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On the taxonomy of Korean jumping plant-lice (Hemiptera: Psylloidea)

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Abstract

The taxonomy of jumping plant-lice from South Korea is revised based on extensive, recently collected material and specimens preserved in several collections. Three species are described as new (*Craspedolepta yongjungi*, *Cacopsylla baccatae* and *Cyamophila floribundae* spp. nov.) and 11 species are recorded from South Korea for the first time (Aphalaridae 2, Homotomidae 1, Liviidae 1, Psyllidae 6, Triozidae 1). One genus and 13 species are synonymised, two species are removed from synonymy and two species are recombined. Comments on the taxonomy are provided and previous misidentifications are discussed.

Key words: psyllids, taxonomy, Aphalaridae, Calophyidae, Homotomidae, Psyllidae, Macrocorsinae, Psyllinae, Triozidae, new species, new records, South Korea

Introduction

Psyllids or jumping plant-lice are small, phloem-feeding insects which are best known for a few economically important pests such as *Diaphorina citri* Kuwayama, 1908 and *Bactericera cockerelli* (Šulc, 1909). The knowledge on the other almost 4,000 described psyllid species (Li, 2011; Burckhardt & Ouvrard 2012) is, however, limited and many taxonomic problems remain to be solved.

In East Asia, 1,001 species have been reported from China (Li 2011), 152 from Japan (Ouvrard 2016), 98 from Korea (Kwon *et al.* 2015a) and 132 from the Russian Far East (Konovalova 1988). Considerable confusion exists in the taxonomy of East Palaearctic psyllids due to insufficient reference between the faunas of the four countries and the uncritical use of old names, particularly from Europe.

Here we focus on the Korean fauna. The first and only major treatment of Korean psyllids is the book by Kwon (1983) which is a milestone in the studies of the East Asian psyllids. Its publication was followed by several checklists (The Entomological Society of Korea & Korean Society of Applied Entomology 1994; Park 1996; Paek *et al.* 2010; Lee *et al.* 2014; Kwon *et al.* 2015a). Whereas most of these lists are mere compilations that of Park (1996) contains some new synonymies and combinations, and that of Kwon *et al.* (2015a) introduces some taxonomic changes and new species records though without providing details. The aim of the present paper is, based on recent fieldwork throughout South Korea, to revise critically the status of some species, to describe some new taxa, to record some species for the first time from Korea and to provide collecting data for others.

Material and methods

Material for this study was examined from following institutions: BMNH—Natural History Museum, London, UK; MHNG—Muséum d'histoire naturelle, Genève, Switzerland; NHMB—Naturhistorisches Museum Basel, Switzerland; NIBR—National Institute of Biological Resources, Incheon, South Korea; SNU—Seoul National University, Seoul, South Korea. The NHMB houses a small collection by Y. J. Kwon, originally deposited in the

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National Museum Wales, Cardiff, UK, and acquired by the NHMB through an exchange of material. This collection contains 34 species, including paratypes, which are identified by Y. J. Kwon.

The Korean provinces are abbreviated as follows: CB—Chuncheongbuk-do; GB—Gyeongsangbuk-do; GG—Gyeonggi-do; GN—Gyeongsangnam-do; GW—Gangwon-do; JB—Jeollabuk-do; JJ—Jeju-do; JN—Jeollanam-do.

The information on host plants provided for each species refers to records from Korea. The plant names follow The Plant List (2016).

Systematics

Aphalaridae: Aphalarinae

Aphalara avicularis Ossiannilsson, 1981

(Fig. 1)

Aphalara avicularis Ossiannilsson, in Ossiannilsson & Jansson, 1981: 24.
Aphalara polygoni sensu Park & Lee, 1982b: 13; Kwon 1983: 18, p.p., nec Foerster, 1848: 90, **misidentifications**.

Material examined. South Korea (all identified as *Aphalara polygoni*): 1 ♂, 3 ♀, GB, Gyeongsan-gun, Hayang-eup, 21.v.1980, 5.vii.1980 (Y. J. Kwon) (NHMB); same data but 2 ♂, 3 ♀, 5.vii.1980 (Y. J. Kwon) (NIBR); 1 ♀, GN, Samnam-myeon, 21.iii.1982 (Y. J. Kwon) (NIBR); 1 ♀, GB, Cheongsong-gun, Budong-myeon, Mt. Juwang, 19.vii.1981 (Y. J. Kwon) (NIBR); 1 ♂, 3 ♀, GB, Daegu City, 22.iii.1982 (Y. J. Kwon) (NIBR). —South Korea (GB, GN, JN) (NHMB, NIBR, SNU).

Host plant. *Polygonum aviculare* L. (Polygonaceae).

Comments. Park & Lee (1982b) list *Aphalara polygoni* Foerster, 1848 collected on *Polygonum aviculare* which suggests that their specimens belong to *A. avicularis*. Their material was not available for examination for confirmation. Kwon (1983) reported *Aphalara polygoni* from seven provinces in South Korea, indicating that the host plants are *Polygonum* spp. Kwon's (1983: 179, plate XXXI fig. 11) illustration of the distal portion of the aedeagus resembles that of *A. avicularis*. We examined specimens identified by Kwon as *A. polygoni* that are *A. avicularis*. We do not know, however, whether the material listed by Kwon (1983) under *A. polygoni* contains also *A. freji* Burckhardt & Lauterer, 1997, another species associated with *Persicaria* spp. and *Polygonum* spp. or genuine *A. polygoni* which develops on *Rumex* spp. (Burckhardt & Lauterer 1997). We have not seen specimens of the latter and its presence in Korea is currently not confirmed.

Aphalara freji Burckhardt & Lauterer, 1997

(Fig. 2)

Aphalara freji Burckhardt & Lauterer, 1997: 296.

Material examined. South Korea (GN, JN) (NIBR, SNU).

Host plant. *Persicaria lapathifolia* (L.) Delarbre (Polygonaceae).

Comments. See under *Aphalara avicularis*.

Craspedolepta formosa Loginova, 1962

(Figs. 3–4)

Craspedolepta formosa Loginova, 1962: 196.

Material examined. South Korea (GW) (NHMB, SNU).

Host plant. *Artemisia* cf. *indica* Willd. (Asteraceae).

Comments. New record for Korea.

FIGURES 1–8. Habitus. **1.** *Aphalara avicularis*, adult male. **2.** *Aphalara freji*, adult male. **3.** *Craspedolepta formosa*, adult male. **4.** *Craspedolepta formosa*, adult female. **5.** *Craspedolepta yongjungi* **sp. nov.**, adult male. **6.** *Craspedolepta yongjungi* **sp. nov.**, adult female. **7.** *Craspedolepta yongjungi* **sp. nov.**, fifth instar immature. **8.** *Calophya nigridorsalis*, adult male.

***Craspedolepta yongjungi* Cho & Burckhardt, sp. nov.**
(Figs. 5−7, 15−20)

Craspedolepta conspersa sensu Kwon, 1983: 24, nec Löw, 1888: 31.
Xanioptera japonica sensu Park, 1996: 268, nec Klimaszewski, 1989: 7.

Diagnosis. Adults of the new species resemble those of *Craspedolepta conspersa* (Löw, 1888), *C. spinosa* Park & Lee, 1982, *C. japonica* (Klimaszewski, 1989), comb. nov. and *C. kwonii* (Klimaszewski, 1997), comb. nov. in the narrow forewings bearing small dots, the apically broad paramere, that is bent in the middle, and the female proctiger bearing a long apical process. It differs from the first species in the forewing that is narrowly rounded apically and bears more homogeneously distributed dark dots, the female proctiger that is stronger curved and the female subgenital plate whose ventral margin is angled in the middle and not evenly curved as in *C. conspersa*. From the other three species *C. yongjungi* differs in the brown dots that are denser and confluent in apical half of the forewing.

Description. Adult. Body colour (Figs. 5–6) green (yellow in ethanol preserved specimens), with indistinct whitish pattern consisting of dots and longitudinal stripes on the dorsum of head and thorax, respectively. Head and thorax covered in short macroscopic setae. Vertex with each half evenly rounded anteriorly; preocular sclerite distinctly developed. Antenna 10-segmented, 1.17–1.24 as long as head width. Forewing slender, 2.72–3.09 times as long as wide, narrowly rounded apically; cell m_1 relatively narrow, cell cu_1 long; pattern consisting of small brown spots that are relatively evenly covering wing membrane, denser in apical half where they are confluent; membrane lacking setae on dorsal surface; surface spinules fine, dense, leaving spinule-free rows along the veins. Terminalia as in Figs. 17–20. Paramere curved in the middle with broad apical half; apico-posterior edge angular. Female proctiger 1.06–1.12 times as long as head width, with concave dorsal margin and long apical process. Female subgenital plate with long apical process; ventral margin angular in the middle.

Measurements (in mm; 3 ♂, 3 ♀): head width ♂ 0.52–0.55, ♀ 0.56–0.62; antenna length ♂ 0.63–0.66, ♀ 0.67–0.72; forewing length ♂ 1.77–1.84, ♀ 2.20–2.30; metatibia length ♂ 0.46–0.47, ♀ 0.47–0.49; proctiger length ♂ 0.20–0.22, ♀ 0.63–0.66.

Fifth instar immature. Body (Fig. 7) greenish or yellowish, elongate. Antenna 7-segmented. Forewing-pads with small humeral lobes. Margin of wing-pads and abdomen bearing lanceolate setae. Tarsal arolium membranous, sessile. Caudal plate angular posteriorly. Anus in ventral position; circumanal ring small, in distance from posterior abdominal margin by more than its own length, consisting of a single row of pores.

Measurements (in mm; 3 immatures): body length 1.73–1.92; body width 1.14–1.22; antenna length 0.77–0.80; forewingpad length 0.68–0.69; metatibia length 0.30–0.32; caudal plate length 0.52–0.57; caudal plate width 0.83–0.95; circumanal ring width 0.10–0.11.

Type material. Holotype ♂, South Korea, GW, Hongcheon-gun, Nae-myeon, Myeonggae-ri, N37°51'37.44" E128°32'36.72", 900 m, 07.vi.2015, *Artemisia* cf. *indica* (G. Cho) (SNU; dry mounted).—Paratypes: 42 ♂, 25 ♀, same data as holotype but (NHMB, SNU; dry and slide mounted, in 95% ethanol); 26 ♂, 24 ♀, 33 immatures, same but 17.v.2016 (D. Burckhardt & G. Cho) (BMNH, NHMB, SNU; dry, in 70% and 95% ethanol); 2 ♂, 3 ♀, same but Hwacheon-gun, Sangseo-myeon, Damok-ri, Sillnae Hill, N38°09'24.4" E127°31'23.3", 850 m, 25.v.2016, *Artemisia* cf. *indica* (D. Burckhardt & G. Cho) (NHMB, SNU; dry and slide mounted, preserved in 70% and 95% ethanol).

Host plant. *Artemisia* cf. *indica* Willd. (Asteraceae), confirmed by the presence of immatures.

Etymology. Named in honour of Professor Yong Jung Kwon for his pioneering work on Korean psyllids.

Comments. *Craspedolepta conspersa* was originally described from Romania [Südungarn, Langenfeld bei Weisskirchen] (Löw 1888; see also Conci & Tamanini 1983) and not Germany as stated by Kwon (1983). Subsequently the species was reported from Hungary (Klimaszewski 1961), Moldova (Loginova 1966), Japan (Miyatake 1969), Italy (Conci & Tamanini 1983), Korea (Kwon 1983), the Russian Far East (Konovalova 1988), Slovenia (Seljak 2006), Switzerland (Burckhardt & Lauterer 2009) and Serbia (Jerinić-Prodanović 2010). The record of Bulgaria by Klimaszewski (1973) is a likely error (Conci & Tamanini 1983). Klimaszewski (1989) described *Xanioptera* (*Loginovia*) *japonica* from Japan, apparently not aware of the reports of *C. conspersa* from Japan, Korea and the Russian Far East (Miyatake 1969; Kwon 1983; Konovalova 1988). Klimaszewski (1989) suggested that *X. japonica* is very close to *C. conspersa* differing in the longer antennae and relative lengths of the forewing veins M+Cu and Cu. For unknown reasons, Park (1996) suggested that *Craspedolepta conspersa* sensu

Kwon (1983) from Korea is conspecific with *Xanioptera japonica*. Comparison of material from Japan identified as *Xanioptera japonica* and from Korea fitting Kwon's description of *C. conspersa* shows subtle, though constant differences between the two taxa. The brown dots on the forewing are sparser and rarely coalesce in the former but are quite dense and confluent in the apical half of the forewing in the latter. The paramere in the former is slightly more rounded at the apico-posterior edge and slightly more angular in the latter. Further, the Korean populations differ from European *C. conspersa* in the more homogeneously spaced dark dots on the forewing, the apically more narrowly rounded forewing and the more curved female terminalia. In this context, two other species are of interest, viz. *Craspedolepta spinosa* Park & Lee, 1982 and *Xanioptera* (*Loginovia*) *kwonii* Klimaszewski, 1997. Both species are from Korea, poorly described and based on insufficient material lacking males, the former from 2 females, one of which damaged, from Mount Hallasan on Jeju Island, the latter from 2 or 3 females from Mount Myohyang, respectively. Both share the narrow forewings bearing brown dots, but differ from the Korean material referred to *C. conspersa* in the dots on the forewing that are not confluent. We conclude that 1. *Craspedolepta japonica* (Klimaszewski, 1989), comb. nov. is a good species, currently known only from Japan; 2. *C. spinosa* and *C. kwonii* (Klimaszewski, 1997), comb. nov. are distinct from both *C. japonica* and from Korean populations previously referred to *C. conspersa* but their identity is doubtful; 3. the European and Korean populations referred to *C. conspersa* are not conspecific. For this reason, we describe the latter under the name of *Craspedolepta yongjungi* sp. nov.

