Journal of Species Research 8(3):294-312, 2019

Ten species of the subfamily Tephritinae (Insecta: Diptera: Tephritidae) newly recorded in Korea

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A total of 56 genera and 101 species of the fly family Tephritidae have been previously recorded in Korea. As a result of an ongoing study of this family, I report the following ten additional species new to Korea: *Actinoptera montana* (Meijere, 1924), *Actinoptera reticulata* Ito, 1984, *Campiglossa luxorientis* (Hering, 1940), *C. melanochroa* (Hering, 1941), *C. quadriguttata* (Hendel, 1927), *C. shensiana* (Chen, 1938), *Oxyna gansuica* Wang, 1998, *Tephritis jocaste* Hering, 1953, *Tephritis okera* (Shinji, 1940), and *Trupanea guttistella* (Hering, 1951). Among the five genera involved here, the genus *Actinoptera* Rondani, 1871 is recognized for the first time in Korea. Therefore, 57 genera and 111 species are now officially recognized for the Korean tephritid fauna. For each newly recognized Korean species, I provide new Korean name, synonymy, taxonomic diagnosis and color photographs. When possible, I list the host records and discuss their intraspecific variability and sexual dimorphism.

Keywords: *Actinoptera*, *Campiglossa*, *Oxyna*, *Tephritis*, *Trupanea*

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DOI:10.12651/JSR.2019.8.3.294

Introduction

The Tephritidae are a large family of acalyptrate flies including over 4,700 valid species worldwide (Norrbom *et al*., 1999; Catalogue of Life as of June, 2019 - www.Catalogueoflife.org). They are primarily phytophagous flies that contain some of the most significant global agricultural pests, and others are significant for their role in the biological control of weeds (White and Elson-Harris, 1992).

Han (2016) enumerated a total of 55 genera and 100 species of Tephritidae officially recorded in Korea. In addition, Han and Ro (2018) reported *Acanthiophilus helianthi* (Rossi, 1794), for which both genus and species were new to the Korean tephritid fauna.

In the present study, I report ten additional species newly recorded in Korea: *Actinoptera montana* (Meijere, 1924), *Actinoptera reticulata* Ito, 1984, *Campiglossa luxorientis* (Hering, 1940), *Campiglossa melanochroa* (Hering, 1941), *Campiglossa quadriguttata* (Hendel, 1927), *Campiglossa shensiana* (Chen, 1938), *Oxyna gansuica* Wang, 1998, *Tephritis jocaste* Hering, 1953, *Tephritis okera* (Shinji, 1940), and *Trupanea guttistella* (Hering, 1951). Among the five genera involved here, the genus *Actinoptera* Rondani, 1871, is recognized for the first time in Korea. Therefore, 57 genera and 111 species are now officially recognized for the Korean tephritid fauna. I also provide new Korean names, taxonomic diagnoses, descriptions, and color photographs of these ten newly recognized Korean species.

Materials and Methods

The morphological terminology and interpretations used in this study follow White *et al*. (1999). Photographs were taken with a Panasonic (Osaka, Japan) DMC G5 camera with a Panasonic Lumix 45−175 mm lens and a Raynox (Yoshida Inc., Tokyo, Japan) MSN-202 macro conversion lens. The consecutive digital images in different focal planes (usually 50−100 shots per a single figure) were Z-stacked using Helicon Focus software (Helicon Soft, Ltd., Kharkov, Ukraine). Some photographs of live specimens (kept in a glass cage) were taken with a Nikon (Tokyo, Japan) D7000 camera with a macro lens and extension tubes.

Most of the specimens used in this study are deposited in the Division of Biological Science and Technology, Yonsei University, Wonju, Korea (YSUW), and some are in the National Institute of Biological Resources, Incheon,

Korea (NIBR). Abbreviations of the other institutions mentioned in the text are as follows: BMNH, The Natural History Museum, Department of Entomology, London, England, UK; IZAS, Institute of Zoology, Academia Sinica, Insect Collection, Beijing, China; NIAS, Laboratory of Insect Systematics, National Institute of Agro-Environmental Sciences, Tsukuba, Japan; NMPC, National Museum (Natural History), Department of Entomology, Prague, Czech Republic; NMW, Naturhistorisches Museum Wien, Vienna, Austria; UOPJ, Entomological Laboratory, University of Osaka Prefecture, Osaka, Japan; ZMAN, Zoologisch Museum, Instituut voor Taxonomische Zoologie, Universiteit van Amsterdam, Amsterdam, Netherlands.

Systematic Accounts

Order Diptera Linnaeus, 1758
Family Tephritidae Newman, 1834
Subfamily Tephritinae
Genus *Actinoptera* Rondani, 1871

1. *Actinoptera montana* (Meijere, 1924)
산별무늬과실파리 (신칭) (Fig. 1A–C)

Tephritis montana Meijere, 1924: 223 (type locality - Indonesia, Java, Pangerango; lectotype ♀, ZMAN; lectotype designation by inference of holotype by Hardy, 1988: 19).

Trypanea separata Zia, 1937: 218 (type locality - China, Zhejiang, Chusan [Zhousan]; holotype ♀, IZAS); Wang, 1998: 251 (new synonym of *A. montana*).

Actinoptera trypaneoides Shiraki, 1968: 88 (type locality - Japan, Ryukyu Is., Iriomote I.; holotype ♂, NIAS).

Tephritis carcassa Dirlbek and Dirlbekova, 1974: 4 (type locality - N. Korea; holotype ♀, NMPC; Kwon, 1985: 90 (in Korean Tephritidae revision - specimens not examined); Norrbom *et al*., 1999: 215 (in world catalog); Han and Kwon, 2000: 70 (new synonym of *Trupanea convergens* - error).

Tephritis cacarssa (misspelling): Wang, 1998: 251 (new synonym of *A. montana* - see Remarks).

Actinoptera montana: Hardy, 1974: 233 (ex *Buchanania arborescens* [Anacardiaceae], flower head); Korneyev and Ovchinnikova, 2004: 554 (in Russian Far East key); Wang, 1998: 250, 251 (in East Asian *Actinoptera* key; diagnosis and distribution).

Diagnosis. This small species has a single dark antero-subapical wing marking with rays as in *Trupanea* species (Figs. 1 vs. 9). Both Korean *Actinoptera* species can be readily distinguished from any other Korean tephritids by having 1) single pair of orbital setae (Fig. 1A-a); 2) extremely short pterostigma (Fig. 1A-b); and 3) lacking apical scutellar seta (Fig. 1B). In Korea, this species can be further distinguished from *A. reticulata*, by wing cells c and br almost hyaline (Fig. 1A-c, d).

Description of Korean material. Wing length about 2.1 mm; all setae and setulae pale yellow to white. Head yellowish brown with small normal shaped mouthparts; genal seta white, strong; with 2 pale yellow frontal and 1 orbital setae; ocellar seta stronger than frontal setae. Thorax looks matte whitish grey due to dark brown ground color covered with heavy whitish grey pruinosity; grey anterior notopleural seta strong; white and thick posterior notopleural seta about half as long as anterior one; grey upper anepisternal seta strong; white and thick lower anepisternal seta about 1/3 as long as upper one; katepisternal seta strong, pale grey; anepimeral seta strong, white; scutellum only with pair of strong, grey basal setae. Legs predominantly yellowish brown with basal half of mid- and hind femora darker; fore femur with 5–6 pale yellow postero-ventral setae; mid coxal seta strong, white. Wing with single large star-shaped dark marking antero-subapically; basal 2/3 of wing largely hyaline, only with small faint brownish areas at apex of pterostigma, narrow area banding crossvein R-M, middle of cells dm and cu_2; cell r_1 apical to pterostigma with narrow longitudinal dark band medially and dark area at apical 1/3; apical half of cell r_{2+3} dark with small round hyaline spot at apex of vein R_{2+3} and much larger round spot subapically; cell r_{4+5} with basal 1/5 hyaline, middle 2/5 dark brown, apical 2/5 lying Y-banded across apices of veins R_{2+3} and R_{4+5}; cell m with 3 longitudinal rays from dark area of cell r_{4+5}. Abdomen matte light grey; oviscape shiny black, equal to or slightly longer than abdominal tergites 4–6.

Material examined. KOREA: Gangwon-do: Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, 8.VI.2017, H.-Y. Han and S.-S. Euo, 1♂ (NIBR).

Distribution. Korea, China (Inner Mongolia, Shanxi, Hebei, Hunan, Jiangxi, Zhejiang, Fujian, Yunnan), Japan (Ryukyu Is.), Philippines, Indonesia (Java), India.

Biology. This species had been reared from flower heads of *Buchanania arborescens* [Anacardiaceae] in Philippines (Hardy, 1974).

Remarks. Wang (1998) synonymized *Tephritis carcassa* with *A. montana*, and I also found that the illustration of the North Korean holotype wing (Dirlbek and Dirlbekova, 1974) is almost identical to that of the single *A. montana* male obtained from South Korea (Fig. 1A). Both species share an almost identical wing pattern as well as the extremely short pterostigma typical to the genus *Actinoptera*. However, the original description indicates that the holotype of *Tephritis carcassa* has two pairs of orbital setae and two pairs of scutellar setae, both of which are characteristics of the genus *Tephritis* but not of *Actinoptera* (*A. montana* actually do have only one pair each of the orbital and scutellar setae; Fig. 1B, C). Since the other

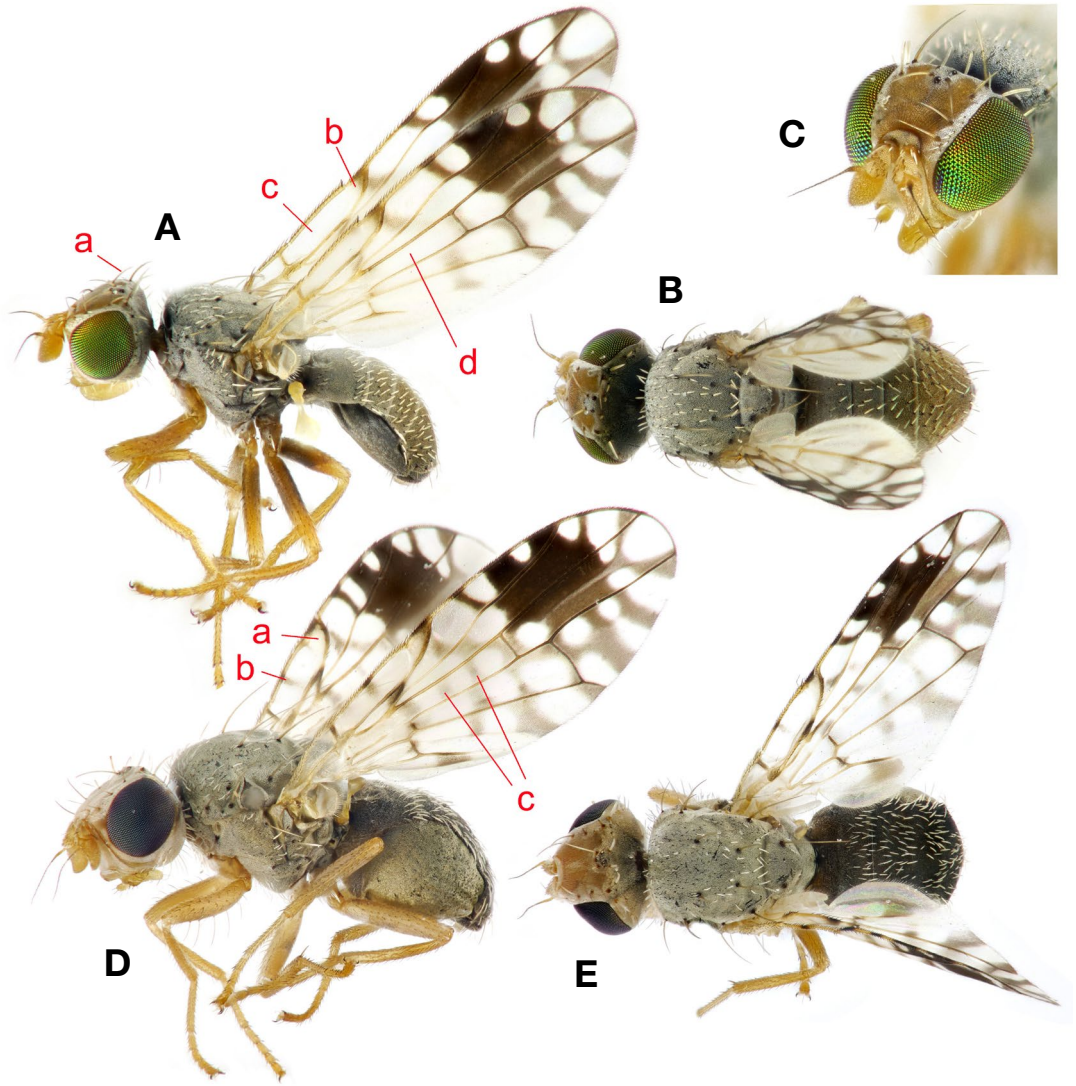


Fig. 1. A–C. *Actinoptera montana* (Meijere, 1924). A. male, lateral view; B. male, dorsal view; C. male head. D, E. *Actinoptera reticulata* Ito, 1984. D. male, lateral view; E. male, dorsal view.

