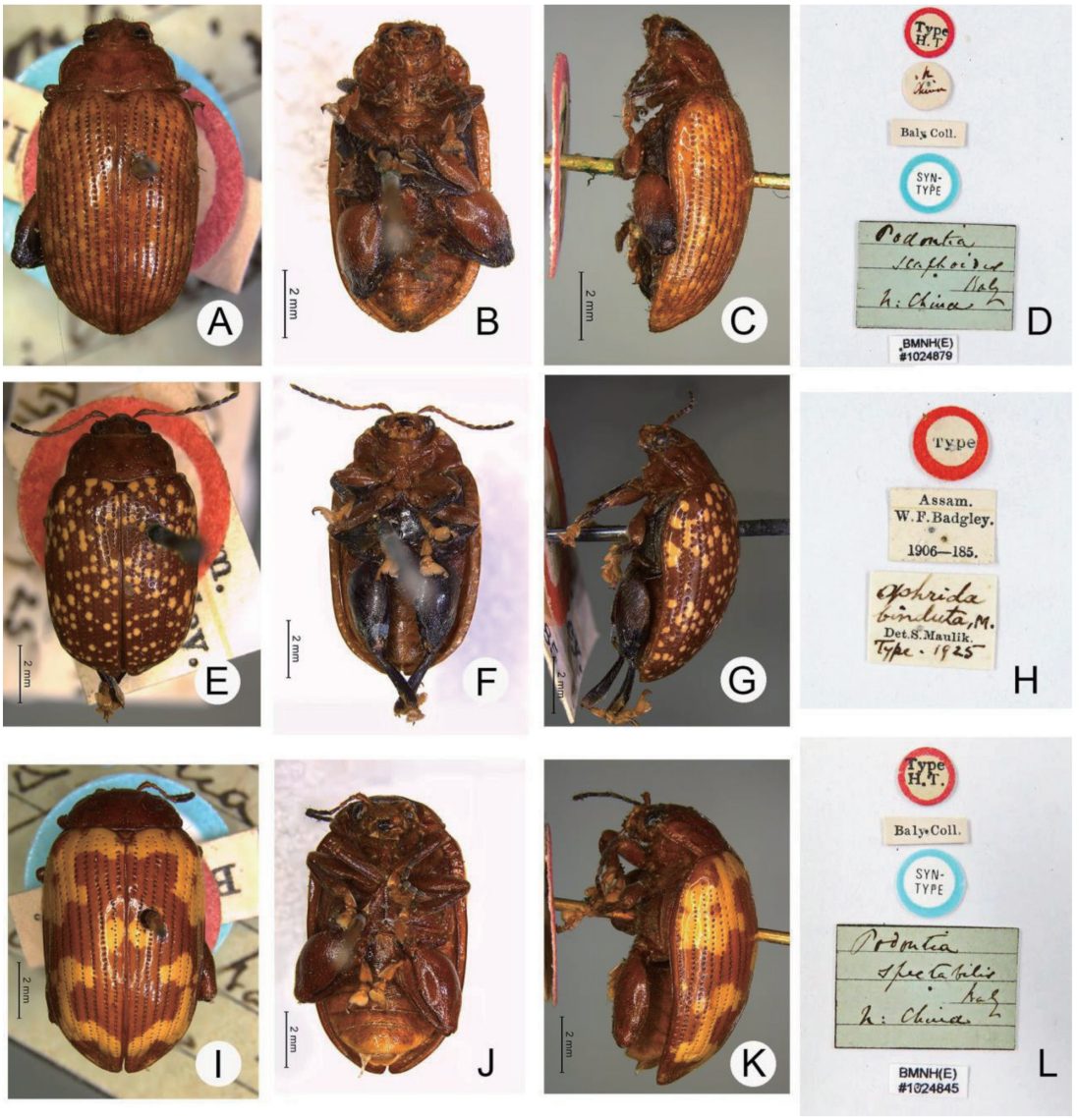

Fig. 2. Type specimens and labels of *Podontia scaphoides*, *Ophrida binduta*, and *P. spectabilis*. A–D: *P. scaphoides*, A. lectotype, dorsal view; B. ditto, ventral view; C. ditto, lateral view; D. labels; E–H: *O. binduta*, E. lectotype, dorsal view; F. ditto, ventral view; G. ditto, lateral view; H. labels; I–L: *P. spectabilis*, I. lectotype, dorsal view; J. ditto, ventral view; K. ditto, lateral view; L. labels.