Klimaszewski (1987), using a phenetic approach to analyse the phylogenetic relationships between Palaearctic species, split *Craspedolepta* s. l. into four genera including the subgenera *Xanioptera* s. str. and *Xanioptera* (*Loginovia*). This analysis is flawed with methodological shortcomings and mistakes in the observation of some characters (Burckhardt & Lauterer 1997) and is, therefore, rejected. Here we follow the generic concepts of Burckhardt & Ouvrard (2012) and Burckhardt & Queiroz (2013).

Aphalaridae: Togepsyllinae

Togepsylla matsumurana Kuwayama, 1949

Togepsylla matsumurana Kuwayama, 1949: 48.

Material examined. South Korea (JJ) (NHMB).

Host plant. Probably *Litsea* Lam. spp. (Lauraceae).

Comments. New record for Korea.

Calophyidae: Calophyinae

Calophya nigridorsalis Kuwayama, 1908

(Figs. 8−10)

Calophya nigridorsalis Kuwayama, 1908: 159.

Material examined. South Korea (JJ, JN) (NHMB, SNU).

Host plant. *Rhus chinensis* Mill., *Toxicodendron succedaneum* (L.) Kuntze, *T. sylvestre* (Siebold & Zucc.) Kuntze, *T. trichocarpum* (Miq.) Kuntze (Anacardiaceae), confirmed by the presence of immatures.

Comments. *Calophya nigridorsalis* has been reported from Korea though without locality data (Cho & Lee 2015b; Kwon *et al.* 2015a).

Homotomidae: Homotominae

Homotoma unifasciata Yu, 1956

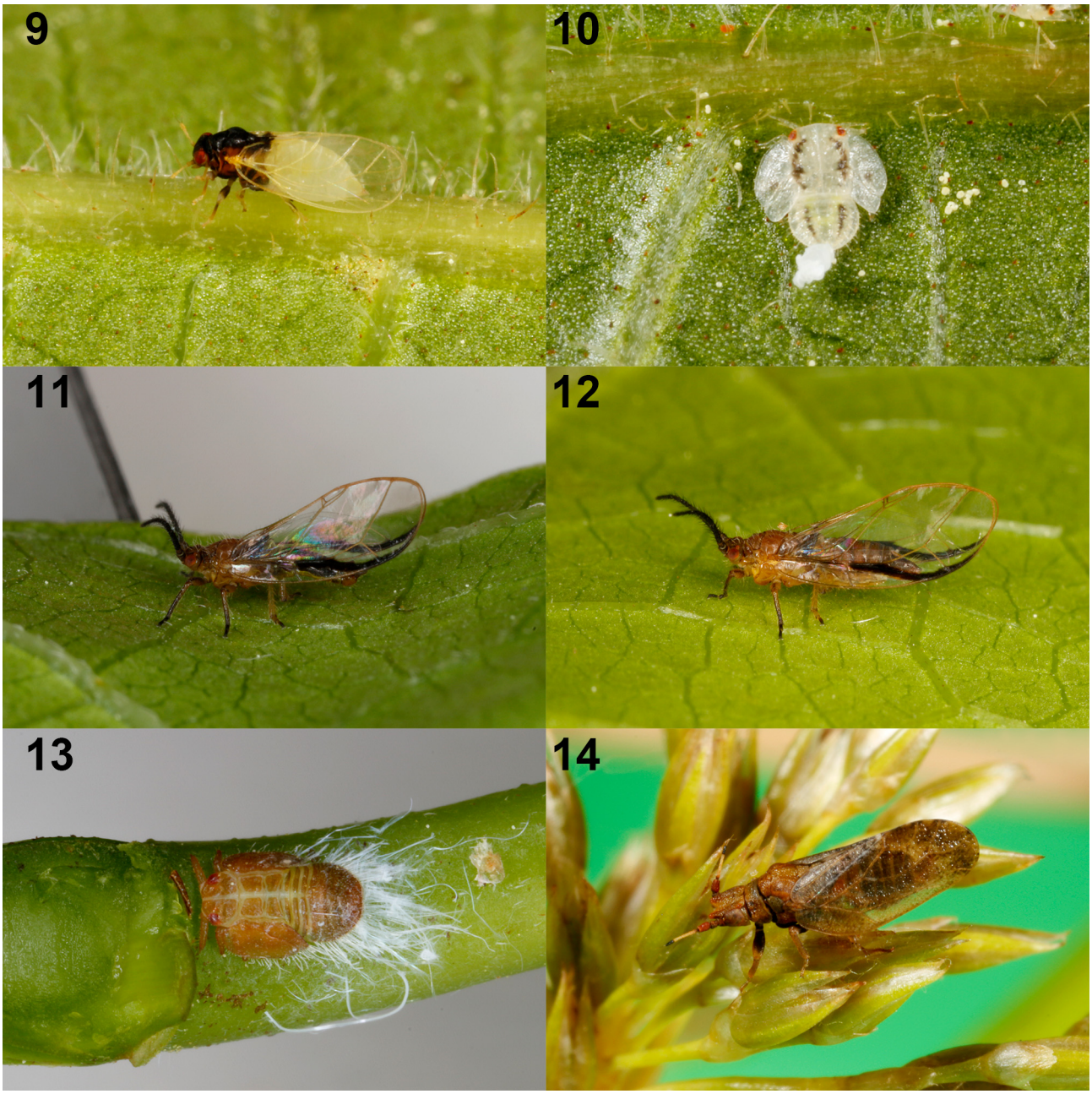
(Figs. 11−13)

Homotoma unifasciata Yu, 1956: 45.

Material examined. South Korea (JJ) (NHMB, SNU).

Host plant. *Ficus erecta* Thunb. (Moraceae), confirmed by the presence of immatures.

Comments. New record for Korea.



FIGURES 9–14. Habitus. **9.** *Calophya nigridorsalis*, adult female. **10.** *Calophya nigridorsalis*, fifth instar immature. **11.** *Homotoma unifasciata*, adult male. **12.** *Homotoma unifasciata*, adult female. **13.** *Homotoma unifasciata*, fifth instar immature. **14.** *Livia khaziensis*, adult male.

Liviidae: Liviinae

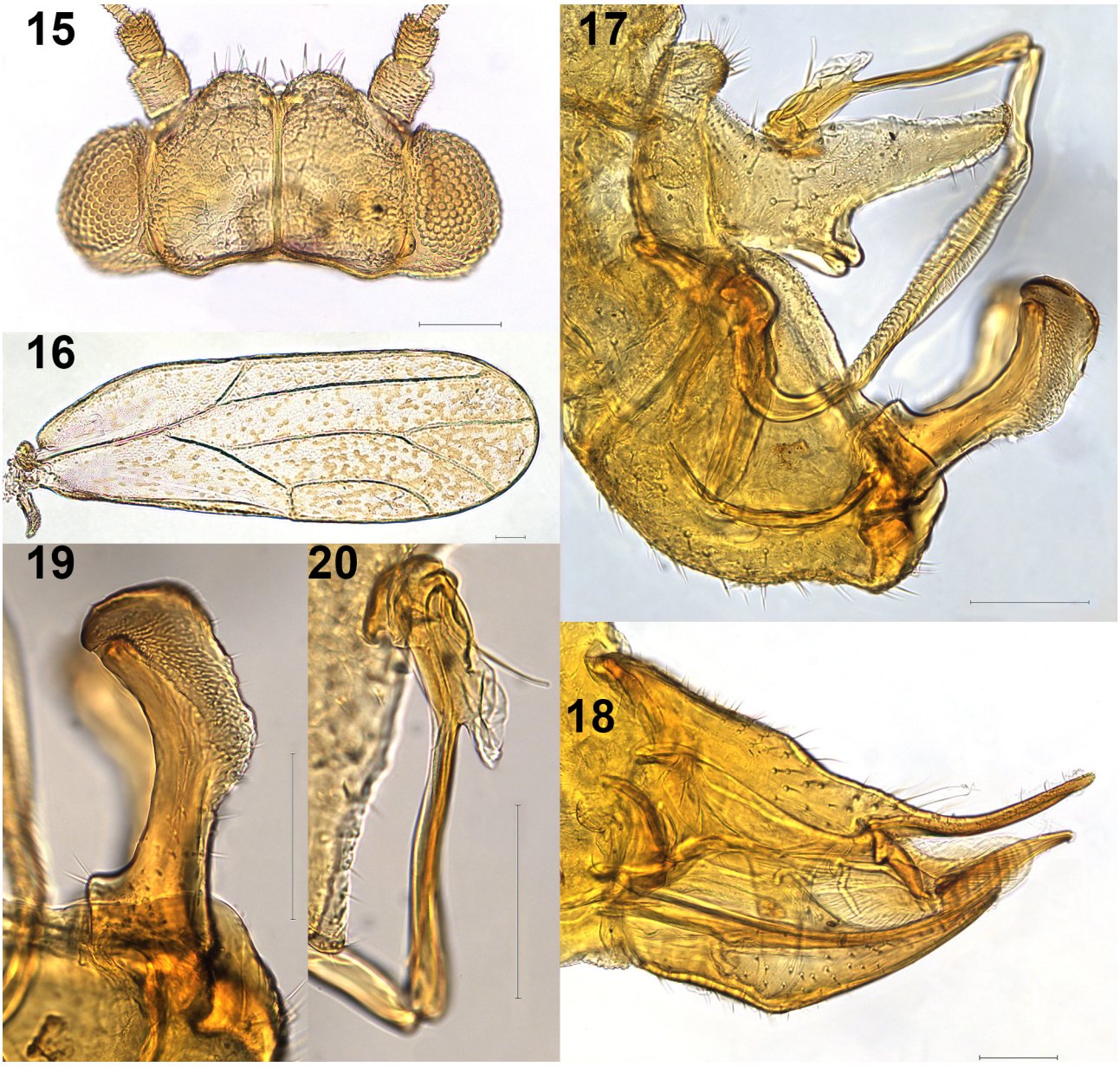
Livia khaziensis Heslop-Harrison, 1949

(Fig. 14)

Livia khaziensis Heslop-Harrison, 1949: 256.

Material examined. South Korea (JJ, JN) (NIBR, SNU).

Host plant. *Juncus* cf. *decipiens* (Buchenau) Nakai (Juncaceae).
Comments. New record for Korea.



FIGURES 15–20. *Craspedolepta yongjungi* **sp. nov. 15.** Head, dorsal view. **16.** Forewing. **17.** Male terminalia, in profile. **18.** Female terminalia, in profile. **19.** Paramere, outer surface. **20.** Distal segment of aedeagus. Scale = 0.1mm.

Psyllidae: Macrocorsinae

***Colophorina flavivittata* (Li, 1992)**
(Fig. 21)

Euphalerus flavivittatus Li, 1992a: 144.
Colophorina flavivittata; Li, 2011: 510.

Material examined. South Korea (GG, GN) (NHMB, NIBR, SNU).
Host plant. *Gleditsia sinensis* Lam. (Fabaceae), confirmed by the presence of immatures.
Comments. New record for Korea. The material from Korea differs from the description of *C. flavivittata* in

the more truncate genal processes (Li 1992a, 2011). More material, including specimens from China, are necessary to evaluate these differences.

Colophorina robinae (Shinji, 1938)

(Figs. 22−25)

Metapsylla robinae Shinji, 1938: 147.
Euphalerus robinae: Miyatake, 1973: 24.
Colophorina robinae: Li, 2011: 511.

Material examined. South Korea (GG, JN) (NHMB, NIBR, SNU).

Host plant. *Gleditsia japonica* Miq. (Fabaceae), confirmed by the presence of immatures.

Comments. In recent Korean checklists (Lee *et al.* 2014; Kwon *et al.* 2015a) this species is still listed under *Euphalerus*.

Epiacizzia kuwayamai (Crawford, 1911)

(Figs. 26−27)

Psylla kuwayamai Crawford, 1911: 432; replacement name for *Psylla tripunctata* Kuwayama, 1908: 172, nec Fitch, 1851: 64, primary homonym.
Epiacizzia kuwayamai; Li, 2011: 546.

Material examined. South Korea (JJ) (NHMB, SNU).

Host plant. *Neolitsea sericea* (Blume) Koidz. (Lauraceae), confirmed by the presence of immatures.