part of the original description as well as the wing illustration agree with the characteristics of *A. montana* (Meijere, 1924; Hardy, 1974), I believe that the female holotype of *T. carcassa* might be an aberrant specimen or, more likely, that there might have been some error involved in the original description. The new Korean name of this species translates as "mountainous *Actinoptera*" referring to its scientific name.

2. *Actinoptera reticulata* Ito, 1984

그물별무늬과실파리 (신칭) (Fig. 1D, E)

Actinoptera reticulata Ito, 1984: 239 (type locality - Japan, Honshu, Settu, Yodogawa-Amanogawa; holotype ♂, UOPJ); Wang, 1998: 250, 251 (in East Asian *Actinoptera* key; diagnosis and distribution); Norrbom *et al*., 1999: 74 (in world catalog); Korneyev and Ovchinnikova, 2004: 554 (in Russian Far East key).

Actinoptera reticulata Ito, 1956: 25 (*Nomen nudum*. Published after 1930 without a description).

Diagnosis. This is a relatively small tephritid fly having a single dark antero-subapical wing marking with rays as in *Trupanea* species (Figs. 1 vs. 9). Both Korean *Actinoptera* species can be readily distinguished from any other Korean tephritids by having 1) single pair of orbital setae; 2) extremely short wing pterostigma (Fig. 1D-a); and 3) lacking apical scutellar seta (Fig. 1E). In Korea, this species can be further distinguished from *A. montana*, by having wing cell c with single narrow grey median spot (Fig. 1D-b) and cell br with two narrow grey median spots (Fig. 1D-c).

Description of Korean material. Wing length 3.3–3.6

mm; all setae and setulae pale yellow to white. Head yellowish brown with small normal shaped mouthparts; genal seta white, strong; 2 frontal and 1 orbital setae; ocellar seta stronger than frontal setae. Thorax looks matte whitish grey due to dark brown ground color covered with heavy whitish grey pruinosity; grey anterior notopleural seta strong; white and thick posterior notopleural seta about half as long as anterior one; grey upper anepisternal seta strong; white and thick lower anepisternal seta about 1/3 as long as upper one; katepisternal seta strong, pale grey; anepimeral seta strong, pale grey; scutellum only with pair of grey, strong basal setae. Legs yellowish brown; fore femur with 5−6 pale yellow postero-ventral setae; mid coxal seta strong, white. Wing with single large star-shaped dark brown marking antero-subapically; basal 2/3 of wing faintly reticulated as follows - cell br with four narrow bands, cell dm with 3 narrow bands, cell cu_2 with 3 narrow bands, anal cell with small spot in middle; cell r_1 apical to pterostigma with narrow longitudinal dark band at basal 1/3 and dark area at apical half with round hyaline spot in middle; apical half of cell r_{2+3} dark with round hyaline spot at apex of vein R_{2+3} and much larger round spot subapically; crossvein R-M faintly banded; cell r_{4+5} basally with large round hyaline spot, middle 2/5 dark brown, apical 2/5 lying Y-banded across apices of veins R_{2+3} and R_{4+5}; cell m with 3 longitudinal rays from dark area of cell r_{4+5}. Abdomen matte light grey; oviscape shiny black, equal to or slightly longer than abdominal tergites 4−6.

Material examined. KOREA: Jeju-do: along Rt. 1131 across Sinraecheon, 25.VI.2003, H.-Y. Han *et al*., 1♂; Jeju-si, Jeolmul Recreational Forest, 25.VI.2003, Han *et al*., 2♂, 2♀. All deposited in YSUW.

Distribution. Korea, Japan (Honshu, Sikoku, Kyushu), China (Fujian, Yunnan), Nepal.

Biology. Unknown.

Remarks. I have collected this species only in Jeju Island, which is the southern-most province in South Korea. Looking at the distribution data, this species seems to inhabit mild temperate and subtropical areas of Far East Asia. The new Korean name of this species translates as "reticulate *Actinoptera*" referring to its scientific name.

3. *Campiglossa luxorientis* (Hering, 1940)

황좀과실파리 (신칭) (Fig. 2A−G)

Paroxyna luxorientis Hering, 1940: 16 (new name for *Paroxyna oxynoides* Hering, 1936).

Paroxyna oxynoides Hering, 1936: 186 (type locality - China, Heilongjiang, Charbin; syntype ♂♀, BMNH; preoccupied by Bezzi 1924).

Campiglossa luxorientis: Korneyev, 1996: 119 (type data; host data; erroneous synonymization of *C. melanochroa* - see Remarks); Wang, 1998: 254, 265 (in East Asian *Campiglossa* key; diagnosis and distribution); Norrbom *et al*., 1999: 112 (in world catalog); Korneyev and Ovchinnikova, 2004: 542 (in Russian Far East key); Korneyev, 2004: 6 (taxonomic discussion).

Diagnosis. This is a highly variable species with sexually dimorphic wing pattern (Fig. 2A, B, D vs. C, F). Male wings tend to be paler antero-basally, and have wing spots larger than those of females. This species can be distinguished from any other Korean *Campiglossa* species by the combination of the following characteristics: 1) body pinkish yellowish brown ground color with moderate whitish pruinosity; 2) thorax mostly with small dark spots on bases of acrostichal, intra-alar, and basal scutellar setae (Fig. 2E, G); 3) abdominal tergites 3−5 each usually with pair of dark brown spots (Fig. 2A, G), but rarely they are missing (Fig. 2B, C, E); and 4) wing cell r_{2+3} basal to crossvein R-M at least with 5 tiny spots plus larger round spot near R-M (Fig. 2D-a, F-a). The closely related species, *C. melanochroa* can be easily distinguished by its much darker body coloration and slender appearance (Figs. 2 vs. 3).

Description of Korean material. Wing length 4.8−5.6 mm; most setae on head and thorax strong, dark brown, but most setulae ivory white; body mostly pinkish yellowish brown ground color with moderate whitish pruinosity. Head pinkish yellowish brown to brown with large geniculate mouthparts; genal seta strong, ivory white; with two dark brown frontal setae; anterior orbital seta dark brown but posterior seta ivory white; ocellar seta dark brown, distinctly longer than anterior orbital seta. Thorax matte pinkish yellowish brown ground color with heavy whitish pruinosity; bases of acrostichal, intra-alar, basal scutellar setae often with round dark brown spots; both notopleural setae dark brown; upper anepisternal seta strong, dark brown but lower anepisternal seta thick and ivory white, about 2/3 as long as upper one; katepisternal seta strong, dark brown; anepimeral seta thick and strong, ivory white; scutellum with apical setae crossed near apex, about half as long as basal seta. Legs yellowish brown with fore femur with 6−7 yellowish white postero-ventral setae; mid coxal seta strong, white. Male wing distinctly paler than female; pale yellow to dark brown with numerous round hyaline spots in variable sizes; cell c hyaline with dark spot in middle; pterostigma brown to dark brown with large yellowish hyaline spot in middle; cell r_1 apical to pterostigma with 3 large hyaline spots (additional spot, if any, much smaller); cell r_{2+3} basal to R-M at least with 5 tiny spots plus large round spot near crossvein R-M; cell r_{4+5} apically with round hyaline spot; cell m with 4 large round spot plus much smaller spots antero-basally. Female wing distinctly darker than male; most major hyaline spots tend to be smaller and tiny spots to be

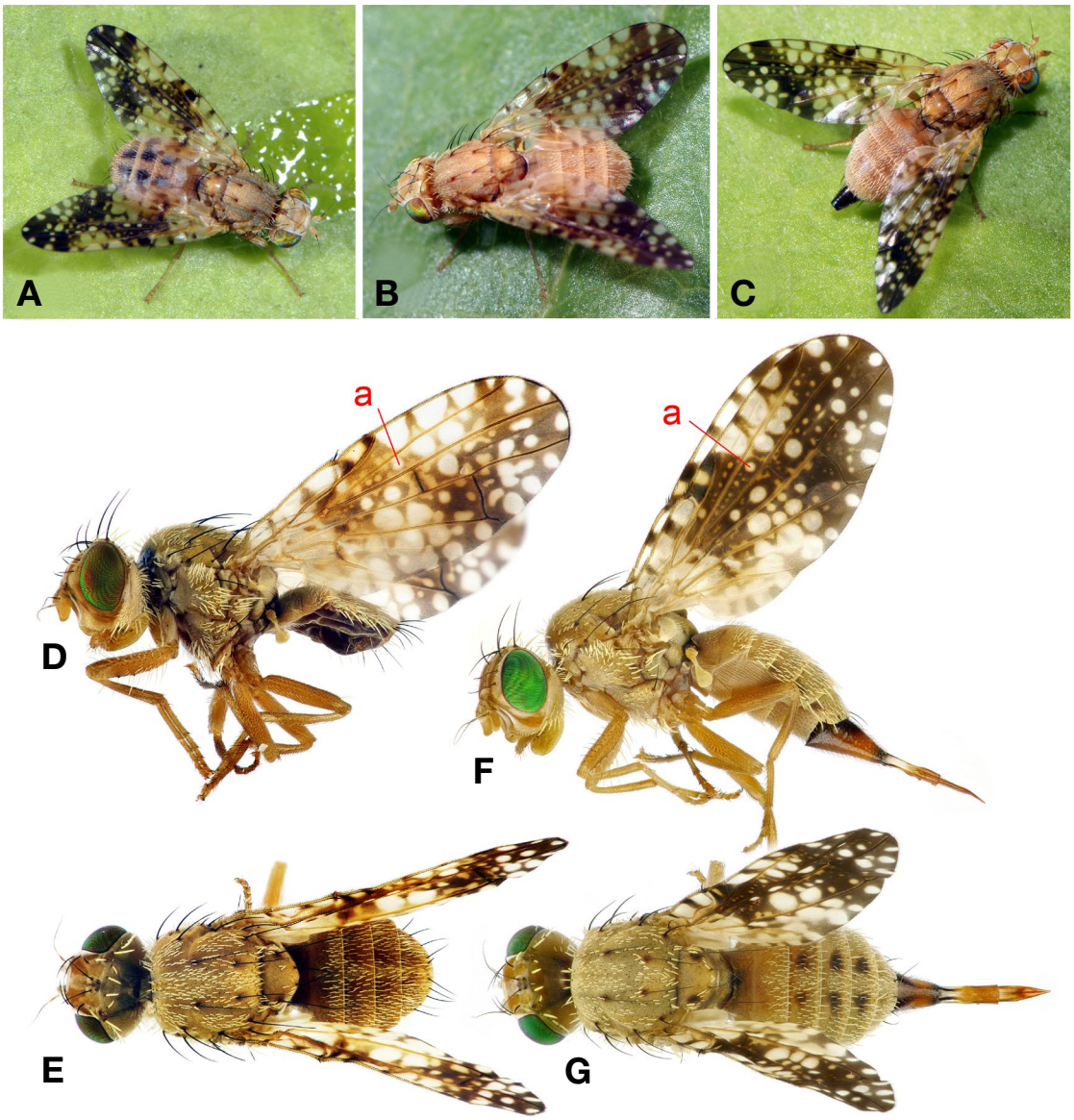


Fig. 2. *Campiglossa luxorientis* (Hering, 1940). A. male, dorsal view; B. male, dorsal view; C. female, dorsal view; D. male, lateral view, E. male, dorsal view; F. female, lateral view; G. female dorsal view.

more numerous. Abdomen mostly pinkish pale brown, often with pair of dark brown spots on each of tergite 3–5; oviscape about as long as preceding 2 abdominal segments, often shiny brown with basal and apical portions dark brown, but rarely entirely dark brown.