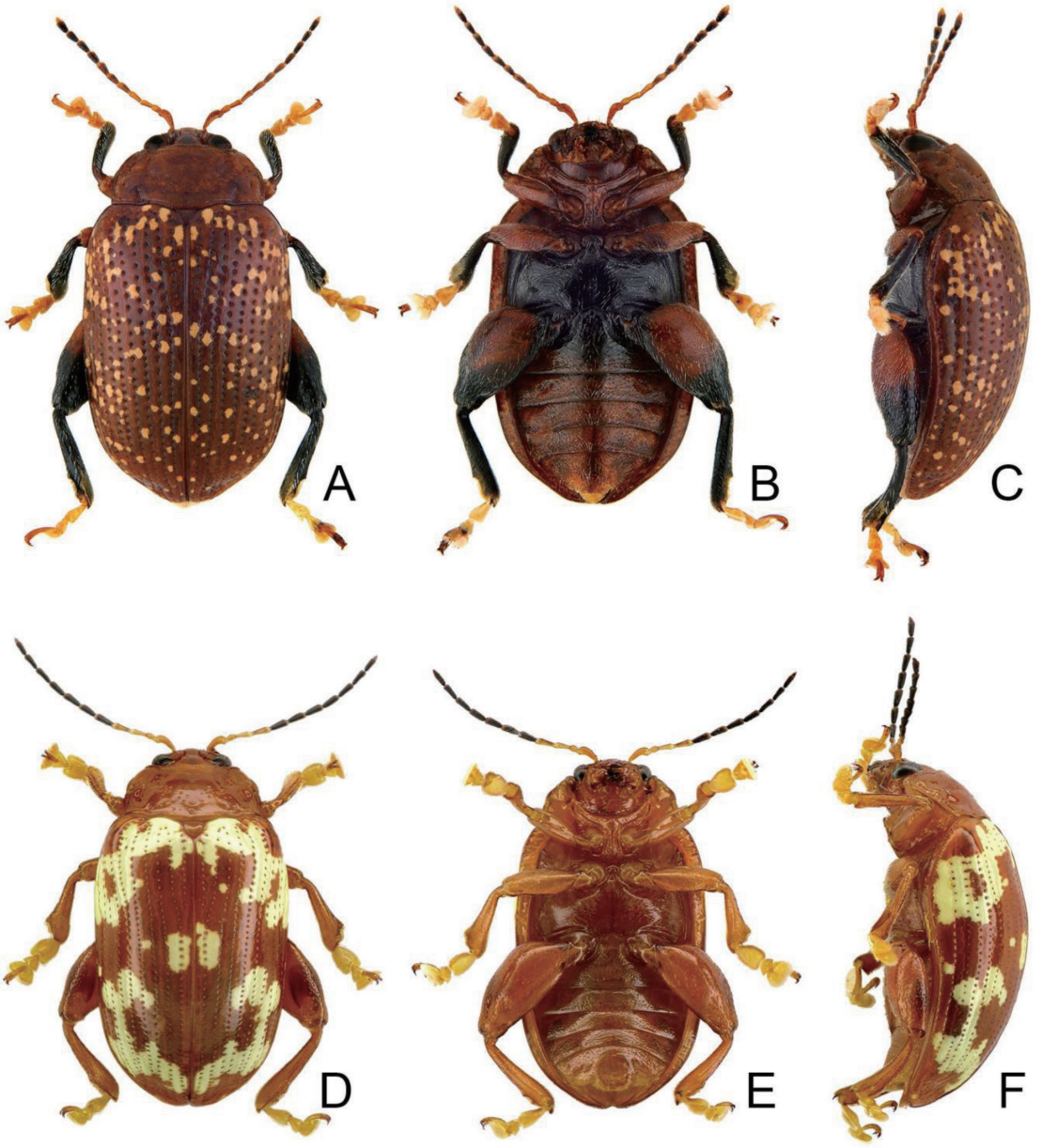

Fig. 3. Habitus of adult *Asiophrida scaphoides* and *A. spectabilis*. A. *A. scaphoides*, female, dorsal view; B. Ditto, ventral view; C. Ditto, lateral view; D. *A. spectabilis*, male, dorsal view; E. Ditto, ventral view; F. Ditto, lateral view.