Comments. New record for Korea. Inoue (2010) suggested that Japanese populations differ morphologically from those of Taiwan, the type locality of the species. Our specimens resemble the Japanese form conforming to the description of Miyatake (1981).

Psyllidae: Psyllinae

Cacopsylla abdominalis (Meyer-Dür, 1871)

(Figs. 28−29)

Psylla abdominalis Meyer-Dür, 1871: 394.
Cacopsylla (Hepatopsylla) abdominalis; Burckhardt, 1983: 62.
Psylla (*Hepatopsylla*) *seonhyeongae* Kwon, 1983: 58, **syn. nov.**
Cacopsylla seonhyeongae; Park, 1996: 272.

Material examined. South Korea: 1 ♀ paratype of *Psylla* (*Hepatopsylla*) *seonhyeongae*, GB, Mt. Juwangsan, 19.vii.1981, *Salix* sp. (Y. J. Kwon) (NHMB).—South Korea (CB, GW) (NHMB, SNU), Europe (Austria, Germany, Switzerland) (MHNG, NHMB).

Host plant. *Salix caprea* L., *Salix* sp. (Salicaceae), confirmed by the presence of immatures.

Comments. Comparison of material of *C. abdominalis* from Europe (MHNG, NHMB) and of a paratype of *C. seonhyeongae* from Korea (NHMB) shows that the two taxa are conspecific. For this reason, they are synonymised here.

Cacopsylla albopontis (Kuwayama, 1908), stat. rev. et comb. nov.

(Fig. 30)

Psylla albopontis Kuwayama, 1908: 164.

Psylla danpunga Park & Lee, 1982: 197, **syn. nov.**
?*Psylla* (*Hepatopsylla*) *abieti* sensu Kwon, 1983: 69, p. p., nec Kuwayama, 1908: 175.
Psylla moni Konovalova & Loginova, 1985: 21, **syn. nov.**
Cacopsylla danpunga; Park, 1996: 271.

Material examined. South Korea (GB, GW, JN, GN, JB) (NHMB, NIBR, SNU).

Host plant. *Acer pictum* Thunb. var. *mono* Maxim., *A. pseudosieboldianum* (Pax) Kom. (Sapindaceae), confirmed by the presence of immatures.

Comments. *Psylla albopontis*, originally described from Japan, is closely related to *Cacopsylla abieti* (Kuwayama, 1908) with which it was synonymised by Miyatake (1964a). It differs from *C. abieti* in the forewing which has dark patches along the apical and posterior margins rather than completely yellow to brown, the denser setae on the inner face of the paramere and the more rounded, rather angular apical dilatation of the distal segment of the aedeagus. We consider *P. albopontis* a good species of *Cacopsylla*, remove it from synonymy and transfer it to *Cacopsylla*. *Psylla danpunga* Park & Lee, 1982, and *Psylla moni* Konovalova & Loginova, 1985 display the same diagnostic characters as *C. albopontis* suggesting they are conspecific. We, therefore, synonymise them with *Cacopsylla albopontis*. We have not examined material of *P. abieti* sensu Kwon (1983). Judging from the description it is a mix of *C. albopontis* and *C. pseudosieboldiani* (Konovalova & Loginova, 1985). The species is associated with several *Acer* spp. (Sapindaceae).

Cacopsylla araliae (Konovalova, 1981), comb. nov.

(Figs. 31−34)

Psylla araliae Konovalova, 1981: 11.

Material examined. South Korea (JN, GW, GG) (NHMB, SNU).

Host plant. *Aralia elata* (Miq.) Seem. (Araliaceae), confirmed by the presence of immatures.

Comments. New record for Korea. This species was described in *Psylla* from the Russian Far East (Konovalova 1988). Cho & Lee (2015a) reported a *Cacopsylla* sp. from Korea without further locality data associated with *Aralia elata* (Miq.) Seem. (Araliaceae) which is referable to *C. araliae*. The species is congeneric with *Cacopsylla fatsiae* (Jensen, 1957) and *C. hederae* (Miyatake, 1964), two species also associated with Araliaceae. For this reason, it is formally transferred here to *Cacopsylla*.

Cacopsylla baccatae Cho & Burckhardt, sp. nov.

(Figs. 35−36, 61−68)

Diagnosis. Adults of the new species resemble those of *Cacopsylla malivorella* [Matsumura, in (Sasaki, 1915)] and *C. myriacantha* Li, 2011 in the forewing with a straight fore margin and a broadly rounded apex, as well as the short broad paramere with a prominent antero-apical beak-like process and two groups of strongly sclerotised peg setae on its inner face. It differs from both species in the narrower paramere whose fore margin is hardly curved in the apical two thirds (rather than strongly curved), and in the strongly inflated apical dilatation of the distal segment of the aedegus (rather than flattened and weakly inflated).—Immatures mostly lack capitate setae, bearing 13–15 long marginal slightly rod-shaped setae on forewing pad and 11 on caudal plate on either side, the latter also with 2+2 marginal sectasetae. Abdomen with three large lateral and two large and a small submedian free sternites on either side of mid-line. Circumanal ring small, close to posterior margin of subgenital plate, consisting of a single row of pores.

Description. Adult. Body colour in recently emerged specimens light green with yellow longitudinal stripes on thorax, translucent forewings with light veins (Fig. 35); overwintered specimens dark brown to black with lighter pattern on head and thorax, forewing greyish with dark brown veins more or less expanded dark brown pattern in apical half, sometimes restricted to narrow stripes along the veins in overwintered specimens. Antenna light brown, segments 4−8 dark brown to black apically, segments 9 and 10 entirely black. Hindwing almost colourless, transparent. Legs brown; tibiae and basitarsi light greyish. Head (Fig. 61) as broad as thorax; vertex subtrapezoidal, covered in microscopic setae; preocular sclerite small and narrow; genal processes 0.7–0.9 times as long as vertex along midline,

relatively evenly conical, subacute apically, their longitudinal axis subparallel. Antenna 1.1–1.2 times as long as head width; segment 3 the longest but not much longer than segment 4; relative length of flagellar segments as 1 : 0.8 : 0.7: 0.7: 0.7: 0.7 : 04 : 0.5; segments 4–8 subequal in length; relative lengths of segment 10 and terminal setae as 1 : 0.9 : 0.3. Forewing oblong oval, with straight anterior margin and broadly, slightly asymmetrically rounded apex (Fig. 62); pterostigma evenly narrowing to apical third of r_1; vein C+Sc evenly curved in the middle, cell c+sc broad; vein Rs imperceptibly sinuous, weakly curved towards fore margin apically; veins M and M_{1+2} distinctly curved, M_{3+4} almost straight; cell m_1 triangular; vein Cu_{1a} moderately curved in the middle, vein Cu_{1b} short, curved at apex; cell cu_1 small and irregularly triangular; surface spinules densely spaced, present in all cells covering membrane up to the veins; veins clothed in very short macroscopic setae. Hindwing simple, membraneous; costal setae not grouped; vein M+Cu developed. Metatibia 0.59–0.60 times as long as head width, with well-developed genual spine and 1+3+1 sclerotised apical spurs; metabasitarsus with two sclerotised spurs. Terminalia as in Figs. 63−66. Male proctiger slender, strongly curved subapically, hairy. Male subgenital plate slightly elongate, hairy in the middle and ventrally. Paramere securiform, slender basally, wide apically, fore margin of apical portion forming anteriorly extended to form narrow, outer lobe, antero-apical edge drawn into obliquely upwards directed point; outer surface covered with simple setae, inner surface with two groups of sclerotised peg setae (Fig. 65). Distal segment of aedeagus straight in basal two thirds, strongly dilated apically to form an irregular sphere (Fig. 66); sclerotised end tube of ductus ejaculatorius short, weakly sinuous. Female terminalia cuneate (Fig. 64). Female proctiger 0.70 times as long as head width, with concave, though slightly sinuous, dorsal outline and narrowly rounded apex; base around circumanal ring membranous; long setae in apical half of proctiger arranged in an irregular longitudinal row on either side; circumanal ring relatively short, consisting of two unequal rows of pores, distally slightly extended to contain three rows. Subgenital plate cuneate, dorsal margin irregularly concave, ventral margin slightly curved at base, otherwise relatively straight, pointed apically, sparsely covered in moderately long hairs except for bare base. Lateral valvulae bluntly rounded apically; dorsal valvulae cuneate, weakly curved; ventral valvulae weakly curved with subapical tooth.

Measurements (in mm; 1 ♂, 1 ♀): head width ♂ 0.71, ♀ 0.75; antenna length ♂ 0.82, ♀ 0.85; forewing length ♂ 2.18, ♀ 2.41; metatibia length ♂ 0.42, ♀ 0.44; proctiger length ♂ 0.43, ♀ 0.53.

Fifth instar immature. Body green with white longitudinal stripe in the middle, elongate, 1.42–1.62 times as long as broad (Figs. 36, 67−68). Antenna 7−segmented, 0.92–1.00 times as long as forewing pad, off-white with dark apices of segments 5 and 6, and entire segment 7. Forewing pad oblong oval, lacking humeral lobes and macroscopic dorsal setae. Legs moderately long, lacking capitate setae. Caudal plate evenly rounded, 1.49–1.69 times as wide as long, lacking long dorsal setae, 2+2 marginal sectasetae. Abdominal venter with three large lateral and two large and a small submedian free sternites on either side of mid-line. Circumanal ring almost circular (Fig. 68), small, close to hind margin, distance between hind margins of circumanal ring and caudal plate about a third of that between fore and hind margins of circumanal ring; composed of a single row of small pores, broken anteriorly. Body margin with following numbers of long simple, slightly rod-shaped setae (one side only): anterior head margin in front of eye 5–7, on eye 1, behind eye 2–3, forewing pad 13–15, hindwing pad 2, precaudal area 6–7, caudal plate 11.

Measurements (in mm; 4 specimens): body length 1.88–2.03; antenna length 0.70–0.78; forewing pad length 0.75–0.78; metatibia length 0.30–0.31; caudal plate length 0.53–0.56.

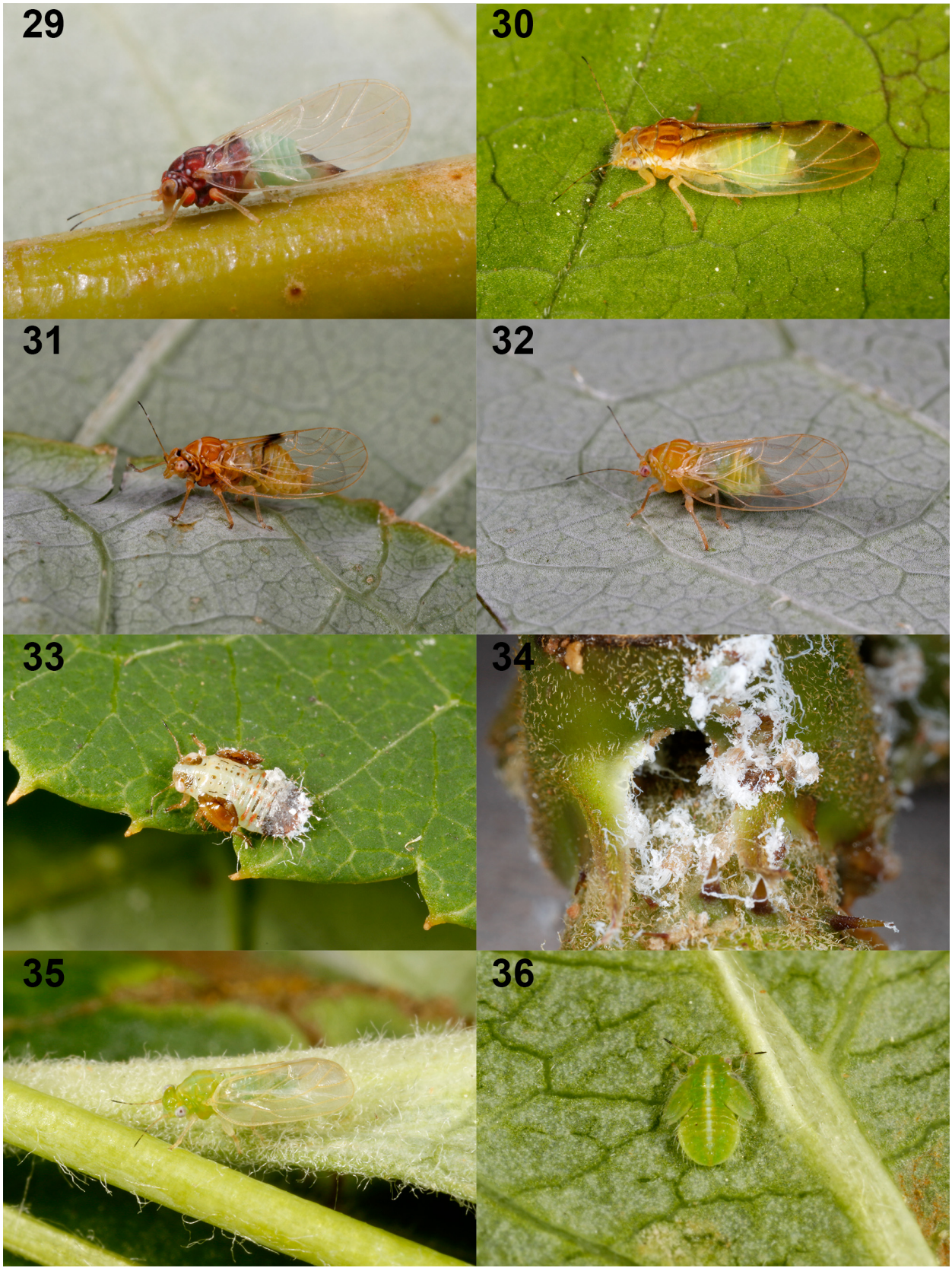
Type material. Holotype ♂, South Korea, GW, Pyeongchang-gun, Daegwanryeong-myeon, Hoenggye-ri, 31.iii.2016 (SNU, dry mounted).—Paratypes: 1 ♂, 1 ♀, same data as holotype but (SNU, slide mounted); 1 ♂, 2 ♀, 5 immatures, same but Hongcheon-gun, Nae-myeon, Myeonggae-ri, 7.vi.2015, *Malus baccata* (G. H. Cho) (SNU; slide mounted and 95% ethanol); 1 ♀, 3 immature, same data but 18.v.2016 (D. Burckhardt & G. H. Cho) (NHMB, SNU; dry and slide mounted, preserved in 70% and 95% ethanol).