Material examined. KOREA: Gangwon-do: Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, 4.VIII.2004, H.-Y. Han *et al*., 18♂, 17♀; *ditto*, 8.VII.2005, 7♂, 6♀; *ditto*, 16.VII.2005, 7♂, 13♀; *ditto*, 19.VII.2005, 18♂, 12♀; 29.VIII.2005, 1♂, 1♀; *ditto*, 2.VIII.2006, 6♂, 6♀; Hongcheon-gun, Nae-myeon, north valley of Mt. Gyebangsan, 5.VIII.2005, H.-Y. Han and H.-S. Lee, 4♂, 4♀. All deposited in YSUW.

Distribution. Korea, China (Heilongjiang, Inner Mongolia, Hebei), Russian Far East, Mongolia.

Biology. Unknown.

Remarks. *Campiglossa luxorientis* is a highly variable species with sexual dimorphism in wing pattern (Fig. 2A, B, D vs. C, F). It appears to be closely related to *C. melanochroa*, which also shows similar sexual dimorphism (Fig. 3C, E). These two species could not be separated by DNA barcode sequences (unpublished personal data), but can easily be distinguished by their morphological characters (see Diagnosis). The early season *C. luxorientis* includes chubby and pinkish yellowish brown colored flies

(Fig. 3), while the late season *C. melanochroa* includes slender and dark colored flies (Fig. 4). Korneyev (1996) suggested them to be conspecific, regarding them as seasonal color forms, but he later (Korneyev, 2004) regarded them as separate species because he found both forms in the same time and place. I also believe that they are distinct species because their morphological differences are well beyond the ordinary seasonal variation range found in *Campiglossa* species (personal observation; light colored early season forms vs. dark color late season forms). Differences can be clearly found in coloration, wing pattern, and body shape (Fig. 2 vs. Fig. 3). It is now well known that there are a good number of closely related species-pairs and complexes that cannot be distinguished by DNA barcoding alone. For example, based on a DNA barcoding analysis of 133 selected lycaenid butterfly species, Wiemer and Fiedler (2007) indicated that there was an 18% overlap in the range of intra- and interspecific sequence divergence due to low interspecific divergence between closely related species. In this study, they separated most closely related species-pairs using their strong phenotypical as well as karyological differentiation. The new Korean name of *C. luxorientis* translates as "yellowish *Campiglossa* fly" referring to its ground coloration.

4. *Campiglossa melanochroa* (Hering, 1941)
취좀과실파리 (신칭) (Fig. 3A–F)

Paroxyna melanochroa Hering, 1941: 30 (type locality - China, Heilongjiang, Charbin [Harbin]; holotype ♀, BMNH); Norrbom *et al*., 1999: 112 (in world catalog as synonym of *C. luxorientis*); Korneyev, 1996: 119 (erroneous new junior synonym of *C. luxorientis* - see Remarks of *C. luxorientis*).

Paroxyna dorema Hering, 1941: 29 (type locality - China, Heilongjian, Sjaolin [Xiaoling]; holotype ♂, BMNH); Korneyev and Ovchinnikova, 2004: 543 (synonym of *P. melanochroa* Hering).

Campiglossa melanochroa: Wang, 1998: 255, 266 (in East Asian *Campiglossa* key; diagnosis and distribution); Korneyev and Ovchinnikova, 2004: 543 (in Russian Far East key); Korneyev, 2004: 8 (resurrected from synonymy of *C. luxorientis*).

Diagnosis. This is a highly variable species with sexually dimorphic wing pattern. Male wing tends to be paler and have more numerous tiny hyaline spots (Fig. 3C vs. E). This species can be distinguished from any other Korean *Campiglossa* species by the combination of the following characteristics: 1) body dark brown ground color with moderate grey to dark brown pruinosity; 2) scutum with six longitudinal brownish grey strips in darker background (Fig. 3D, F); 3) middle 1/3 of male wing cell r_{2+3} predominantly hyaline due to 3 oversized hyaline spots in pale grey background (Fig. 3C-a), apical 1/3 with 4–5 moderate sized hyaline spots in dark grey background; 4) middle 1/3 of female wing cell r_{2+3} clearly with 3 large hyaline spots in darker background (Fig. 3E-a), apical 1/3 with 2 hyaline spots (often merged) subapically. The closely related species, *C. luxorientis* can be easily distinguished by its much paler body coloration (Figs. 3 vs. 2).

Description of Korean material. Wing length 3.7–4.5 mm; most setae on head and thorax strong, dark brown, but most setulae ivory white; head and legs predominantly yellowish brown but thorax and abdomen predominantly dark brown with moderate grey to brown pruinosity. Head yellowish brown to brown with large and geniculate mouthparts; genal seta strong, ivory white; with two dark brown frontal setae; anterior orbital seta dark brown but posterior seta ivory white; ocellar seta dark brown, distinctly longer than anterior orbital seta. Thorax matte dark brown ground color with greyish pruinosity; scutum with 6 longitudinal greyish strips often traced in clean specimen; scutellum dark brown; pleura mostly greyish; both notopleural setae dark brown; scutellum with apical setae crossed near apex, about half as long as basal seta; upper anepisternal seta strong, dark brown but lower anepisternal seta thick and ivory white, about 2/3 as long as upper one; katepisternal seta strong, dark brown; anepimeral seta thick and strong, white. Legs yellowish brown but fore and hind femora with dark brown tinge; fore femur with 6–7 yellowish white postero-ventral setae; mid coxal seta strong, white. Male wing mostly pale grey to dark grey with numerous round hyaline spots in variable sizes; cell bc hyaline; cell c hyaline with grey spot in middle; pterostigma dark grey with large round yellowish hyaline spot in middle; cell r_1 apical to pterostigma with 3 large but obscure hyaline spots touching each other (additional spots, if any, much smaller); basal 1/3 of cell r_{2+3} grey with 7–9 tiny yellowish hyaline spots, middle 1/3 predominantly hyaline due to 3 oversized hyaline spots in pale grey background, apical 1/3 with 4–6 moderate sized hyaline spots in grey background; cell r_{4+5} with numerous hyaline spots including round apical spot; cell m with at least 10 variably sized hyaline spots. Female wing mostly dark grey with numerous round hyaline spots in variable sizes; cell br hyaline; cell c hyaline with dark spot in middle; pterostigma brown to dark brown with large round hyaline spot in middle; cell r_1 apical to pterostigma with 3 large clearly defined hyaline spots (any additional spots, if any, much smaller); basal 1/3 of cell r_{2+3} almost completely dark grey with 2–3 tiny spots, middle 1/3 clearly with 3 large hyaline spots in grey to dark grey background, apical 1/3 with 2 large hyaline spots (often merged) subapically; cell r_{4+5} with about 10 variably sized hyaline spots including apical spot; cell m with 4 clearly large round spot plus few much smaller spots antero-basally. Abdomen matte dark brown ground

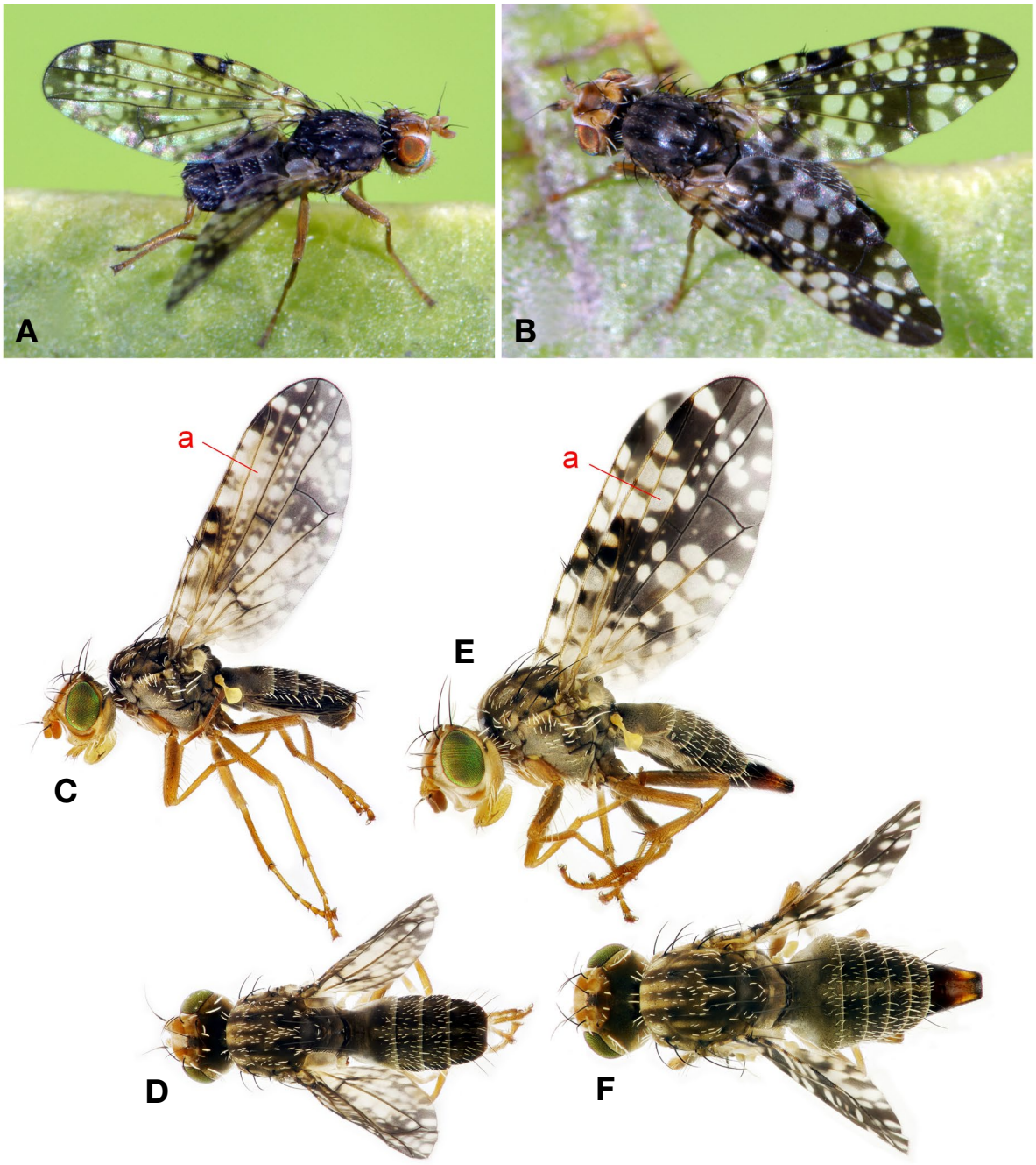


Fig. 3. *Campiglossa melanochroa* (Hering, 1941). A. male, latero-dorsal view; B. female, dorsal view; C. male, lateral view, D. male, dorsal view; E. female, lateral view; F. female dorsal view.

color with greyish longitudinal mid-stripe often traced in clean specimen; oviscape about as long as or longer than preceding 2 segments, often shiny brown with basal and apical portions dark brown, but rarely entirely dark brown.