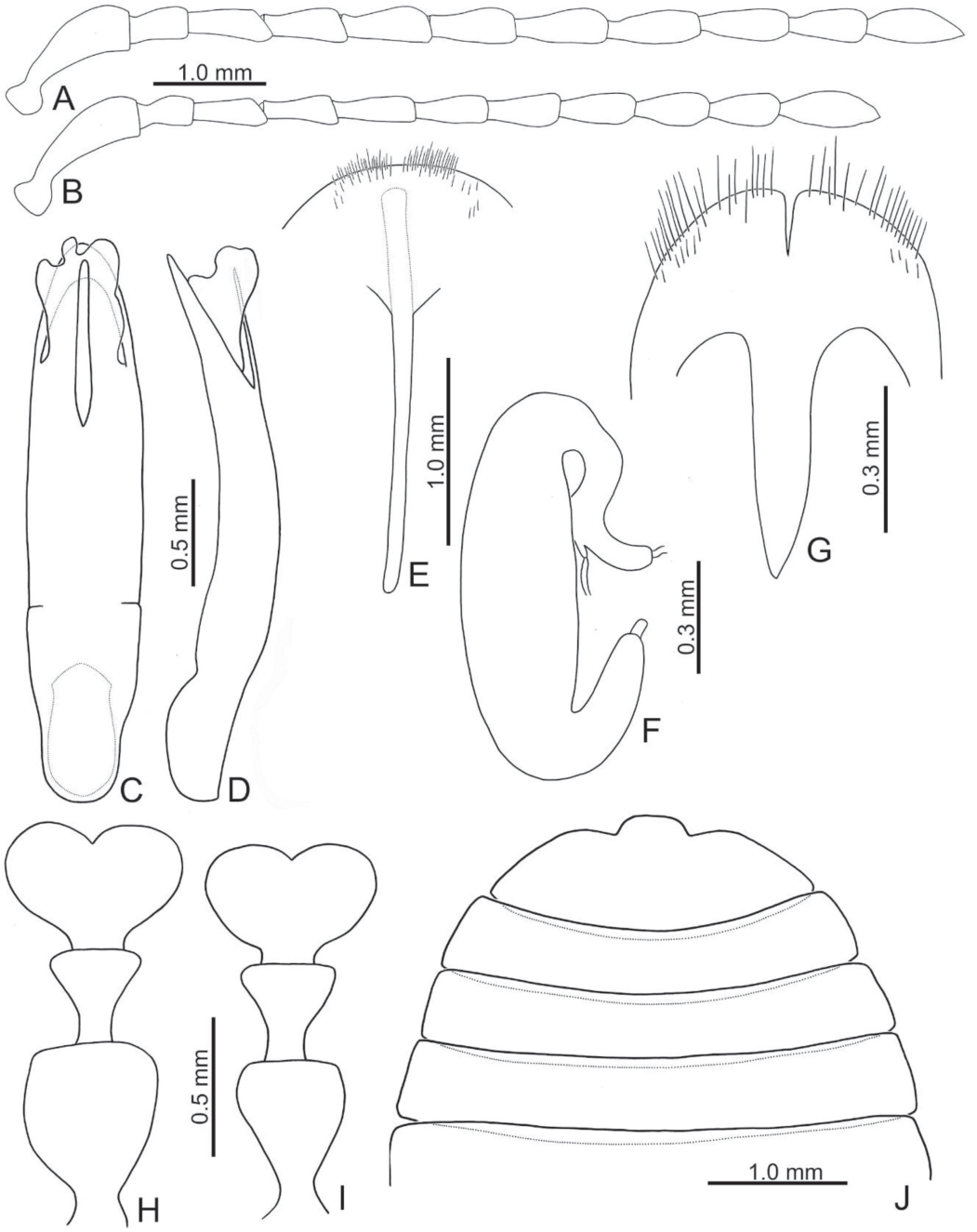

Fig. 4. Diagnostic characters of *Asiophrida scaphoides*. A. Antenna, male; B. Antenna, female; C. Penis, dorsal view; D. Penis, lateral view; E. Ventrite VIII, female; F. Spermatheca; G. Gonocoxae; H. Tarsomeres I–III, male; I. Tarsomeres I–III, female; J. Ventrite I–V, male.