Host plant. *Malus baccata* (L.) Borkh. (Rosaceae), confirmed by the presence of immatures.

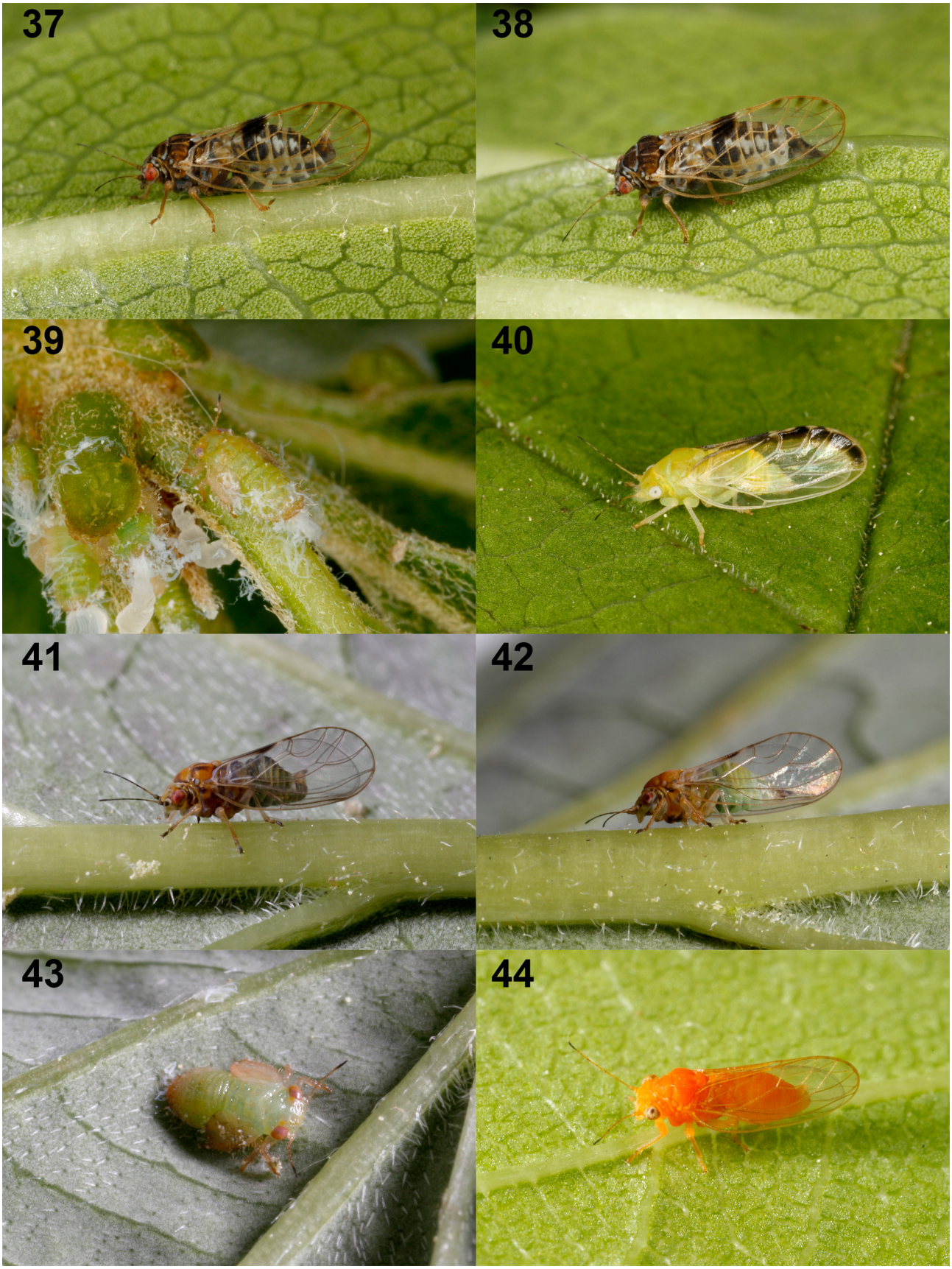
Etymology. Named after its host *Malus baccata*.

Comments. *Cacopsylla baccatae* shares with *C. malivorella* from Japan and the Russian Far East and *C. myriacantha* Li, 2011 from China the shape of the forewing, the peculiar built of the paramere and, with the former, the host *Malus*, that of the latter being unknown. This suggests that the three species are closely related. *C. baccatae* differs from the other two species in details of the paramere, e. g. the length/width ratios which are as follows: *C. baccatae* 2.0, *C. malivorella* 1.7 and *C. myriacantha* 1.4. *C. baccatae* differs from the other two species also in the more inflated, subspherical apical dilatation of the distal portion of the aedeagus which is more flattened in the other two species.

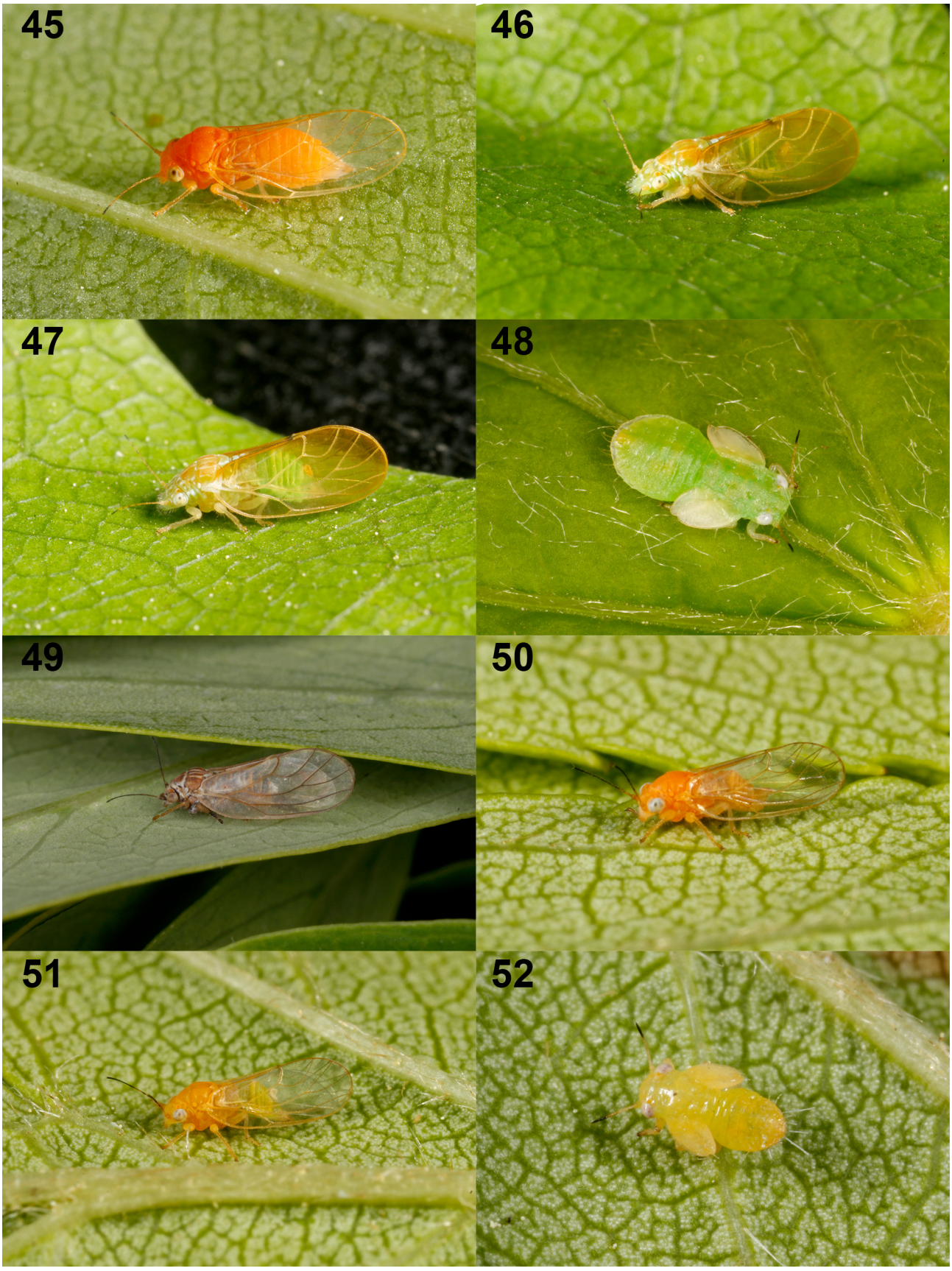
FIGURES 21–28. Habitus. **21.** *Colophorina flavivittata*, adult male. **22.** *Colophorina robinae*, adult male. **23.** *Colophorina robinae*, adult female. **24.** *Colophorina robinae*, fifth instar immature. **25.** Leaf galls induced by *Colophorina robinae*. **26.** *Epiacizzia kuwayamai*, adult male. **27.** *Epiacizzia kuwayamai*, adult female. **28.** *Cacopsylla abdominalis*, adult male.



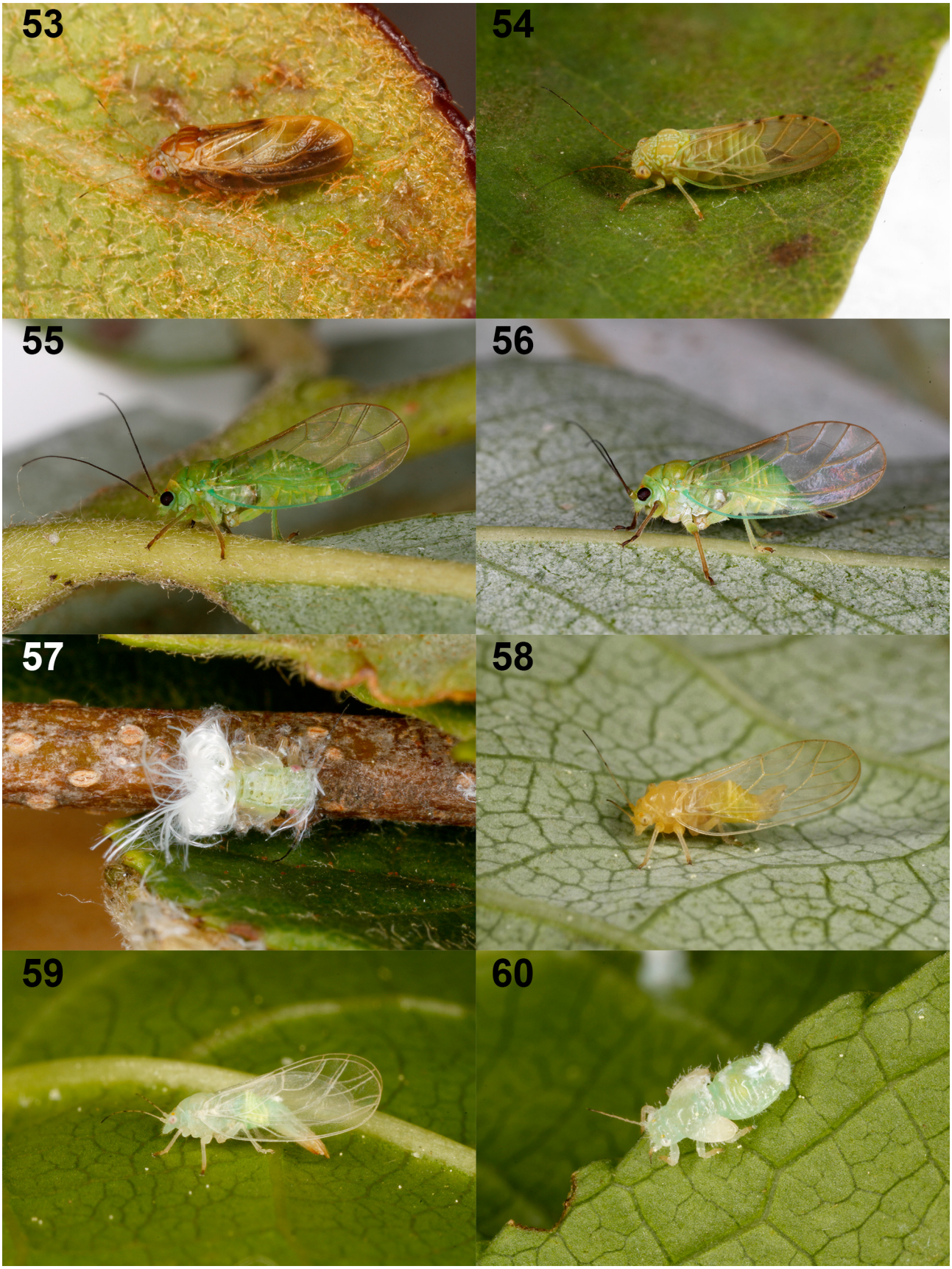
FIGURES 29–36. Habitus. **29.** *Cacopsylla abdominalis*, adult female. **30.** *Cacopsylla albopontis*, adult female. **31.** *Cacopsylla araliae*, adult male of autumn generation. **32.** *Cacopsylla araliae*, adult female of spring generation. **33.** *Cacopsylla araliae*, fifth instar immature. **34.** Microhabitat of *Cacopsylla araliae*, interpetiolar space. **35.** *Cacopsylla baccatae* **sp. nov.**, adult male. **36.** *Cacopsylla baccatae* **sp. nov.**, fifth instar immature.