Material examined. KOREA: Gangwon-do: Jeongseon-gun, Jeongseon-eup, Mt. Gariwangsan from Mahangchi to 1561 m peak, col. 11.X.2005, em 2.XI.2005, ex *Aster subulatus* Michx., flower, H.-Y. Han *et al*., 1♂ 1♀; Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, col. 26.IX.1998, em. X.1998, ex *Aster tataricus* L. flower, H.-Y. Han and K.-E. Ro, 7♂; *ditto*, col. 30.VIII.2000, em. 18−19.XI.2000, ex *Aster* sp. flower, H.-Y. Han *et al*.; *ditto*, col. 6.X.2001, em. 9−26.XI.2001, ex *Aster tataricus* L. flower, 7♂; *ditto*, col. 6.X.2001, em. 26−30.X.2001,

ex *Aster ageratoides* Turcz. Flower, 2♂ 9♀; *ditto*, col. 29.IX.2002, em. 18.X−20.XI.2002, ex *Aster tataricus* L. flower, 12♂ 11♀; *ditto*, col. 25.IX.2003, em. 13−20. IX.2003, ex *Aster tataricus* L. flower, 31♂ 43♀; *ditto*, col. 15.X.2004, em. 17.X−7.XI.2004, ex *Aster tataricus* L. flower, 15♂ 13♀; *ditto*, 14.V.2006, 1♀; Hongcheon-gun, Nae-myeon, north valley of Mt. Gyebangsan, 26.V.2006, H.-Y. Han and H.-W. Byun, 1♀. All deposited in YSUW.

Distribution. Korea, China (Heilongjiang), Russian Far East.

Biology. In Korea, many specimens have been emerged from flower heads of the following *Aster* species: *A. ageratoides* Turcz., *A. scaber* Thunb., *A. subulatus* Michx., and *A. tataricus* L. The flower heads were collected between September and November, and the flies emerged between September and November in the same year. Since some adults (mostly not looking fresh) were collected in early spring (late March to April), I believe that they are likely to overwinter as adult stage. However, I do not know whether this species is univoltine or has additional earlier alternative host plants. Korneyev (1996) also found some Russian Far East specimens in SIZK with the labels indicating that they emerged from *Kamimeris hispida* (Thunb.) Nees [Asteraceae].

Remarks. This species appears to be closely related to *C. luxorientis*, which also shows similar sexual wing dimorphism. These two species could not be separated by DNA barcode sequences (unpublished personal data), but can easily be distinguished by their morphological characters. Please see the Remarks of *C. luxorientis* for further discussion. The new Korean name of this species translates as "aster (especially the *Aster* plants for spring salads in Korea) *Campiglossa* fly" referring to its host plants.

5. *Campiglossa quadriguttata* (Hendel, 1927)

맵시좀과실파리 (신칭) (Fig. 4A−F)

Paroxyna quadriguttata Hendel, 1927: 158 (type locality - Russia, Chitinskaya, near Tschita [Chita], "Piestschanka"; holotype ♀, NMW; type data - Hardy, 1968: 120).

Aliniana aliena Hering, 1951: 12 (type locality - China, Heilongjiang, Charbin [Harbin]; holotype ♂, BMNH).

Gonioxyna conopea Dirlbek and Dirlbekova, 1972: 3 (type locality - Mongolia, Ulaanbaatar, Lok. Nr. 1; holotype ♂, NMPC).

Gonioxa magniceps: Chen, 1938: 253 (misidentification).

Campiglossa quadriguttata: Wang, 1998: 253, 269 (in East Asian *Campiglossa* key; diagnosis and distribution); Norrbom *et al*., 1999: 113 (in world catalog); Korneyev and Ovchinnikova, 2004: 544 (in Russian Far East key).

Gonioxyna magniceps (misidentification): Chen, 1938: 116 (diagnosis, Chinese distribution).

Diagnosis. This species has an extreme wing sexual dimorphism; male wing tends have more numerous hyaline spots (Fig. 4C vs. 4E). Males can be easily identified by their unique wing pattern, but females have a typical *Campiglossa* appearance. They can be separated from any other Korean *Campiglossa* species by the combination of the following characteristics: 1) thorax mostly pale greyish brown but bases of acrostichal, intra-alar, post-alar, basal scutellar setae with round dark brown spots; 2) both orbital setae dark brown; 3) pterostigma completely dark grey or nearly so in male (Fig. 4C-a), but with distinct hyaline spot in female (Fig. 4E-a); 4) cell r_1 apical to pterostigma with 5 large hyaline spots in male, but with 4 hyaline spots in female; and 5) area bordered by crossvein R-M (reaching about as far as crossvein length) with at least 7−12 tiny hyaline spots (contrasting well with much larger hyaline spots basal and proximal to them) in male (Fig. 4C-b), but that area of female without such tiny spots but with two moderate sized round hyaline spots at base and apex of that area (Fig. 4E-b).

Description of Korean material. Wing length 5.0−6.0 mm; most setae on head and thorax strong, dark brown, but most setulae white; body mostly pale yellow ground color with heavy grey pruinosity. Head pale yellowish brown with large and geniculate mouthparts; genal seta strong, dark brown; with two dark brown frontal setae; both orbital setae dark brown; ocellar seta dark brown, distinctly longer than anterior orbital seta. Thorax looks greyish pale brown due to yellowish brown ground color with heavy greyish white pruinosity; bases of acrostichal, intra-alar, post-alar, basal scutellar setae with round dark brown spots; both notopleural setae dark brown; upper anepisternal seta strong and dark brown, but lower anepisternal seta white, about 2/3 as long as upper one; ketepisternal seta strong, dark brown; anepimeral seta strong, white; scutellum with apical setae crossed near apex, about 2/3 as long as basal seta. Legs pale yellowish brown with fore femur with 6−7 brown postero-ventral setae; mid coxal seta strong, white. Male wing dark grey to grey with numerous round hyaline spots in variable sizes; cell c hyaline with dark spot in middle; pterostigma completely dark grey (rarely with tiny hyaline spot); cell r_1 apical to pterostigma with 5 large hyaline spots; cell r_{2+3} apical to crossvein R-M with two large hyaline spots basally (anterior spot sometimes divided into two spots), plus at least 9 much smaller hyaline spots arranged in 2 irregular rows; cell br apical to crossvein BM-Cu with 3 moderate sized round hyaline spots plus about 5 tiny spot just before crossvein R-M; cell r_{4+5} before crossvein DM-Cu with 6−7 tiny hyaline spots, apical to crossvein DM-Cu with at least 10 larger round hyaline spots; cell m with 6−7 large round hyaline spots. Female wing dark grey with less numerous hyaline spots than male; cell c hyaline with dark spot in middle; pterostigma dark grey with sin-

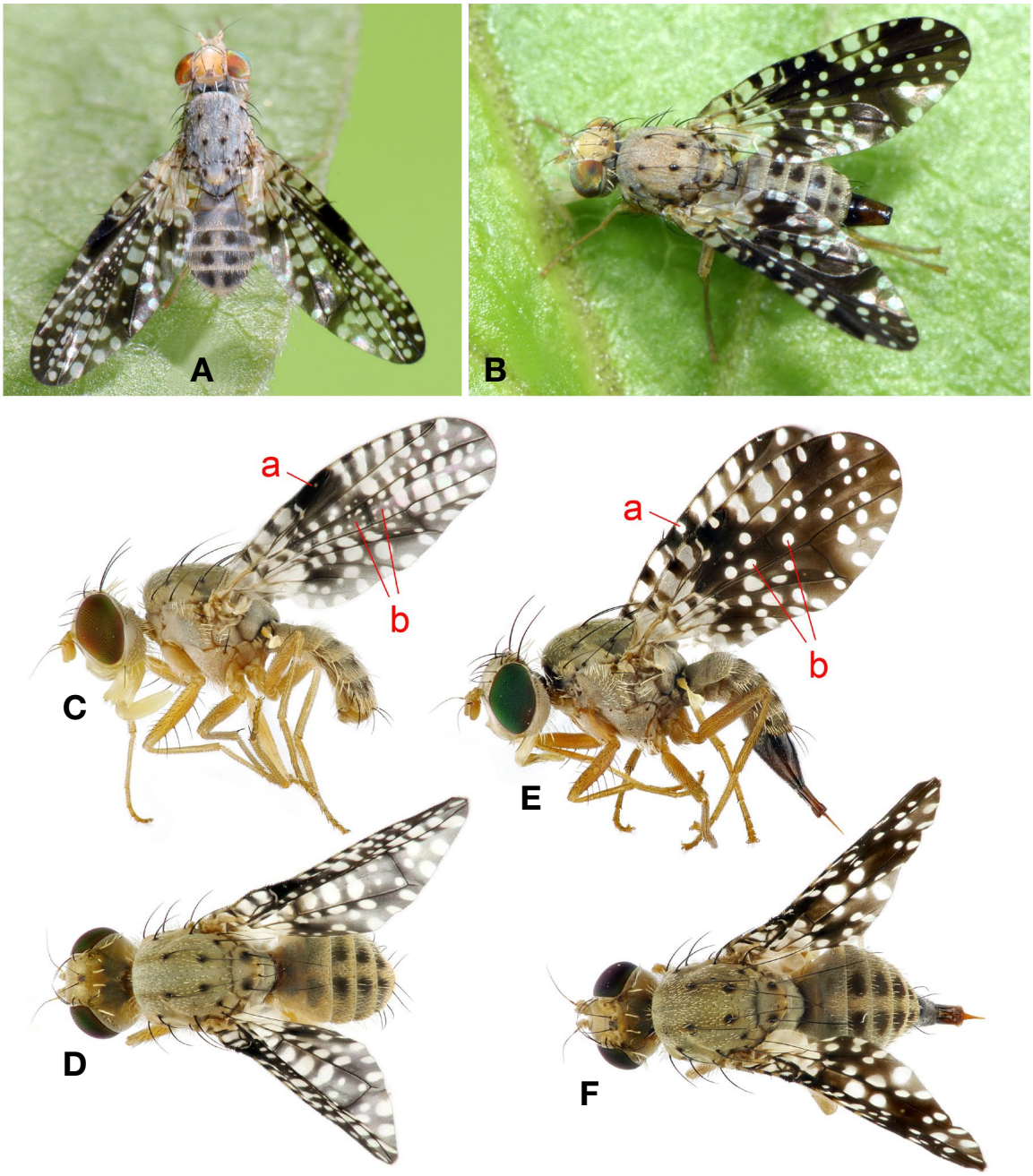


Fig. 4. *Campiglossa quadriguttata* (Hendel, 1927). A. male, dorsal view; B. female, dorsal view; C. male, lateral view, D. male, dorsal view; E. female, lateral view; F. female dorsal view.

gle hyaline spot; cell r_1 apical to pterostigma with 4 hyaline spots (but 5 spots in the drawing by Korneyev (1997)); cell r_{2+3} apical to crossvein R-M with at least 6 hyaline spots; cell br apical to crossvein BM-Cu with 2 round hyaline spot in middle; cell r_{4+5} with 7−9 round hyaline spots; cell m with 5 moderate sized round hyaline spots. Abdomen mostly greyish pale brown, with pair of large dark brown spots on each of tergite 3−5 (plus tergite 6 in female); oviscape about as long as preceding 3 abdominal segments, shiny reddish brown with dark brown basal and apical areas.