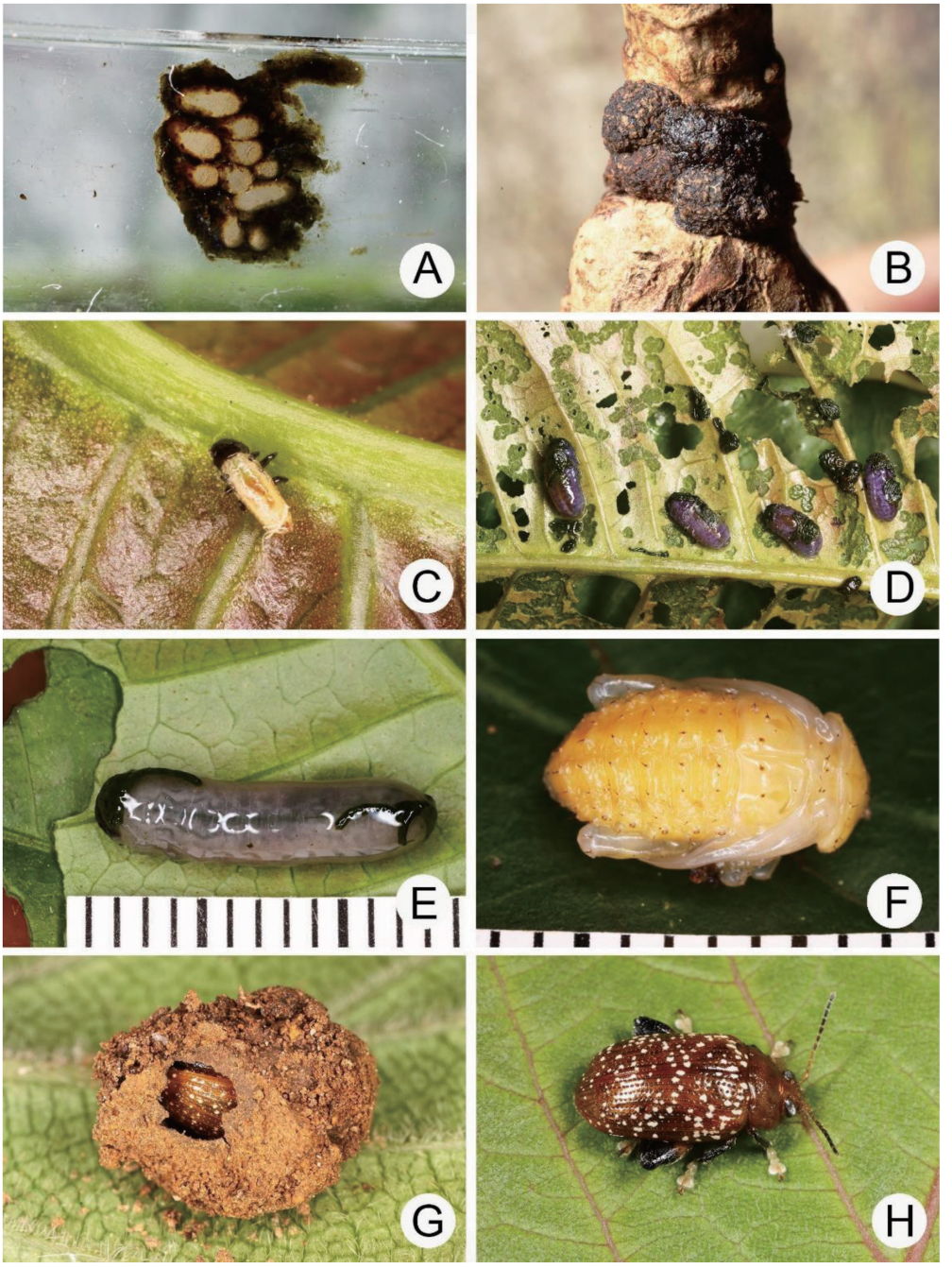

Fig. 5. Life stages of *Asiophrida scaphoides*. A. The egg mass deposited inside a glass container at the laboratory; B. Egg masses deposited on the twigs in the field; C. First-instar larva; D. Second-instar larva; E. Third-instar larva; F. Pupa; G. Adult within underground chamber; H. Alert adult.