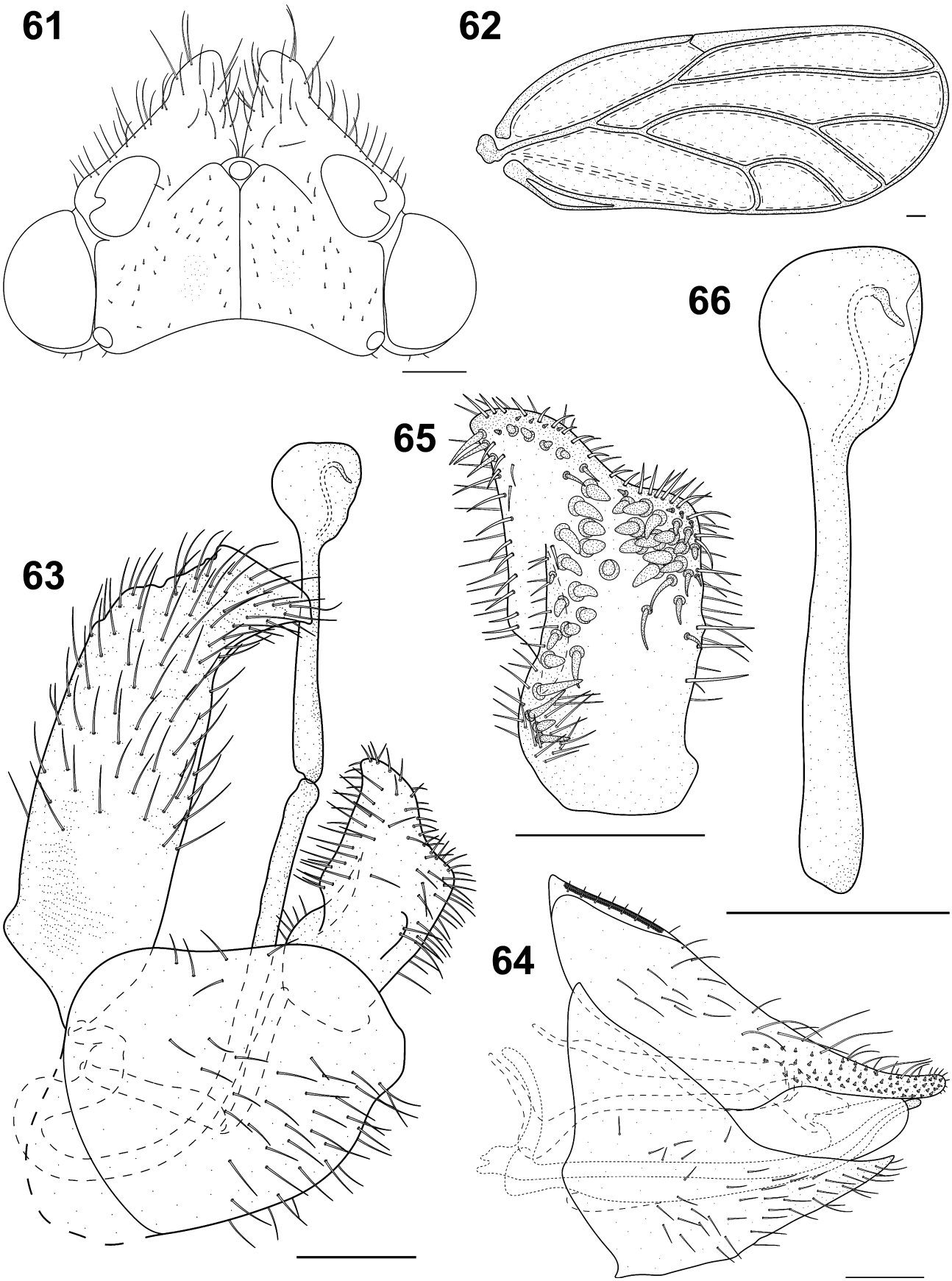
FIGURES 37–44. Habitus. **37.** *Cacopsylla bibari*, adult male. **38.** *Cacopsylla bibari*, adult female. **39.** *Cacopsylla bibari*, fifth instar immature. **40.** *Cacopsylla lineaticeps*, adult female. **41.** *Cacopsylla nopeunsanicola*, adult male. **42.** *Cacopsylla nopeunsanicola*, adult female. **43.** *Cacopsylla nopeunsanicola*, fifth instar immature. **44.** *Cacopsylla peninsularis*, adult male.



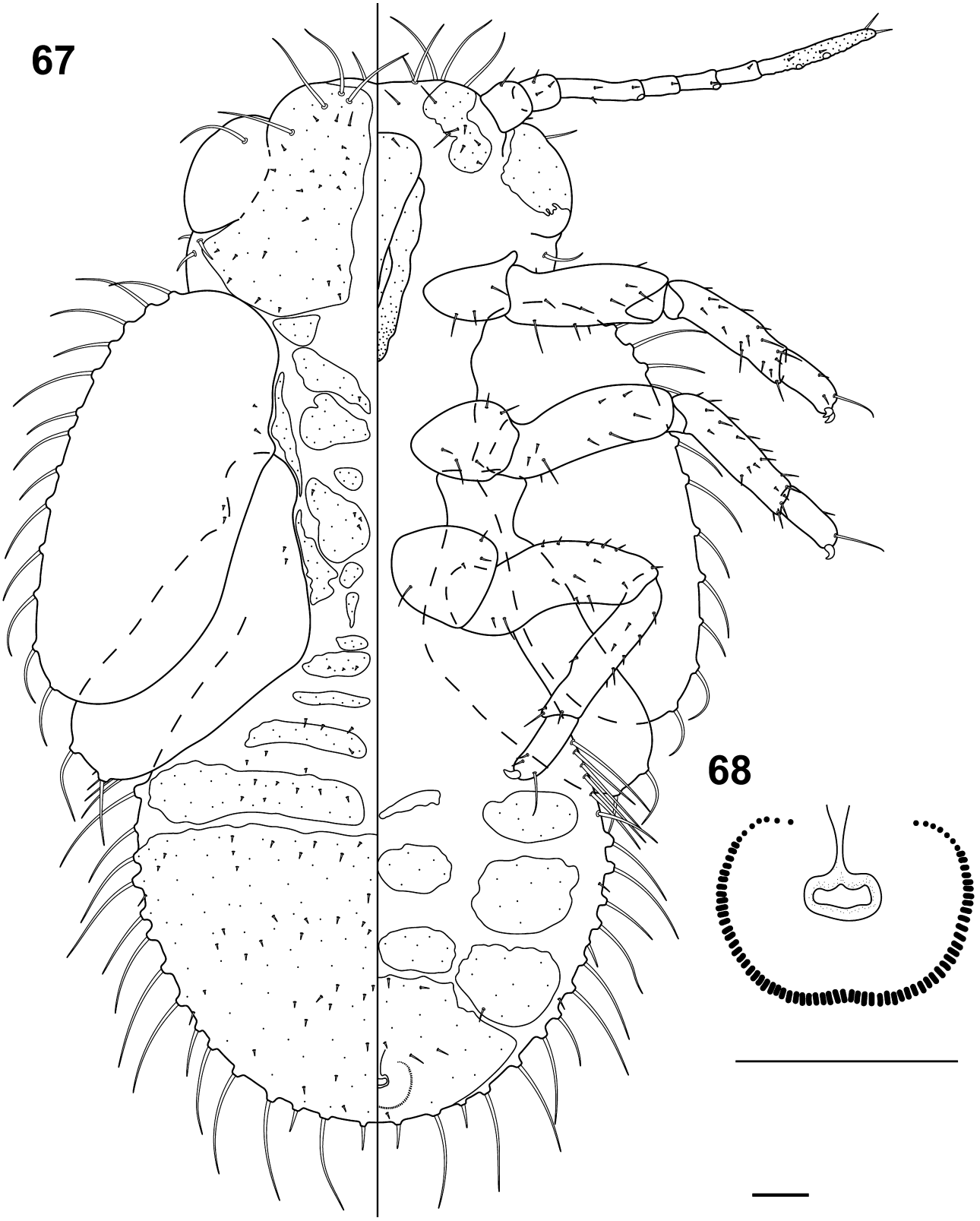
FIGURES 45–52. Habitus. **45.** *Cacopsylla peninsularis*, adult female. **46.** *Cacopsylla pseudosieboldiani*, adult male. **47.** *Cacopsylla pseudosieboldiani*, adult female. **48.** *Cacopsylla pseudosieboldiani*, fifth instar immature. **49.** *Cacopsylla pulchra*, adult female. **50.** *Cacopsylla sangjaei*, adult male. **51.** *Cacopsylla sangjaei*, adult female. **52.** *Cacopsylla sangjaei*, fifth instar immature.



FIGURES 53–60. Habitus. **53.** *Cacopsylla satsumensis*, adult male. **54.** *Cyamophila floribundae* **sp. nov.**, adult female. **55.** *Psylla alniformosanaesuga*, adult male. **56.** *Psylla alniformosanaesuga*, adult female. **57.** *Psylla alniformosanaesuga*, fourth instar immature. **58.** *Psylla longicauda*, adult male. **59.** *Psylla longicauda*, teneral adult female. **60.** *Psylla longicauda*, fifth instar immature.



FIGURES 61–66. *Cacopsylla baccatae* **sp. nov. 61.** Head, dorsal view. **62.** Forewing, dashed line represents the areas with surface spinules. **63.** Male terminalia, in profile. **64.** Female terminalia, in profile. **65.** Paramere, inner surface. **66.** Distal segment of aedeagus. Scale = 0.1mm.



FIGURES 67–68. *Cacopsylla baccatae* **sp. nov.**, fifth instar immature. **67.** Habitus, dorsal aspect (Left) and ventral aspect (right). **68.** Circumanal ring. Scale = 0.1mm.

***Cacopsylla bibari* (Kwon, 1983)**
(Figs. 37−39)

Psylla (*Hepatopsylla*) *bibari* Kwon, 1983: 65.
Cacopsylla bibari, Park, 1996: 271.
Psylla (*Hepatopsylla*) *quelparticola* Kwon, 1983: 64, **syn. nov.**
Cacopsylla quelparticola, Park, 1996: 272.
Cacopsylla sp. 1, Hayashi & Miyatake, 2012: 39.

Material examined. South Korea (JJ, JN) (NHMB, SNU).

Host plant. *Pittosporum tobira* (Thunb.) W.T. Aiton (Pittosporaceae), confirmed by the presence of immatures.

Comments. Kwon (1983) described both *Cacopsylla quelparticola* and *C. bibari* based on a single male each from Jeju Island. The major difference between the two is, according to Kwon (1983), the spinule free stripes on the forewing which are 'apparently broad' in the former and 'prominent but relatively narrower' in the latter. We collected large series of specimens in several localities on Jeju Island and in the South of the Peninsula, along with *Cacopsylla tobirae* on *Pittosporum tobirae* (Pittosporaceae), which suggest that these differences are within the range of intraspecific variation. For this reason, we synonymise the two taxa. As both species have been described in the same publication we chose *Psylla bibari* as senior name as it is more euphonious and, thus, complies better with recommendation 25C of the International Commission on Zoological Nomenclature (1999). *Cacopsylla* sp. 1 by Hayashi & Miyatake (2012) from Japan, collected on *Pittosporum tobirae*, is referrable to *C. bibari*.