Material examined. KOREA: Gangwon-do: Hoengseong-gun, Dunnae-myeon, Mt. Cheongtaesan, 1.VIII. 2006, H.-Y. Han *et al.*, 1♂ (YSUW); Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, 20.VI.2005, H.-Y. Han *et al.*, 1♂ (YSUW); *ditto*, 19.VII.2005, 1♂ (YSUW); Jeongseon-gun, Gohan-eup, Mt. Hambaeksan, From

Manhang-jae to 1585 m peak, N37°09′40″ E128°55′04″, 18.IX.2016, S.S. Euo *et al*., 1♀ (NIBR); Pyeongchang-gun, Yongpyeon-myeon, S. Valley of Mt. Gyebangsan, 3.X.2003, H.-Y. Han *et al*., 2♀ (YSUW).

Distribution. Korea, China (Heilongjiang, Inner Mongolia, Xinjiang, Gansu, Ningxia, Hebei), Russia (e Siberia), Mongolia.

Biology. Unknown.

Remarks. The new Korean name of this species translates as "pretty *Campiglossa*."

6. *Campiglossa shensiana* (Chen, 1938)

산국좀과실파리 (신칭) (Fig. 5A–H)

Paroxyna shensiana Chen, 1938: 139 (type locality - China, Shaanxi, Tsin-ling; holotype ♀, IZAS).

Campiglossa shensiana: Wang, 1998: 254, 270 (in East Asian *Campiglossa* key; diagnosis and distribution); Norrbom *et al*., 1999: 113 (in world catalog); Korneyev and Ovchinnikova, 2004: 553 (in Russian Far East key).

Diagnosis. This is a highly variable species with distinctly sexually dimorphic wing patterns. Unless I had host associated specimens, conspecifity of male and female specimens could have been very difficult to recognize. They can be distinguished from other Korean *Campiglossa* species by the combination of the following characteristics: 1) wing with more or less rectangular dark grey to black antero-medial marking (Fig. 5C-a, 5G-b) consisting of pterostigma (completely dark in male but with small round hyaline spot in female) plus dark portion of cells r_1 and r_{2+3} just posterior to it; 2) anterior orbital seta always dark, but posterior seta either dark or white; 3) male wing with dark antero-subapical marking (Fig. 5C-b) well defined (apex of cell r_1 plus similar sized dark area posterior to it surrounded by hyaline spots; in female this spot not well defined as such); 4) cell br with 3–4 round hyaline spots with basal most one often missing or tiny; 5) cell r_{4+5} with 5–9 hyaline spots (male tends to have more) including apical one; 6) apical 1/3 of cell cu_2 completely grey in male (Fig. 5C-c) but with single hyaline spot in female (Fig. 5G-a); and 7) legs predominantly yellowish brown. *Campiglossa shensiana* female has somewhat similar wing pattern as both sexes of *C. messalina*, but the latter species can be easily separated by the 1–3 (mostly 3) clear hyaline spots on cell r_1 area just posterior to pterostigma while the same area is completely dark in the former (Fig. 5G-b). Korneyev and Ovchinnikova (2004) suggested a possible synonymy of *C. shensiana* and *C. messalina*, probably because of this superficial similarity.

Description of Korean material. Wing length 3.0–3.5 mm; most setae on head and thorax strong, dark brown, but most setulae white. Head yellowish brown with moderate sized geniculate mouthparts; genal seta strong, white; anterior orbital seta always dark, but posterior seta either dark (Fig. 5C, D, G, H) or white (Fig. 5E, F); ocellar seta dark brown, distinctly longer than anterior orbital seta. Thorax looks brownish grey due to yellowish brown ground color with heavy grey pruinosity; bases of acrostichal, basal scutellar setae with dark brown spots; scutum often with 5 (mid, sublateral, lateral) narrow dark grey longitudinal stripes; both notopleural setae dark brown; upper anepisternal seta strong, dark brown but lower anepisternal seta white, about half as long as upper one; katepisternal seta strong, dark brown; anepimeral seta thick and strong, white; scutellum with apical setae crossed, about 2/3 as long as basal seta. Legs yellowish brown with fore femur with 6–7 brown postero-ventral setae; mid coxal seta strong, pale brown; fore femur often with grey tinge postero-basally. Male wing dark grey to grey with numerous round hyaline spots in variable sizes; cell c hyaline with dark spot in middle; pterostigma completely dark grey; cell r_1 posterior to cell c hyaline with dark spot in middle, posterior to pterostigma completely dark grey, apical to pterostigma with 3 large hyaline spots; cell r_{2+3} basally with short hyaline area, posterior to pterostigma completely dark grey, 4–5 hyaline spots posterior to 3 large hyaline spots of r_1; cell br with 3–4 round hyaline spots with basal most one often missing or tiny; cell r_{4+5} with 7–9 hyaline spots including apical one; cell m with 3–4 hyaline spots; apical 1/3 cell cu_2 completely grey. Female wing dark grey to grey with numerous round hyaline spots in variable sizes; cell c hyaline with dark spot in middle; pterostigma dark grey with round hyaline spot; cell r_1 posterior to cell c hyaline with dark spot in middle, posterior to pterostigma completely dark grey, apical to pterostigma with 3 large hyaline spots; cell r_{2+3} basally with short hyaline area, posterior to pterostigma completely dark grey, with 2 hyaline spots posterior to 3 large hyaline spots of r_1; cell br with 3–4 round hyaline spots with basal most one often missing or tiny; cell r_{4+5} with 5–7 hyaline spots including apical one; cell m with 3–4 round hyaline spots; apical 1/3 of cell cu_2 grey with single hyaline spot. Abdomen mostly greyish pale brown, with pair of large submedial dark brown spots on each of tergites 3–5; oviscape about as long as preceding 3 abdominal segments, shiny dark brown to brown.

Material examined. KOREA: Gangwon-do: Hoengseong-gun, Dunnae-myeon, Mt. Cheongtaesan, 20.VII. 2003, D.-S. Choi *et al*., 1♀; Hongcheon-gun, Nae-myeon, Mt. Maenghyeonbong, col. 10.X.1999, em. 4–16.V.2000, ex *Chrysanthemum boreale* Makino, flower, H.-Y. Han *et al*., 5♀; Hongcheon-gun, Nae-myeon, Woldungol, col. 10.X.2002, em. 6.V.2003, ex *Chrysanthemum boreale* Makino, flower, H.-Y. Han and K.-E. Ro, 2♀; Jeongseon-gun, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, col. 6.X.2001, em. 9.V.2002, ex

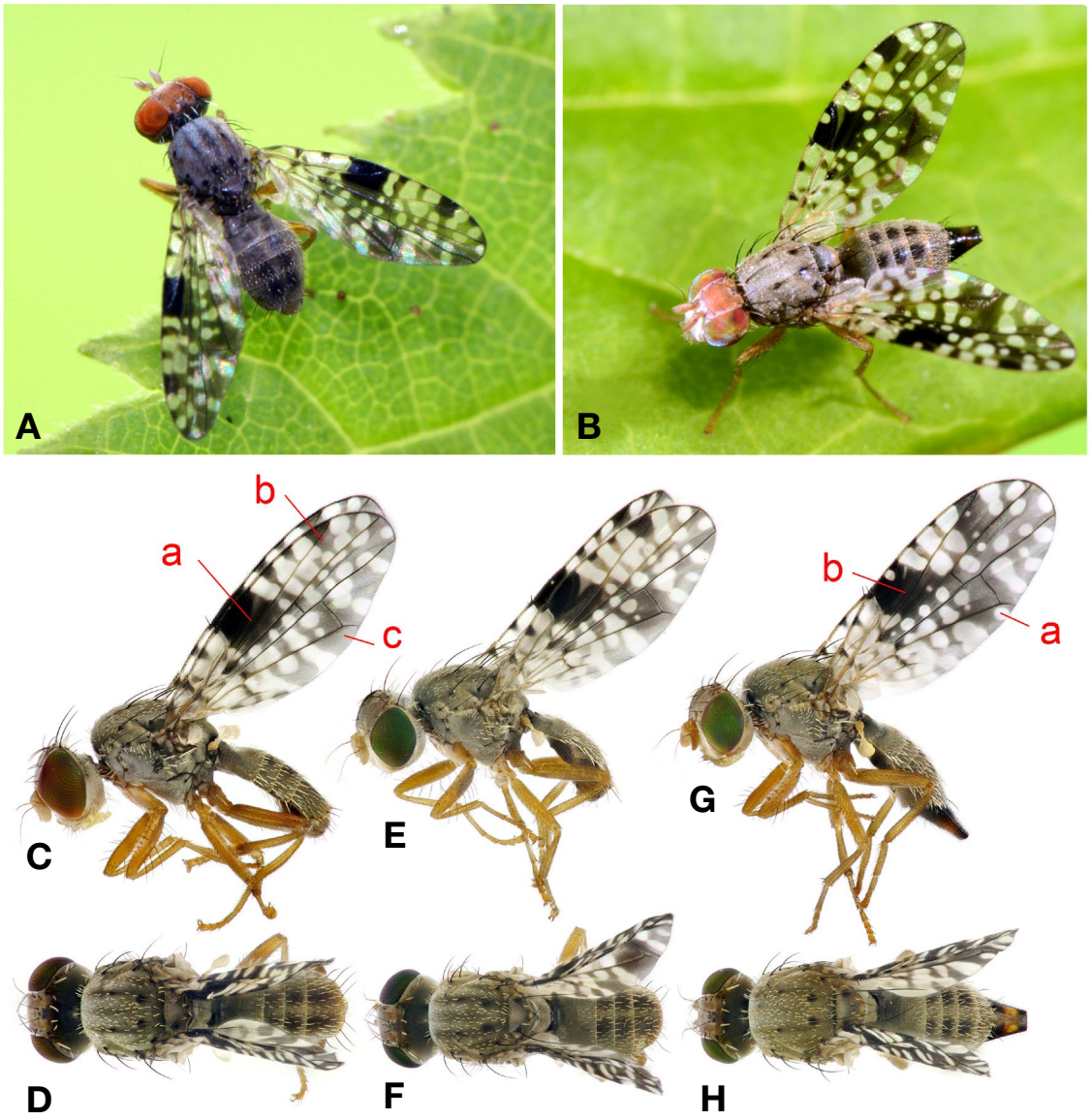


Fig. 5. *Campiglossa shensiana* (Chen, 1938). A. male, dorsal view; B. female, dorsal view; C. male, lateral view; D. male, dorsal view; E. male, lateral view, F. male, dorsal view; G. female, lateral view; H. female dorsal view.

Chrysanthemum makino Matsumura and Nakai, flower, H.-Y. Han *et al*., 3♂ 4♀; *ditto*, em. 25.IV–6.V.2005, ex *Chrysanthemum boreale* Makino, flower, 9♂ 7♀; *ditto*, col. 15.X.2004, em. 25.IV–6.V.2005, ex *Chrysanthemum boreale* Makino, flower, 15♂ 22♀; *ditto*, 10.IX.2013, H.-S. Lee *et al*., 1♀; Samcheok-si, Hajang-myeon, Mt. Jungbongsan, col. 8.X.2014, em. V.2015, ex *Chrysanthemum boreale* Makino, flower, S.-W. Suk and Y.-B. Lee, 1♂; Samcheok-si, Geunsan-dong, Mt. Geunsan, N37°24′28″ E129°8′9″, 01.V.2015, Y.-B. Lee *et al*., 1♀; Taebaek-si, Mungok-dong, col. 3.X.1997, em. 12.IV.1998, ex *Chrysanthemum indicum* L., flower, H.-Y. Han *et al*., 2♂; Wonju-si, Gwirae-myeon, Unnam-ri, col. 13.X.2001, em. 2–16.V.2002, ex *Chrysanthemum boreale* Makino, flower, D.-S. Choi *et al*., 3♂ 12♀. All deposited in YSUW.