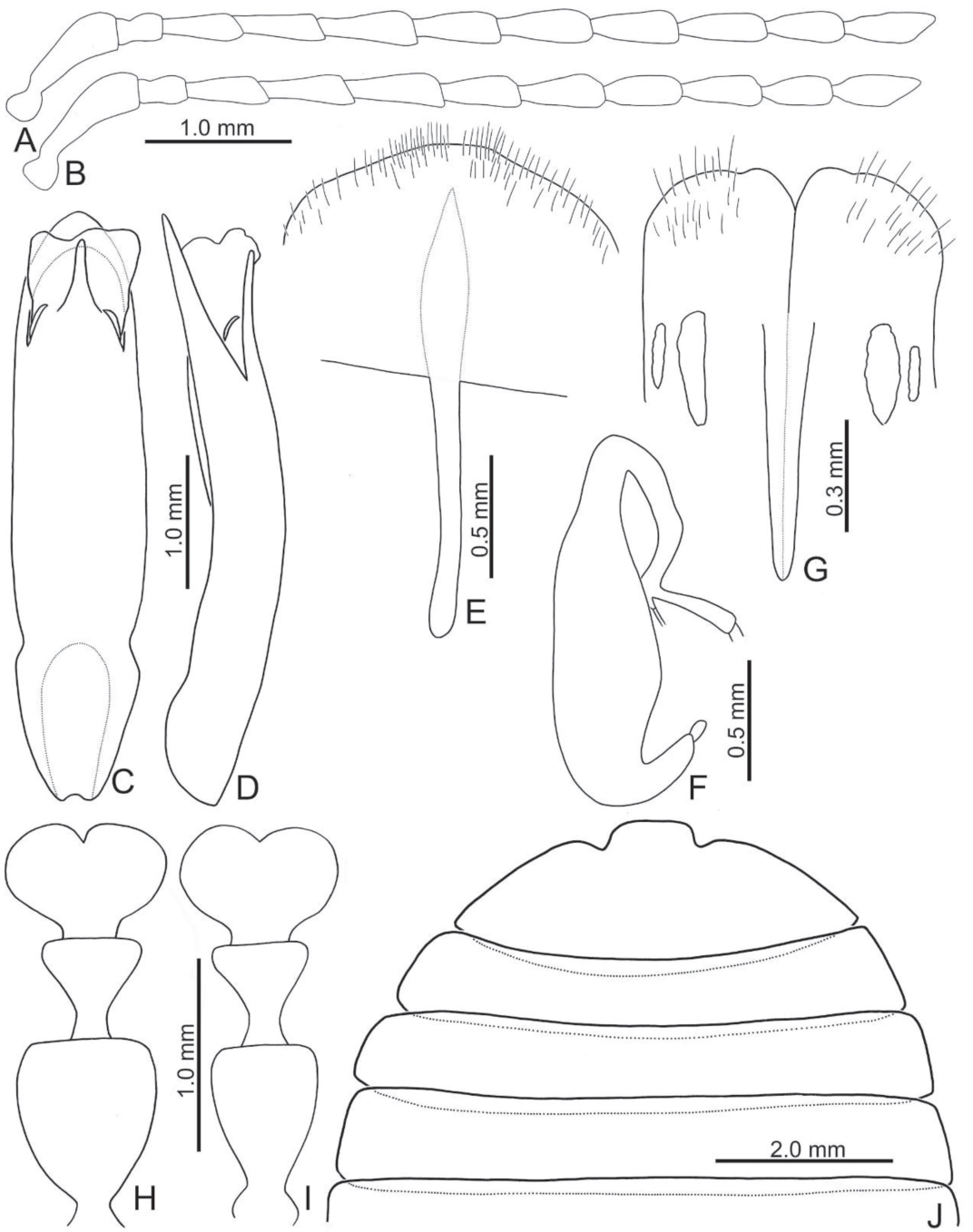

Fig. 6. Diagnostic characters of *Asiophrida spectabilis*. A. Antenna, male; B. Antenna, female; C. Penis, dorsal view; D. Penis, lateral view; E. Ventrite VIII, female; F. Spermatheca; G. Gonocoxae; H. Tarsomeres I–III, male; I. Tarsomeres I–III, female; J. Ventrite I–V, male.

Fig. 7. Life stages of *Asiophrida spectabilis*. A. Female depositing egg masses on twig; B. Eggs exposed in egg mass; C. Egg masses deposited on twigs in the field; D. First-instar larva; E. Second-instar larva; F. Third-instar larva; G. Pupa; H. Alert adult.

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臺灣產斑碩葉蚤屬 *Asiophrida* Medvedev 種類的分類回顧及其生物學注解 (鞘翅目：金花蟲科：螢金花蟲亞科：葉蚤族)