***Cacopsylla lineaticeps* (Kwon, 1983)**
(Fig. 40)

Psylla (*Hepatopsylla*) *lineaticeps* Kwon, 1983: 69.
Cacopsylla lineaticeps; Li *et al.*, 1993: 12; Park, 1996: 271.
Psylla ginnali Konovalova & Loginova, 1985: 20, **syn. nov.**
Cacopsylla ginnali; Labina *et al.*, 2014: 327.

Material examined. South Korea: 1 ♂, 1 ♀, GB, Mt. Juwangsan, 19.vii.1981 (Y. J. Kwon) (NHMB).—South Korea (GB, GG, GW) (NHMB, SNU).

Host plant. *Acer tataricum* L. subsp. *ginnala* (Maxim.) Wesm. (Sapindaceae), confirmed by the presence of immatures.

Comments. The narrow forewing bearing an apical, well defined dark band, the male and female terminalia, as well as the host, i.e. *Acer tataricum* L. subsp. *ginnala* (Maxim.) Wesm. (Sapindaceae) define this species. *Psylla ginnali* Konovalova & Loginova (1985) shares these characters suggesting that it is conspecific with *C. lineaticeps*. This has been previously presumed by Labina *et al.* (2014) and we formally synonymise the two taxa.

***Cacopsylla nopeunsanicola* (Kwon, 1983)**
(Figs. 41−43)

Psylla (*Hepatopsylla*) *nopeunsanicola* Kwon, 1983: 72.
Cacopsylla swidae Inoue, 2004b: 144, **syn. nov.**

Material examined. South Korea: 1 ♂ paratype of *Psylla* (*Hepatopsylla*) *nopeunsanicola*, GW, Mt. Seolagsan, 30.vii.1982 (Y. J. Kwon) (NHMB). —South Korea (GB, GG, GW, JN) (NHMB, SNU), Japan (SNU).

Host plant. *Cornus controversa* Hemsl. (Cornaceae), confirmed by the presence of immatures.

Comments. Kwon (1983) described *Psylla nopeunsanicola* from each locality in GW and JJ, respectively. We collected the species in many places on *Cornus controversa* (Cornaceae), which is its host plant, not *Abies* sp. as suggested by Kwon (1983). Inoue (2004b) pointed out that the Japanese populations previously referred to the European *Cacopsylla melanoneura* in fact belong to a different species, which he named *C. swidae* after its host

Swida controversa, a synonym of *Cornus controversa*. Comparison of specimens of *C. swidae* from Japan and of *C. nopeunsanicola* from Korea suggests that the two taxa are conspecific and, for that reason, they are synonymised here.

Cacopsylla peninsularis (Kwon, 1983)

(Figs. 44−45)

Psylla (*Cacopsylla*) *peninsularis* Kwon, 1983: 46.
Cacopsylla penninsularis [sic]; Park, 1996: 272.
Psylla (*Cacopsylla*) *peninsularis hanlasanensis* Kwon, 1983: 46, synonymised by Park, 1996: 272.
Cacopsylla (*Hepatopsylla*) *sorbicoccinea* Inoue, 2004a: 409, **syn. nov.**

Material examined. South Korea: 1 ♀ paratype of *Psylla* (*Cacopsylla*) *peninsularis*, GB, Mt. Palgongsan, 27.v.1981 (Y. J. Kwon) (NHMB); 1 ♀ paratype of *Psylla* (*Cacopsylla*) *peninsularis hanlasanensis*, JJ, Mt. Hanlasan, 23.vii.1981 (Y. J. Kwon) (NHMB).—South Korea (GB, GG, GW) (NHMB, SNU), Japan (SNU).

Host plant. *Sorbus alnifolia* (Sieb. & Zucc.) K. Koch (Rosaceae), confirmed by the presence of immatures.

Comments. The comparison of paratypes of *Cacopsylla peninsularis* and *C. peninsularis hanlasanensis* with Japanese specimens of *C. sorbicoccinea* showed that the three taxa are conspecific. For this reason, we synonymise *C. sorbicoccinea* with *C. peninsularis*. We also confirm the synonymy of *C. peninsularis hanlasanensis* with the latter suggested by Park (1996).

Cacopsylla pseudosieboldiani (Konovalova & Loginova, 1985)

(Figs. 46−48)

Psylla pseudosieboldiani Konovalova & Loginova, 1985: 22.
Cacopsylla pseudosieboldiani; Labina *et al.*, 2014: 327.
Psylla (*Hepatopsylla*) *abieti* sensu Kwon, 1983: 69, p. p., nec Kuwayama, 1908: 175.
Psylla koreana Park, 1992: 22, **syn. nov.**
Cacopsylla koreana; Park, 1996: 271.
Cacopsylla sieboldiana Li, 2011: 1106, **syn. nov.**

Material examined. South Korea: 1 ♂, 1 ♀, identified as *Psylla abieti*, JJ, Mt. Hanlasan, 22.vii.1981 (Y. J. Kwon) (NHMB).—South Korea (GB, GG, GN, GW, JB, JJ, JN) (NHMB, NIBR, SNU).

Host plant. *Acer pseudosieboldiani* (Pax) Kom., *A. pictum* Thunb. var. *mono* (Maxim.) Maxim. (Sapindaceae), confirmed by the presence of immatures.

Comments. Among the East Asian *Cacopsylla* species associated with *Acer* spp. (Sapindaceae) (Konovalova & Loginova 1985; Park & Lee 1992), two species, i.e. *C. abieti* and *C. pseudosieboldiani*, are characterised by massive, apically truncate genal processes and by relatively broad, yellow to ochreous forewings, lacking a dark pattern except for the dark claval apex and bearing very dense surface spinules, covering the entire wing membrane. The paramere of *C. abieti* is broad subapically, that of *C. pseudosieboldiani* slender. *Psylla koreana* Park (1992) and *Cacopsylla sieboldiana* Li (2011) display these head and forewing characters and, in particular the apically slender paramere, suggesting that they are conspecific with *C. pseudosieboldiani*. For this reason, we synonymise them. We have examined specimens from JJ identified by Y. J. Kwon as *P. abieti* that are *C. pseudosieboldiani*. Judging from his description, it appears that the specimens treated by Kwon (1983) under *P. abieti* are a mix of *C. albopontis* and *C. pseudosieboldiani*.

Cacopsylla pulchra (Zetterstedt, 1840)

(Fig. 49)

Chermes pulchra Zetterstedt, 1840: 309.
Psylla sapporensis Kuwayama, 1908: 166; synonymised by Miyatake, 1964b: 7.

Psylla (*Hepatopsylla*) *kwonnabiae* Kwon, 1983: 71, **syn. nov.**
Cacopsylla kwonnabiae; Park, 1996: 271.

Material examined. South Korea: 1 ♂, 1 ♀ paratypes of *Psylla* (*Hetatopsylla*) *kwonnabiae*, GG, Mt. Myeongseongsan, 16.v.1982 (Y. J. Kwon) (NHMB).—South Korea (GB, GG, GW), Europe (Austria, Czech Republic, France, Germany, Italy, Russia, Switzerland) (MHNG, NHMB, SNU).

Host plant. *Salix gracilistyla* Miq. (Salicaceae), confirmed by the presence of immatures.

Comments. The comparison of specimens of *Cacopsylla pulchra* from Europe with paratypes of *C. kwonnabiae* shows that they are conspecific. For this reason, they are synonymised here.

Cacopsylla sangjaei (Kwon, 1983)

(Figs. 50−52)

Psylla (*Hetatopsylla*) *sangjaei* Kwon, 1983: 72.
Cacopsylla sangjaei; Park, 1996: 272.
Cacopsylla idiocrataegi Li, 1992b: 91, **syn. nov.**

Material examined. South Korea (GG, GW) (NHMB, SNU).

Host plant. *Crataegus pinnatifida* Bunge (Rosaceae), confirmed by the presence of immatures.

Comments. *Cacopsylla sangjaei* develops on *Crataegus pinnatifida* on which it is commonly found. The description of *C. idiocrataegi* by Li (1992b), that develops also on *Crataegus pinnatifida*, suggests that this species is conspecific with *C. sangjaei*. The two taxa are, therefore, synonymised.

Cacopsylla satsumensis (Kuwayama, 1908)

(Fig. 53)

Psylla satsumensis Kuwayama, 1908: 177.
Cacopsylla satsumensis; Inoue, 2010: 352.
Psylla (*Hepatopsylla*) *truncaticephala* Kwon, 1983: 70, **syn. nov**.
Cacopsylla truncaticephala; Park, 1996: 272.

Material examined. 1 ♂, 1 ♀ paratypes of *Psylla* (*Hetatopsylla*) *truncaticephala*, JN, Hongdo Island, 11.viii.1981 (Y. J. Kwon) (NHMB).—South Korea (JJ, JN) (NHMB, SNU), Japan (SNU).

Host plant. *Rhaphiolepis indica* (L.) Lindley (Rosaceae), confirmed by the presence of immatures.

Comments. The comparison of paratypes of *P. truncaticephala* with specimens of *C. satsumensis* from Japan shows that they are conspecific, sharing the brown cloudy pattern in the apical half of the forewing and the host plant *Rhaphiolepis indica* (L.) Lindl. (Rosaceae), not *Camellia japonica* as suggested by Kwon (1983). For this reason, we synonymise the two taxa here.

Cacopsylla visci (Curtis, 1835)

Psylla visci Curtis, 1835: 565.

Material examined. South Korea (GW) (SNU), Europe (Austria, France, Germany, Spain, Switzerland) (MHNG, NHMB).

Host plant. From Korea only adults are available which were collected in a light trap. It is likely that the species develops on *Viscum coloratum* (Kom.) Nakai (Viscaceae), the only species of this genus occurring in Korea.

Comments. New record for Korea.

***Cacopsylla zinovjevi* (Loginova, 1965)**

Psylla zinovjevi Loginova, 1965: 203.
Cacopsylla zinovjevi; Li & Yuang, 1995: 138.

Material examined. South Korea (GW) (NHMB), Russia (MHNG).

Host plant. *Salix* sp. (Salicaceae).

Comments. New record for Korea.

***Cyamophila floribundae* Cho & Burckhardt, sp. nov.**
(Figs. 54, 69, 71, 73, 75, 77, 79−80)

Diagnosis. The new species is similar to *Cyamophila hexastigma* (Horváth, 1899). It differs in the surface spinules of the forewing which are denser and irregularly spaced, leaving only narrow spinule-free stripes along the veins. It differs from *C. hexastigma* also in the host: *Maackia floribunda*, rather than *M. amurensis*.

Description. Adult. Colour and structure similar to *C. hexastigma*. Body colour greenish (Fig. 54), yellowish in ethanol preserved specimens, with whitish pattern on head and thorax in young specimens becoming dark brown in overwintered individuals. Antenna yellow, segments 1 and 2, greyish brown, segments 4–7 brown apically, dark portion becoming larger in more distal segments, segments 8–10 brown to almost black. Forewing transparent, veins yellow or brown; membrane transparent, slightly yellowish, particularly towards the wing apex and in older specimens; in old specimens also sometimes yellow or ochreous stripes along veins in apical part; with each a conspicuous brown spot in the middle of cells m_1, m_2 and cu_1 along wing margin; surface spinules present in all cells, densely spaced forming irregular transverse rows, leaving only narrow, spinule-free stripes along the veins. Terminalia as in Figs. 75, 77, 79−80.

Measurements (in mm; 3 ♂, 3 ♀): head width ♂ 0.92−0.97, ♀ 0.98−1.05; antenna length ♂ 2.08−2.34, ♀ 2.16−2.39; forewing length ♂ 2.86−3.10, ♀ 3.12−3.31; metatibia length ♂ 0.60−0.65, ♀ 0.66−0.69; proctiger length ♂ 0.39−0.44, ♀ 0.77−0.83.

Type material. Holotype ♂, South Korea, JJ, Jeju-si, Halla Arboretum, 04.viii.2015, *Maackia floribunda* (G. Cho) (SNU; dry mounted).—Paratypes, South Korea: same data as holotype but, 10 ♂, 20 ♀, 1 immatures, (SNU, dry and slide mounted, in 95% ethanol); same data but, 1 ♂, 2 ♀, 5 immatures, 29.iv.2016 (D. Burckhardt & G. H. Cho) (NHMB, SNU; 70% and 95% ethanol).

Host plant. *Maackia floribunda* (Miq.) Takeda (Fabaceae), confirmed by the presence of immatures.

Etymology. Named after its host plant *Maackia floribunda*.

Comments. *Cyamophila floribundae* is morphologically similar to *C. hexastigma* and differs mostly in the distribution of the surface spinules. The male paramere is in average slightly stronger widened towards the apex in the former.