Distribution. Korea, China (Shaanxi).

Biology. This is one of the most common *Campiglossa* species frequently infesting the flower heads of *Chrysanthemum boreale* Makino in Korea (new record). I also reared flies of this species from *Ch. indicum* L. and *Ch. makinoi* Matsumura and Nakai (new records). All the reared specimens had emerged from overwintered flower heads in May after storing the fall collected host plants in a 4ºC refrigerator (between early December and early April).

Remarks. Wang (1998) mentioned that the head of the holotype female was missing, but the holotype wing photograph (Wang, 1998-XXXII: 311) unmistakably shows

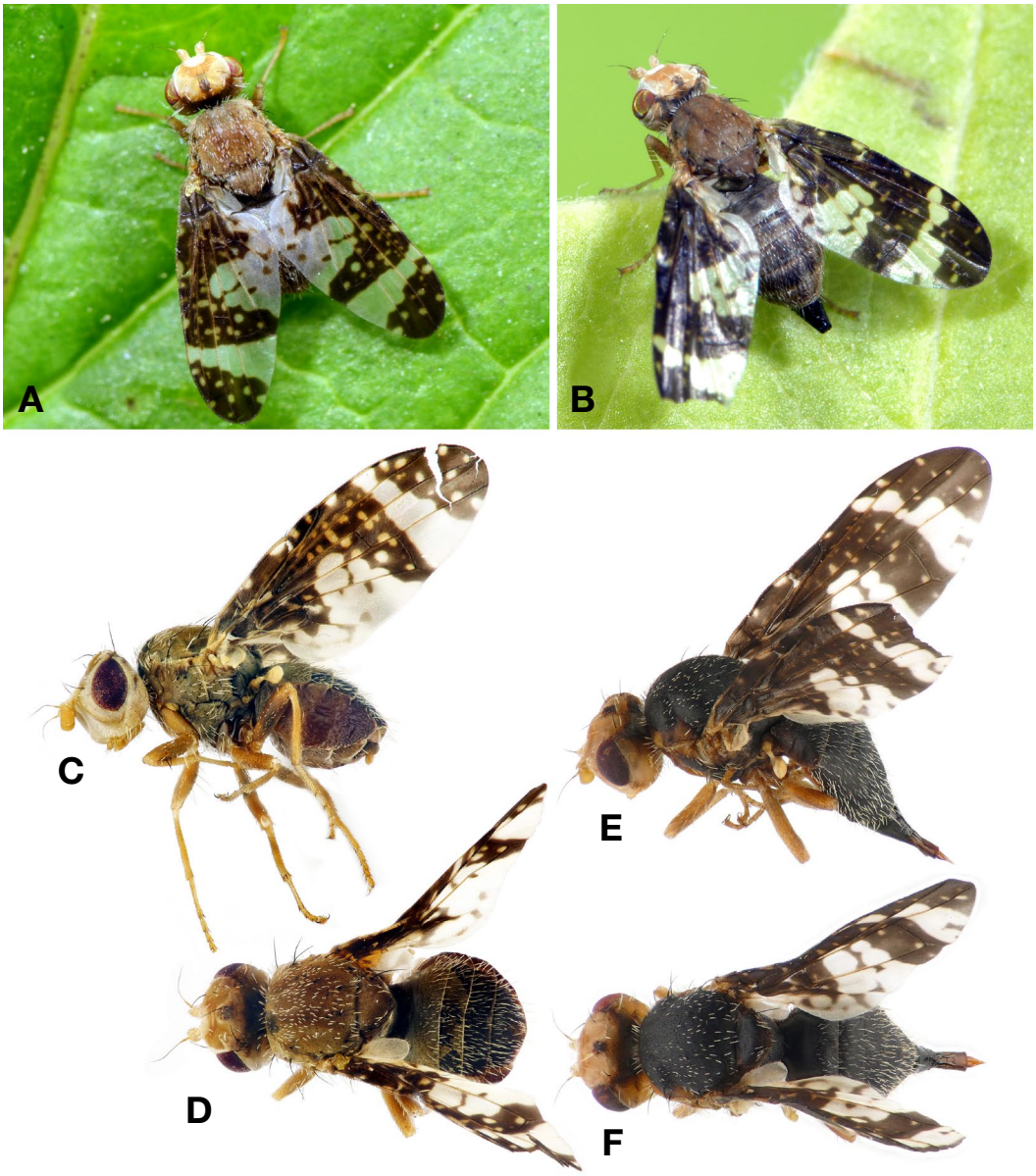


Fig. 6. *Oxyna gansuica* Wang, 1998. A. male, dorsal view; B. female, dorsal view; C. male, lateral view, D. male, dorsal view; E. female, lateral view; F. female dorsal view.

the female wing characteristics I recognized in the Korean specimens. In the present study, for the first time, I was able to recognize the sexually dimorphic male specimens (see Diagnosis) based both on host rearing as well as subsequent DNA barcoding analysis (unpublished personal data). The new Korean name of this species refers to its most common host plant (*Ch. boreale*).

7. *Oxyna gansuica* Wang, 1998

간수산과실파리 (신칭) (Fig. 6A–F)

Oxyna gansuica Wang 1998: 282 (type locality - China, Gansu, Zhangye; holotype ♂, IZAS), 280 (in East Asian *Oxyna* key); Korneyev and Ovchinnikova, 2004: 535 (in Russian Far East key).

Diagnosis. This species can be readily distinguished from any other Korean *Oxyna* species by its unique wing pattern with tiny yellowish or hyaline spotted dark brown background and the following two hyaline areas (Fig. 6A–C, E): 1) subbasal hyaline area with few tiny dark spots, covering most of anal lobe, cell cu_2 excluding short basal and apical areas, middle half of cell dm, middle 1/3 of cell br between crossveins BM-Cu and R-M; and 2) uninterrupted hyaline subapical longitudinal band. This

species appears somewhat similar to European *O. obesa* Loew, 1862 [see Korneyev and Hidalgo (2013) for photographs of the holotype female], but *O. gansuica* can be readily distinguished by having the white posterior notopleural seta as well as the subbasal hyaline area not extending anterior to vein R_{4+5}.

Description of Korean material. Wing length 4.8−4.9 mm; most setae on head and thorax dark brown, but most setulae white; head and legs predominantly pale yellowish brown, but thorax and abdomen matte brown. Head pale yellowish brown except dark brown occipital area; with moderate sized geniculate mouthparts; with single dark brown frontal setae; anterior orbital seta dark brown but posterior seta white, half as long as anterior seta; ocellar seta dark brown, as long as frontal setae. Thorax and preabdomen look matte brown due to dark brown ground color with heavy brown to yellowish brown pruinosity; dark brown anterior notopleural seta strong; white and thick posterior notopleural seta slightly shorter than anterior one; upper anepisternal seta strong, dark brown but lower anepisternal seta white, about 3/5 as long as upper one; scutellum bare in middle with apical setae crossed, about 2/3 as long as basal seta. Legs yellowish brown; fore femur with basally 4−5 white and apically 2 dark brown postero-ventral setae; mid coxal seta strong, white. Wing tiny yellowish brown to hyaline spotted dark brown background with the following two hyaline areas; subbasal hyaline area (with few tiny dark spots) covering most of anal lobe, cell cu_2 excluding short basal and apical areas, middle half of cell dm, middle 1/3 of cell br between crossveins BM-Cu and R-M; hyaline subapical longitudinal band uninterrupted. Abdomen matte brown; oviscape shiny black, about as long as two preceding abdominal tergites.

Material examined. KOREA: Gangwon-do: Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, 6.VI.2006, H.Y. Han *et al*., 1♀ (NIBR); *ditto*, 17.VI.2011, 1♂ (YSUW).

Distribution. Korea, China (Gansu).

Biology. Unknown.

Remarks. The genus *Oxyna* is notorious for its taxonomic difficulties due to high intra-specific but low inter-specific variation. In Korea, there are three recorded species of *Oxyna* [*O. amurensis* Hendel, 1927, *O. lutulenta* (Loew, 1860), and *O. parietina* (Linnaeus, 1758)], among which *O. parietina* could only be safely identified at the moment. The newly recognized, *O. gansuica* is the second species that can also be clearly identified. According to our combined morphological and molecular analysis based on many samples, there are at least five species of *Oxyna* in Korea. A more rigorous taxonomic study is underway for the Korean species (Han and Ro, in preparation). The new Korean name of this species refers to its type locality, Gansu, China.

8. *Tephritis jocaste* Hering, 1953

각시취과실파리 (신칭) (Fig. 7A−F)

Tephritis jocaste Hering, 1953: 11 (type locality - China, Manchuria, Chandaochezsy; holotype ♂, BMNH); Wang, 1998: 292, 298 (in East Asian *Tephriris* key; diagnosis and distribution); Norrbom *et al*., 1999: 217 (in world catalog).

Tephritis n. sp. near *separata*: Han and Kwon, 2000: 68 (in Korean *Tephritis* key).

Diagnosis. This is a typical looking *Tephritis* having two large dark wing markings joined each other: antero-medial marking and antero-subapical marking with rays. It can be distinguished from any other Korean *Tephritis* species by the combination of the following characteristics: 1) thorax and abdomen yellowish brown ground color with grey pruinosity; 2) legs yellowish brown; 3) oviscape yellowish brown with dark brown basal and apical areas, about as long as two preceding tergites; 4) apical dark area of wing cell r_1 without any hyaline spot (Fig. 7C-a; see Fig. 8C for comparison); 5) cell r_{2+3} just beyond apex of vein R_{2+3} with moderate sized hyaline spot (Fig. 7C-b); 6) basal 1/3 of cell dm completely hyaline (Fig. 7C-c); and 7) cell cu_2 with about 10 largely overlapping hyaline spots leaving only some small dark spots.