李奇峰 [1,*]　余素芳 [2]　曹美華 [2]

摘要

李奇峰、余素芳、曹美華。2024。臺灣產斑碩葉蚤屬 *Asiophrida* Medvedev 種類的分類回顧及其生物學注解 (鞘翅目：金花蟲科：螢金花蟲亞科：葉蚤族)。台灣農業研究 73(2):71–87。

碩葉蚤屬 (*Podontia* Dalman) 與斑碩葉蚤屬 (*Asiophrida* Medvedev) 為 *Blepharida*-group 當中，有分布到臺灣的兩個屬。斑碩葉蚤屬包含白斑大葉蚤 (*A. scaphoides* (Baly)) 與白紋大葉蚤 (*A. spectabilis* (Baly))，本文重新描述此兩物種，並針對雄性生殖器、雌蟲生殖突基節、雌蟲受精囊、雙性的第一至第三跗節與第五腹節及雌蟲的第八腹節腹板加以描繪；同時提供此兩種葉蚤其幼蟲與成蟲取食行為、寄主植物及生活史等生物學之詳細資料。本研究同時指定 *Podontia scaphoides* Baly, 1865, *Ophrida binduta* Maulik, 1926 及 *P. spectabilis* Baly, 1862 的選模標本。

關鍵詞：葉蚤、分類學、漆樹科、木蠟樹、羅氏鹽膚木。

投稿日期：2024 年 1 月 14 日；接受日期：2024 年 2 月 17 日。
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