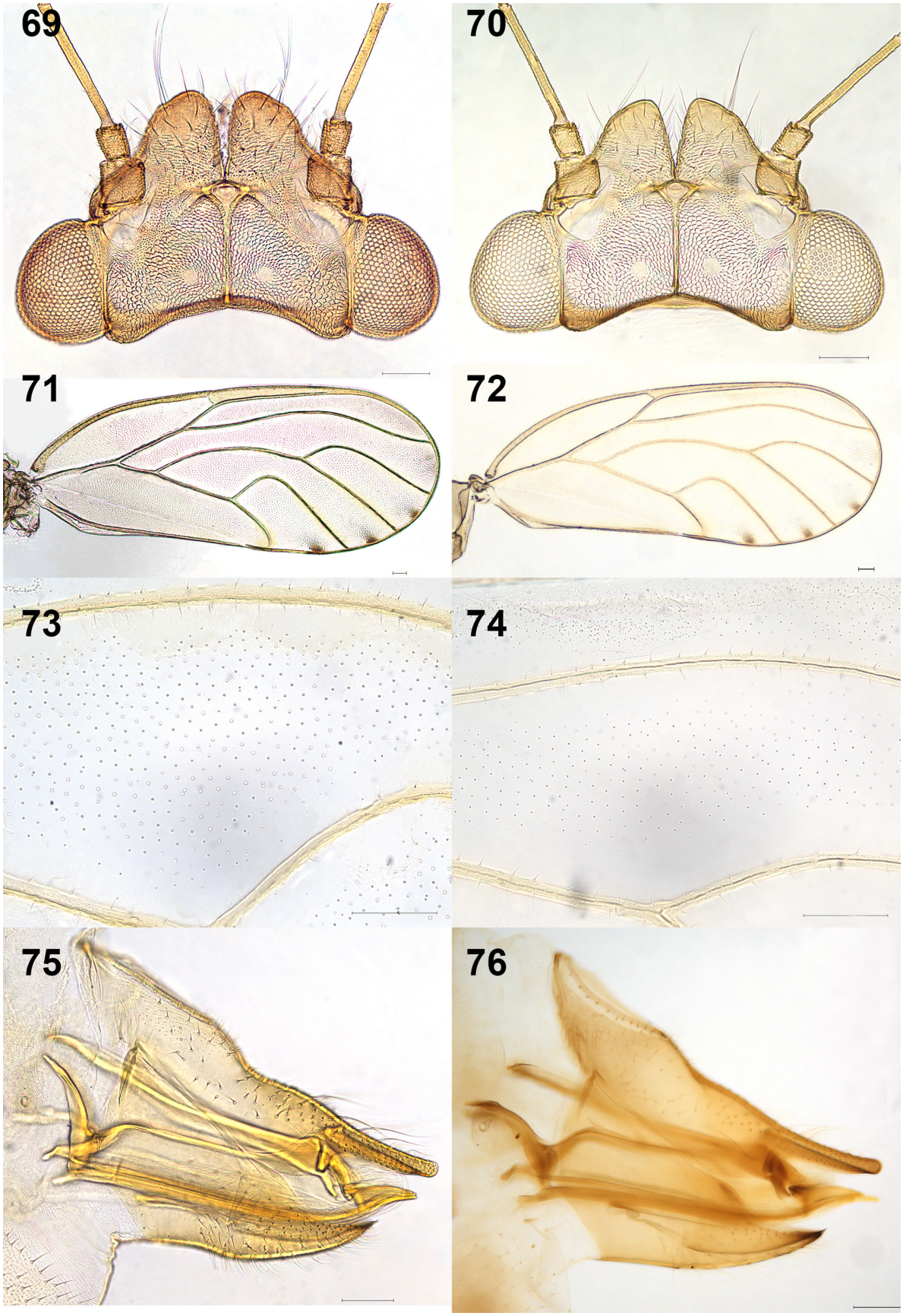
Psylla alniformosanaesuga Lauterer *et al.*, 1988
(Figs. 55−57)

Psylla alniformosanaesuga Lauterer *et al.*, 1988: 72.
Psylla alni, Kwon, 1983: 40, nec Linnaeus, 1758: 454, **misidentification**.

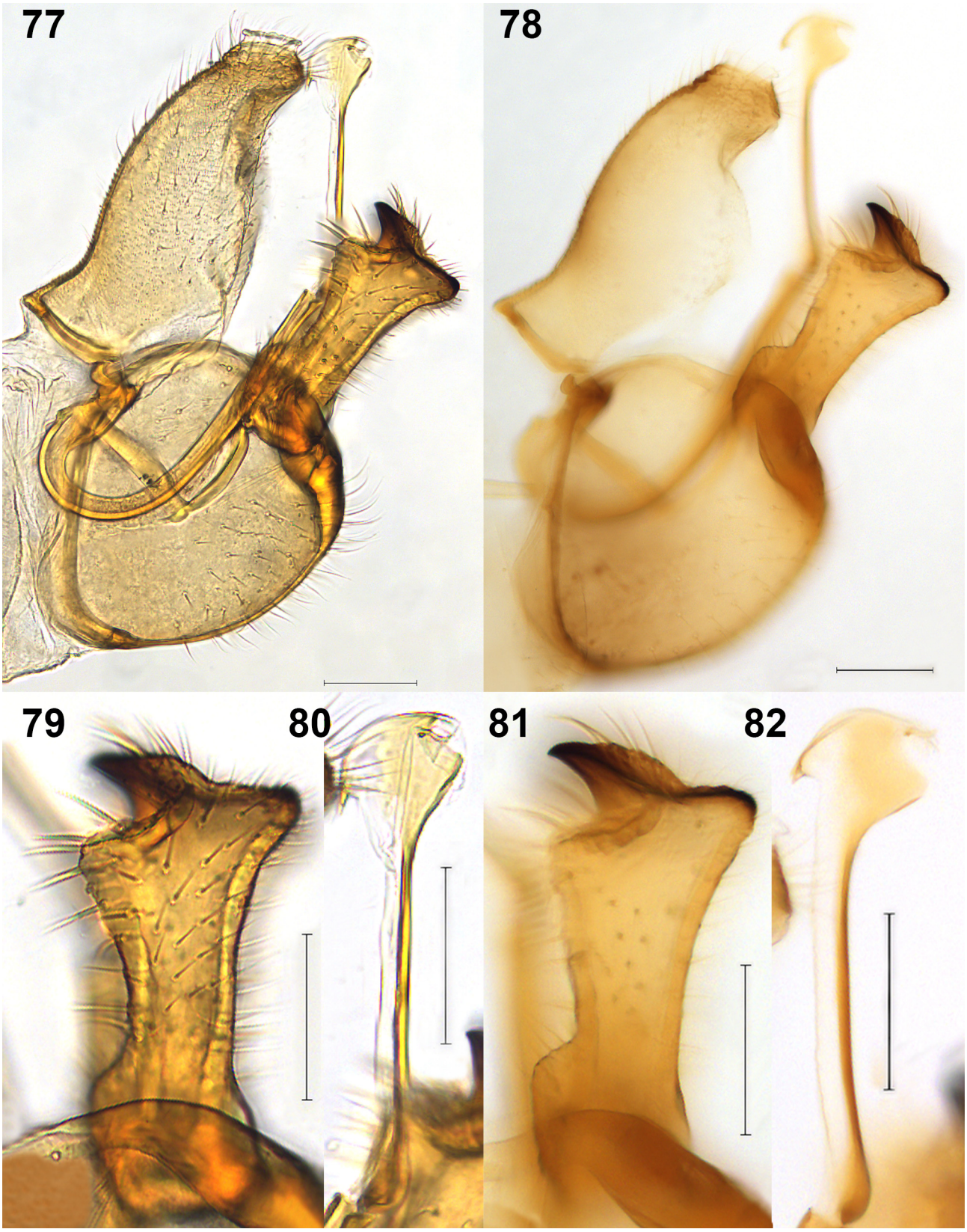
Material examined. South Korea: 1 ♂, 1 ♀ identified as *Psylla alni*, GB, Mt. Palgonsan, 18.vi.1983 (Y. J. Kwon) (NHMB).—South Korea (GB, GN, GW) (NHMB, SNU), Taiwan (NHMB).

Host plant. *Alnus incana* (L.) Medik. subsp. *hirsuta* A.Löve & D.Löve (Betulaceae), confirmed by the presence of immatures.

Comments. All previous records of *Psylla alni* from Korea (Kwon 1983; Park 1996; Kwon *et al.* 2015a) concern *P. alniformosanaesuga*. The former is excluded from the psyllid fauna of Korea.



FIGURES 69–76. Comparison between *Cyamophila floribundae* **sp. nov.** (69, 71, 73, 75) and *Cyamophila hexastigma* (70, 72, 74, 76). **69–70.** Head, dorsal view. **71–72.** Forewing. **73–74.** Forewing surface spinulation. **75–76.** Female terminalia, in profile. Scale = 0.1mm.



FIGURES 77–82. Comparison between *Cyamophila floribundae* **sp. nov.** (77, 79, 80) and *Cyamophila hexastigma* (78, 81, 82). **77–78.** Male terminalia, in profile. **79, 81.** Paramere, outer surface. **80, 82.** Distal segment of aedeagus. Scale = 0.1mm.

***Psylla longicauda* Konovalova, 1986**
(Figs. 58−60)

Psylla longicauda Konovalova, 1986: 148.

Material examined. South Korea (GG, GW) (NHMB, SNU).

Host plant. *Prunus padus* L. (Rosaceae), confirmed by the presence of immatures.

Comments. New record for Korea.

Triozidae

***Eotrioza ussuriensis* Konovalova, 1987**
(Figs. 83−84)

Eotrioza ussuriensis Konovalova, 1987: 35.
Trachotrioza beijingensis Li, 2011: 1350, **syn. nov.**

Material examined. South Korea: 1 ♂, 3 ♀, GW, Hongcheon-gun, Nae-myeon, Myeonggae-ri, 17.v.2016 (G. Cho & D. Burckhardt) (NHMB, SNU).

Host plant. Unknown.

Comments. Previously reported from Korea from a single female specimen without exact locality information (Kwon *et al.* 2015b).

Li (2011) erected *Trachotrioza* for two new Chinese species, *T. beijingensis* based on one male and one female, and *T. apicinigra* based on two males. Li's (2011) description leaves little doubt that *Trachotrioza beijingensis* is a junior synonym of *Eotrioza ussuriensis* originally described from the Russian Far East (Konovalova 1987). The differences between *T. beijingensis* and *T. apicinigra* mentioned in the original description (Li 2011), mostly size and colour, are more difficult to interpret. As we have not examined Li's types, we keep the two as separate species and transfer the latter to *Eotrioza*. This results in following nomenclatorial changes: *Eotrioza* Konovalova, 1987 = *Trachotrioza* Li, 2011, **syn. nov.**, *Eotrioza ussuriensis* Konovalova, 1987 = *Trachotrioza beijingensis* Li, 2011, **syn. nov.**, *Eotrioza apicinigra* (Li, 2011), **comb. nov.** from *Trachotrioza*.

***Trioza chilgia* Park & Lee, 1980, stat. rev.**
(Figs. 85−86)

Trioza camphorae sensu Kim, 1965: 53, nec Sasaki, 1910: 277.
Trioza chilgia Park & Lee, 1980: 15.
Heterotrioza (*Dyspersa*) *chilgia*, Kwon & Lee, 1981: 159.
Heterotrioza (*Dyspersa*) *noknamui* Kwon & Lee, 1981: 159; synonymised by Park, 1996: 275.
Trioza brevifrons sensu Kwon & Lee, 1981: 160, nec Kuwayama, 1910: 61, **misidentification**
Metatriozidus brevifrons sensu Kwon *et al.*, 2015d: 1, nec Kuwayama, 1910: 61.

Material examined. South Korea: 2 ♂, 4 ♀ identified as *Heterotrioza noknamui*, JJ, Jungmun, 23.vii.1981 (Y. J. Kwon) (NHMB).—South Korea (GG, JJ, JN) (NHMB, SNU).

Host plant. *Celtis sinensis* Pers. (Ulmaceae).

Comments. Kwon *et al.* (2015b, c) synonymised *Trioza chilgia*, including its junior synonym *Heterotrioza noknamui*, and the Chinese *Trioza bifasciaticeltis* Li & Yang, 1991 with *Trioza brevifrons* Kuwayama, 1910, a species described from Taiwan. They also transferred the species to the artificial genus *Metatriozidus* which was synonymised with *Trioza* by Yang *et al.* (2013). The 'revisionary survey' of the 'four species' by Kwon *et al.* (2015d) suffers from some misconceptions.