Description of Korean material. Wing length 4.2−4.5 mm; most setae on head and thorax strong, grey to dark grey, but most setulae white. Head yellowish brown with small normal non-geniculate mouthparts; genal seta strong, pale brown; with two dark grey frontal setae; anterior orbital seta dark grey but posterior seta white; ocellar seta dark grey, distinctly longer than anterior orbital seta. Thorax looks matte pale brownish grey due to yellowish brown ground color with grey pruinosity; notopleuron with anterior seta strong, dark grey, but posterior seta thick and white, about 2/3 as long as anterior one; anepisternal setae dark grey with upper seta strong but lower seta about 2/3 as long as upper one; katepisternal seta strong, grey; anepimeral seta strong pale grey to grey; scutellum with apical setae crossed, about 2/3 as long as basal seta. Legs yellowish brown with fore femur with 6−7 pale grey postero-ventral setae; mid coxal seta strong, pale grey. Wing hyaline, essentially with 2 large dark merged markings - antero-medial marking and antero-subapical marking with rays; cell c almost hyaline with faint greyish spot in middle; pterostigma completely dark brown; cell r_1 posterior to cell c hyaline with grey spot, posterior to pterostigma completely dark, but, apical to pterostigma with 2 large hyaline areas divided by narrow longitudinal dark band, apical dark area (slightly smaller than pterostigma) without any hyaline spot; cell r_{2+3} basally with hyaline area, posterior to pterostigma almost completely dark brown, large and much smaller hyaline

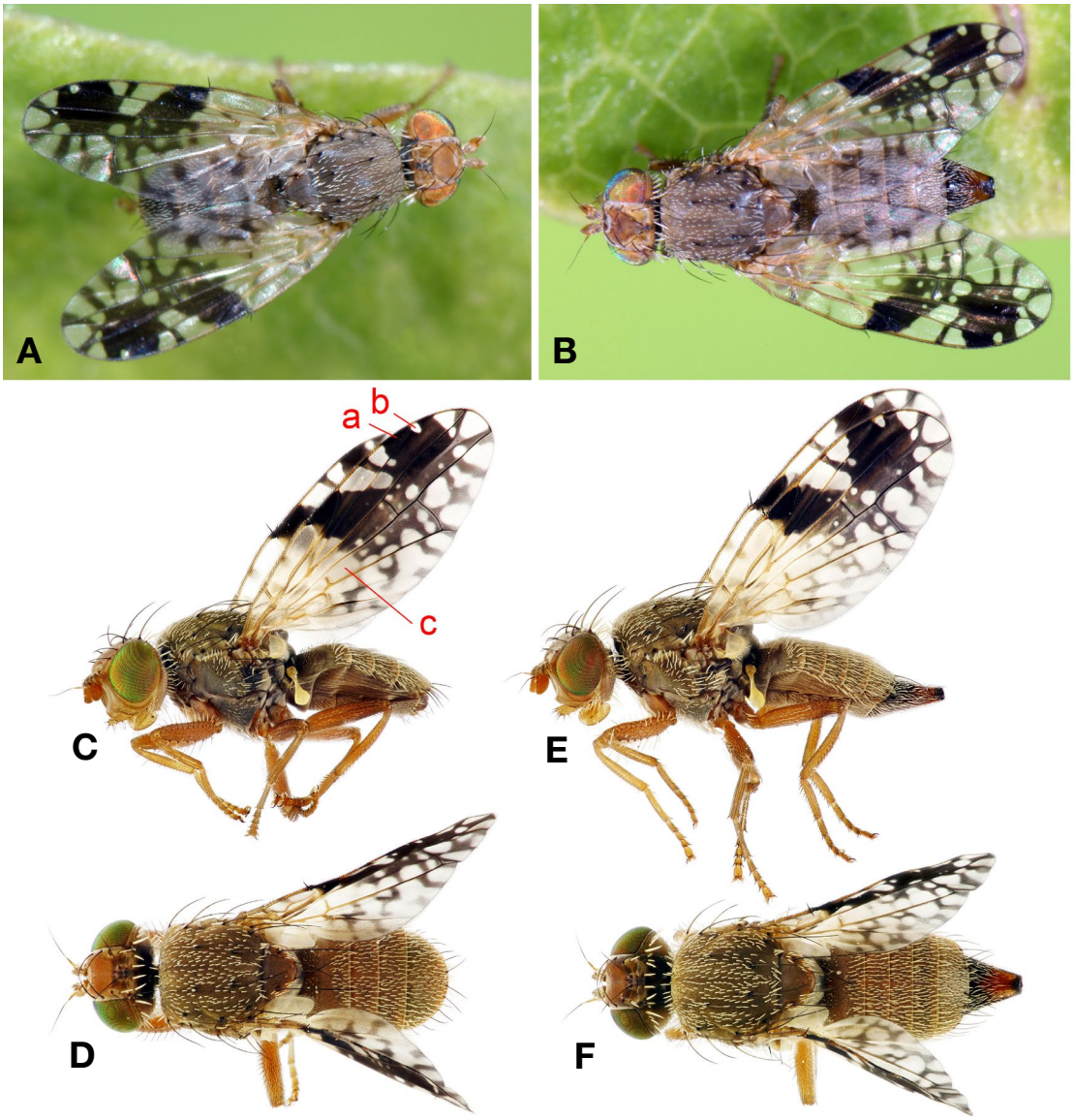


Fig. 7. *Tephritis jocaste* Hering, 1953. A. male, dorsal view; B. female, dorsal view; C. male, lateral view, D. male, dorsal view; E. female, lateral view; F. female dorsal view.

spots connected to 2 large hyaline spots of cell r_1; cell r_{2+3} with tiny hyaline spot just beyond apex of vein R_{2+3} plus large hyaline spot posterior to it; basal 2/3 of cell br almost hyaline, posterior 1/3 dark grey with 2−4 tiny hyaline spots; cell r_{4+5} often with tiny hyaline spot connected to large apical hyaline spot of r_{2+3}, large round hyaline spot posterior to it, apically with lying Y-ray ended across veins R_{2+3} and R_{4+5}; cell m basically with 3 large hyaline spots, leaving 4 dark vertical rays within cell, basal hyaline spot often divided into 2; cell bm completely hyaline; basal 1/3 of cell dm completely hyaline; posterior 2/3 grey to dark grey with 5−7 hyaline spots recognized; cell cu_2 with about 10 largely overlapping hyaline spots leaving only some small dark spots; anal cell anteriorly with 2−3 faint grey spots, posteriorly almost hyaline. Abdomen pale brownish grey; oviscape about as long as preceding 2 abdominal segments, shiny yellowish brown with basal 1/3 and apex dark brown.

Material examined. KOREA: Gangwon-do: Hongcheon-gun, Nae-myeon, north valley of Mt. Gyebangsan, 8.VIII. 1996, H.-Y. Han and H.-W. Byun, 3♂ 1♀; Hongcheon-gun, Nae-myeon, Woldungol, col. 10.X.2002, em. 7−20. XI.2003, ex *Saussurea pulchella* Fisch., flower, H.-Y. Han *et al*., 7♂ 14♀; Jeongseon-gun, Gohan-eup, Mt. Hambaeksan, from Manhang-jae to 1585 m peak, N37°09′40″ E128°55′04″, 14.VIII.1999, H.-Y. Han *et al*., 11♂ 23♀;

ditto, 9.VIII.2000, 5♂ 8♀; *ditto*, col.10.X.2003, em. 16–24.X.2003, ex *Saussurea pulchella* Fisch., flower, H.-Y. Han and K.-E. Ro, 17♂ 13♀; Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, col. 6.X.2001, em. 19.X–19XI.2001, ex *Saussurea pulchella* Fisch., flower, H.-Y. Han *et al*.; *ditto*, col. 29.IX.2002, em. 18.X.–14.XI.2002; *ditto*, col. 25.IX.2003, em. 16–24.X.2003. All deposited in YSUW.

Distribution. Korea, China (Heilongjiang), Russian Far East.

Biology. In Korea, I have reared a number of flies from the fall collected (September to October) flowers of *Saussurea pulchella* Fisch. [Asteraceae] (new record). Flies have emerged between mid-October and mid-November of the same year.

Remarks. The new Korean name of this species refers to the above host plant.

9. *Tephritis okera* (Shinji, 1940)

삽주과실파리 (신칭) (Fig. 8A–F)

Platensia okera Shinji, 1940: 2 (type locality - Japan, Honshu, Iwate Pref., Morioka City; type Shinji).

Tephritis okera: Sueyoshi, 1998: 124 (resurrected from synonymy of both *T. separata* and *T. ismene*).

Tephritis separata (*T. okera* as erroneous junior synonym): Ito, 1984: 248 (in synonymy of *T. separata*): Wang, 1998: 302 (in synonymy of *T. separata*).

Tephritis ismene (*T. okera* as errorneous junior synonym): Korneyev, 1996: 123 (in synonymy of *T. ismene*); Norrbom *et al*., 1999: 218 (in synonymy of *T. ismene*).

Diagnosis. This is a typical looking *Tephritis* having two large dark wing markings joined each other: antero-medial marking and antero-subapical marking with rays. It can be readily distinguished from any other Korean *Tephritis* species by having a large number of hyaline spots of cells dm and cu_2 as follows (Fig. 8C, E): 1) cell dm with at least 12 hyaline spots recognized; and 2) cell cu_2 with over 20 variously sized hyaline spots.

Description of Korean material. Wing length 4.8–5.0 mm; most setae on head and thorax strong, grey, but most setulae white. Head yellowish brown with small normal non-geniculate mouthparts; genal seta strong, pale brown; with two grey frontal setae; anterior orbital seta grey but posterior seta white; ocellar seta grey, distinctly longer than anterior orbital seta. Thorax looks matte pale brownish grey due to yellowish brown ground color with grey pruinosity; notopleuron with anterior seta grey but posterior seta white, thick, about 2/3 as long as anterior one; both anepisternal setae grey with lower seta about 2/3 as long as upper one; katepisternal seta strong, grey; anepimeral seta strong grey; scutellum with apical setae crossed, about half as long as basal seta. Legs yellowish brown with fore femur with 6–7 pale brown postero-ventral setae; mid coxal seta strong, grey. Wing hyaline, essentially with 2 merged markings - dark antero-medial marking and antero-subapical marking with rays; cell c almost hyaline with pale grey spot in middle; pterostigma completely dark brown except for narrow pale brown postero-basal corner; cell r_1 posterior to cell c hyaline with pale grey spot, posterior to pterostigma completely dark, but, apical to pterostigma with 2 large hyaline areas divided by narrow longitudinal dark band, apical dark area (slightly smaller than pterostigma) often with tiny hyaline spot antero-medially; cell r_{2+3} basally with hyaline area, posterior to pterostigma almost completely dark, large and much smaller hyaline spots connected to 2 large hyaline spots of cell r_1, apically with tiny hyaline spot near apex of vein R_{2+3} plus larger hyaline spot posterior to it; basal half of cell br almost hyaline, posterior half dark with 2–3 small merged hyaline postero-basal spots; cell r_{4+5} with small round hyaline spot just anterior to crossvein DM-Cu, apically with lying Y-ray ended across veins R_{2+3} and R_{4+5}; cell m basically with 3 large hyaline spots, leaving 4 dark rays within cell, basal ray with 2–4 tiny hyaline spots; cell bm almost completely hyaline; cell dm with at least 12 hyaline spots recognized; cell cu_2 with over 20 variously sized hyaline spots; anal lobe also with at least 10 hyaline spots. Abdomen yellowish brown ground color with grey pruinosity; oviscape about as long as or slightly shorter than 3 preceding abdominal segments, shiny brown with basal 1/3 and apical tip dark brown.

Material examined. KOREA: Gangwon-do, Injegun, Buk-myeon, Mt. Maebongsan, N37°56′43.1″ E128°13′40.0″, col. 17.IX.2015, em. 27.X.2017, ex *Atractylodes japonica* Koidz., H.-Y. Han *et al*., 5♂ 5♀; Injegun, Deokjeok-ri, Mt. Hanseoksan, N38°03′05″ E128°15′23″, 1114 m, 10.VI.2016, H.Y. Han *et al*., 1♀; Jeongseon-gun, Nammyeon, Mt. Mindungsan, from Yupyeongri to 1119 m peak, N37°16′15″ E128°46′30″, 24.VI.2005, H.-Y. Han *et al*., 2♂; Wonju-si, Heungeop-myeon, Maeji-ri, Yonsei University Campus, 7.VII.2008, Y.B. Lee, 1♀; *ditto*, 18.VI.2009, Y.B. Lee, 1♀. All deposited in YSUW.

Distribution. Korea, Japan (Honshu).

Biology. This species infests flower heads of *Atractylodes japonica* Koidz. in Korea (new records) and Japan (Shinji, 1940; Sueyoshi, 1998). In Korea, September collected *A. japonica* flowers yielded the flies in October of the same year.

Remarks. The new Korean name of this species refers to its host plant.

10. *Trupanea guttistella* (Hering, 1951)

암수다른별과실파리 (신칭) (Fig. 9A–F)

Trypanea guttistella Hering, 1951: 13 (type locality - China, Heilongjiang, Charbin [Harbin]; holotype ♂, BMNH).

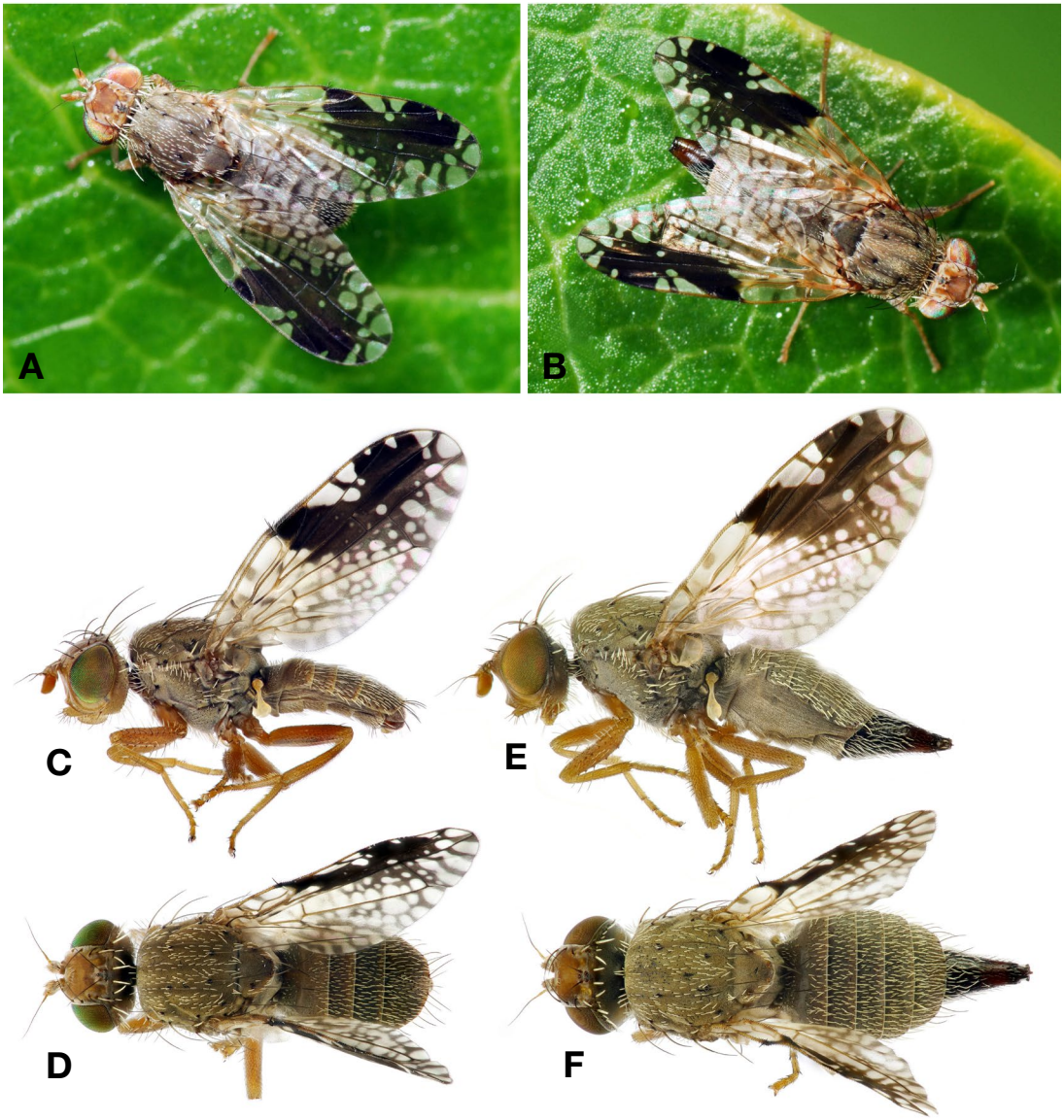


Fig. 8. *Tephritis okera* (Shinji, 1940). A. male, dorsal view; B. female, dorsal view; C. male, lateral view, D. male, dorsal view; E. female, lateral view; F. female dorsal view.

Trupanea collina Ito, 1984: 255 (type locality - Japan, Honshu, Kawati, Iwawakisan; holotype ♀, UOPJ).

Trupanea guttistella: Wang, 1998: 307 (diagnosis and distribution); Norrbom *et al*., 1999: 233 (in world catalog); Korneyev and Ovchinnikova, 2004: 564 (in Russian Far East key).

Diagnosis. Three known Korean *Trupanea* species look somewhat similar to *Actinoptera* species by having a single dark subapical wing spot with rays, but can be readily distinguished by having two pairs of orbital setae and longer pterostigma (about twice as long as wide). *Trupanea guttistella* is the only Korean member of this genus that has a distinct sexual dimorphism in wing pattern with the subapical star-like wing spot much more extensive in female (Fig. 9A vs. 9C, E).

Description of Korean material. Wing length 3.9–4.2 mm; most setae on head and thorax strong, grey, but most setulae white. Head yellowish brown with small normal non-geniculate mouthparts; genal seta strong, pale brown; with 3 grey frontal setae; anterior orbital seta grey but posterior seta white; ocellar seta grey, distinctly longer than anterior orbital seta. Thorax looks whitish grey due to mostly dark brown ground color with heavy whitish grey pruinosity; postpronotal lobe with yellowish brown ground color; notopleuron with anterior seta grey but posterior seta thick, white, about 2/3 as long as anterior one; anepisternal setae brown with upper seta strong but

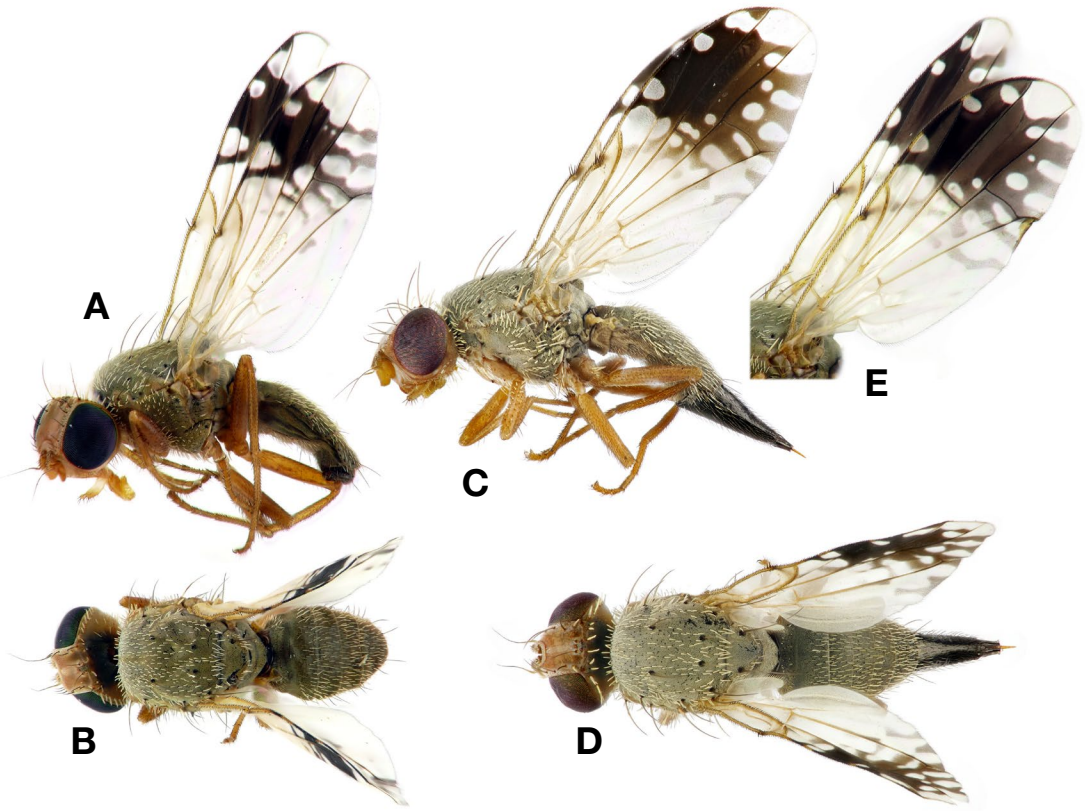


Fig. 9. *Trupanea guttistella* (Hering, 1951). A. Russian Far East male, lateral view, B. Russian Far East male, dorsal view; C. Korean female, lateral view; D. Korean female dorsal view; E. Russian Far East female wing.

lower anepisternal seta about 2/3 as long as upper one; scutellum only with pair of basal setae. Legs yellowish brown with fore femur with 4−5 brownish grey postero-ventral setae; mid coxal seta strong, pale brown. Male wing essentially hyaline on basal half, subapically with single large dark spot with rays; cell r_1 apical to pterostigma hyaline at basal 1/3, remaining area dark brown with large hyaline subbasal round spot leaving narrow basal longitudinal band; cell r_{2+3} with small anterior hyaline spot connected to r_1 hyaline spot extending r_1 longitudinal dark band, dark area ended subapically with small round hyaline spot at apex of vein R_1; apex of cell r_{2+3} with small isolated dark spot; basal 2/3 of cell r_{4+5} largely dark, narrowly hyaline just apical to crossvein R-M, large hyaline spot anterior to crossvein DM-Cu, dark area ended at about apical 1/3 without any ray within cell; cell m with 3 narrow rays extended from dark area of cell r_{4+5}; 2 more rays recognized at apical 1/3 of cell dm. Female wing with subbasal spot much larger then male; cell r_{4+5} predominantly dark with basal longitudinal hyaline spot and smaller round hyaline spot close to crossvein DM-Cu, dark area ends at about apical 1/4 with clear postero-apically directed ray often ends at or slightly into cell m; cell m rays not recognized as in male due to more extended dark area, instead about 3−4 hyaline spots recognized. Abdomen matte whitish grey but ground color dark brown; oviscape shiny dark brown, cone-shaped, about as long as 3 preceding segments.

Material examined. KOREA: Gangwon-do: Inje-gun, Girin-myeon, Mt. Jeombongsan, Gombaeryeong, N38°01′38.9″ E128°25′58.0″, 9.VII.2016, H.-Y. Han *et al*., 1♀ (YSUW); Jeongseon-gun, Nam-myeon, Mt. Mindungsan, from Yupyeong-ri to 1119 m peak, N37°16′15″ E128°46′30″, 16.VII.2005, H.-Y. Han *et al*., 1♀ (NIBR). RUSSIA: Primorsky-Krai: Khasansky-District, Barabash, N43°10′46.9″ E131°28′20.0″, 22.VI.2008, H.-Y. Han and H.-S. Lee, 2♂2♀ (YSUW); *ditto*, Nadezhdinsky-District, Vol'no-Nadezhdinskoye, N43°22′31.6″ E132°01′43.1″, 22.VI.2008, H.-Y. Han and H.-S. Lee, 1♀ (YSUW).

Distribution. Korea, Russian Far East, China (Heilongjiang), Japan (Honshu).

Biology. Unknown.

Remarks. Since the only two Korean specimens available were females, some additional specimens collected from Russian Far East were compared (see Material examined). The new Korean name of this species translates as "sexually dimorphic *Trupanea*," referring to its wing dimorphism.

Acknowledgements

This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201902205). I sincerely thank Kyung-Eui Ro, Hye-Woo Byun, Sam-Kyu Kim, Chan-Hee Park, Hyun-Suk Lee, O-Young Lim, Sang-Wook Suk, Jong-Su Lim, Yong-Bong Lee, Dong-Jun Cha, Seulmaro Hwang, Jong-Mee Jung, Hak-Seon Lee, Dong-Han Kim, Han-Saem Lee, Seung-Su Euo, Soo-Hyun Jeong, Chan-Ouk Kim, and Jung-Whan Choi for their help in collecting and curating the Korean tephritid specimens.

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Submitted: July 7, 2019
Revised: July 18, 2019
Accepted: July 24, 2019