Trioza brevifrons was described by Kuwayama (1910) from a single female from Taiwan. Miyatake (1964b) reported the species from Japan though pointing out that the two Japanese specimens at hand differ from *T. brevifrons* in the longer genal processes. Later, Miyatake (1969) listed two additional specimens, one from *Celtis*

sinensis var. *japonica*, as *Trioza* sp. 1 suggesting it may belong to a new species. Miyatake (1971) identified a single female from Korea (as *Trioza* sp.) 'as the species which the author is ready to describe from Japan in the near future.' Miyatake (1976) listed another female (as *Trioza* sp.) from Japan from *Celtis sinensis* var. *japonica*. Miyatake (1979), finally, reported again *T. brevifrons* from Japan suggesting that the population from Japan may represent a new species. Kwon & Lee (1981) listed *T. brevifrons* from Korea referring to a personal communication of Y. Miyatake to Y. J. Kwon. In his book, Kwon (1983) reproduced an English translation of the original German description of *T. brevifrons* almost verbatim. Apparently, he has not seen the holotype nor other material of *T. brevifrons* from Taiwan. It is difficult to understand why he decided that the species should have 1+3 metatibial spurs, a character not mentioned in the original description. There is also no information given by Kuwayama (1910) on the host plant. Park (1996) synonymised *T. chilgia* and *H. noknamui*, and suggested that *T. brevifrons* sensu Kwon (1983) is a misidentification, probably following Miyatake (1979). Neither Yang (1984) nor Yang *et al.* (2013) treated *T. brevifrons* due to the lack of material. They certainly did not exclude the species from the Taiwanese fauna as was erroneously suggested by Kwon *et al.* (2015b). According to Kuwayama's (1910) description, *T. brevifrons* has an almost straight vein Rs ('Radius fast gerade') which is relatively long ('Radialstück der Costa 2mal so lang wie das Spitzenstück derselben'). The Japanese and Korean species associated with *Celtis* has, however, a distinctly curved, short vein Rs and the portions of the fore margin between the apices of veins R_1 and Rs, and between the apices of veins Rs and M_{1+2} are subequal in length. We conclude that the Taiwanese *T. brevifrons* and the triozids on *Celtis sinensis* var. *japonica* reported under various names from China, Japan and Korea are not conspecific. The former, whose holotype seems lost, has to be regarded as a nomen dubium whereas the latter should be named *Trioza chilgia* with the junior synonym *Heterotrioza noknamui*. Not having seen relevant material of *T. brevifrons* sensu Kwon (1983) nor of *Trioza bifasciaticeltis* we cannot comment on their identity. In any case, currently there are no reliable records of *T. brevifrons* from outside Taiwan. Judging from the description of *Ceropsylla celticola* Li, 2011 from China collected on *Celtis tetrandra*, this species is probably also closely related to *T. chilgia*.

According to Kwon & Lee (1981) the records of *Trioza camphorae* Sasaki, 1910 from Korea (Kim 1965; see also Kwon 1983: 95) concern all *Trioza chilgia*. It is difficult to understand why Kwon *et al.* (2015a, c) list *Trioza camphorae* from Korea citing Kim (1965) as source. There are so far no reliable records of *Trioza camphorae* from Korea.

The genus *Metatriozidus* was synonymised by Yang *et al.* (2013) for its artificial nature and not lack of definition as suggested by Kwon *et al.* (2015c, d). We firmly believe that any biologically meaningful classification of organisms should reflect phylogeny and not mere resemblance between taxa.

Trioza cinnamomi **(Boselli, 1930), comb. rev.**
(Figs. 87−90)

Spanioza cinnamomi Boselli, 1930: 201.
Metatriozidus cinnamomi, Kwon *et al.*, 2015d: 1.

Material examined. South Korea (JJ, JN) (NHMB, SNU).

Host plant. *Cinnamomum yabunikkei* H.Ohba (Lauraceae), confirmed by the presence of immatures.

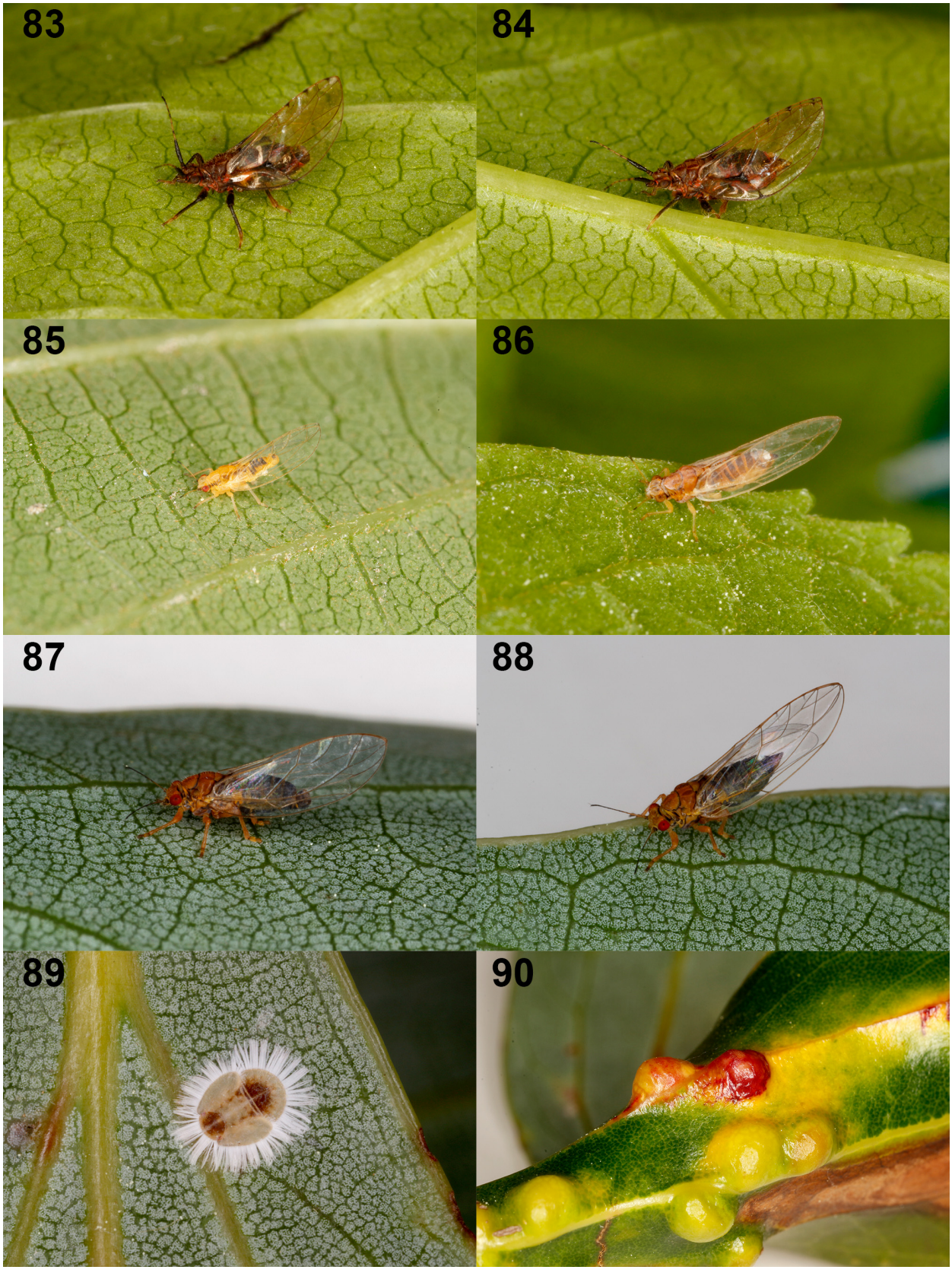
Comments. Our specimens of *Trioza cinnamomi* were collected on *Cinnamomum yabunikkei* H. Ohba (Lauraceae). For the use of *Metatriozidus* by Kwon *et al.* (2015a, d) see comments under *T. chilgia*.

Trioza machilicola **Miyatake, 1968, comb. rev.**
(Figs. 91−94)

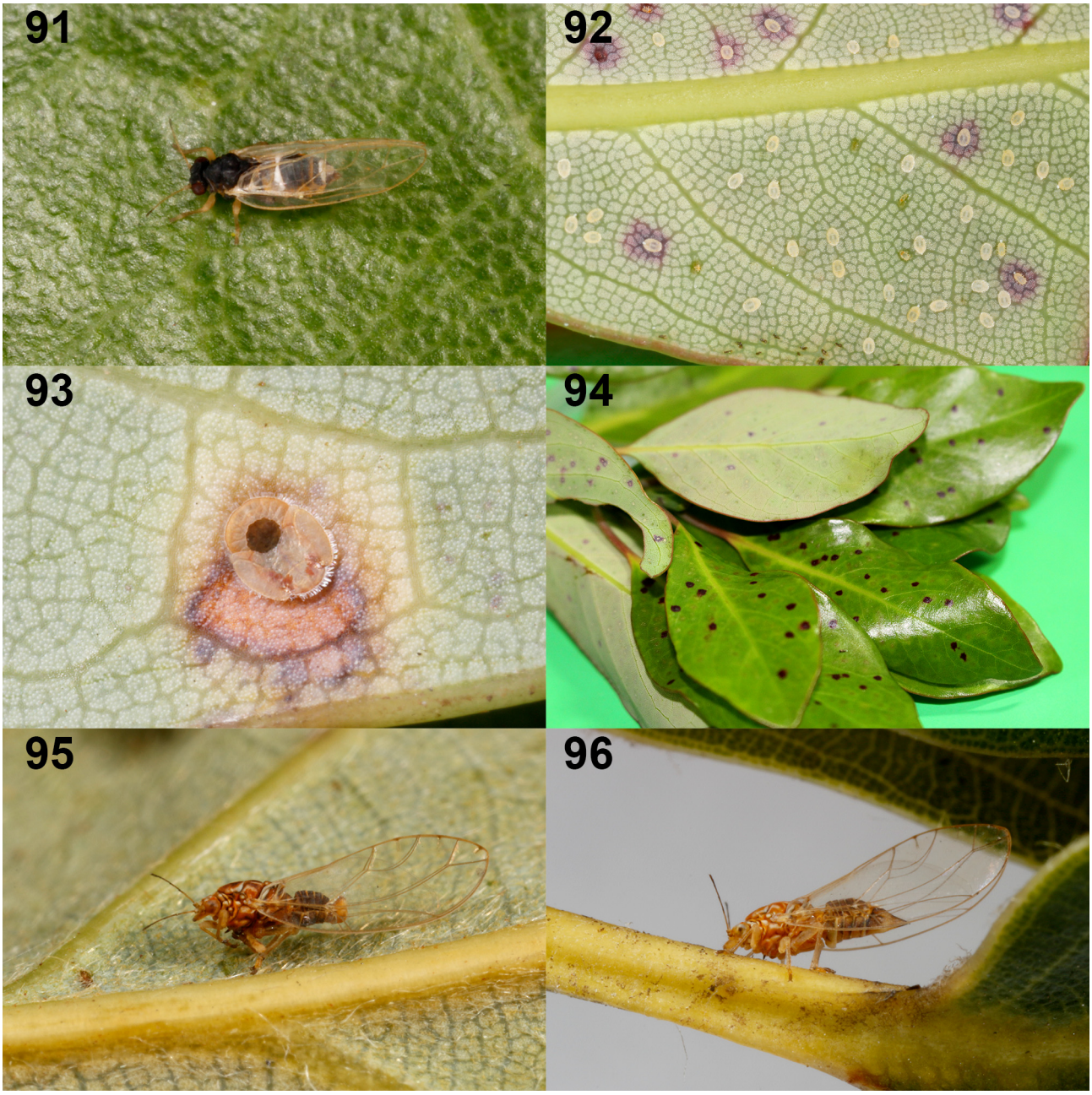
Trioza machilicola Miyatake, 1968: 1.
Metatriozidus machilicola, Kwon *et al.*, 2015c: 1.

Material examined. South Korea (JJ, JN) (NHMB, SNU).

Host plant. *Machilus thunbergii* Sieb. & Zucc. (Lauraceae), confirmed by the presence of immatures.



FIGURES 83–90. Habitus. **83.** *Eotrioza ussuriensis*, adult male. **84.** *Eotrioza ussuriensis*, adult female. **85.** *Trioza chilgia*, adult male of summer generation. **86.** *Trioza chilgia*, adult female of winter generation. **87.** *Trioza cinnamomi*, adult male. **88.** *Trioza cinnamomi*, adult female. **89.** *Trioza cinnamomi*, fifth instar immature. **90.** Galls induced by immatures of *Trioza cinnamomi*.



FIGURES 91–96. Habitus. **91.** *Trioza machilicola*, adult female. **92.** First and second instar immatures of *Trioza machilicola*. **93.** Parasitized fifth instar immature of *Trioza machilicola*. **94.** Infected symptoms of *Trioza machilicola*. **95.** *Trioza quercicola*, adult male. **96.** *Trioza quercicola*, adult female.

Comments. *Trioza machilicola* has been reported from Korea previously (Cho & Lee 2015b; Kwon *et al.* 2015a, d). For the use of *Metatriozidus* by Kwon *et al.* (2015a, d) see comments under *T. chilgia*.

Trioza quercicola **Shinji, 1944**
(Figs. 95–96)

Trioza quercicola Shinji, 1944: 455.

Material examined. South Korea (JN) (SNU).

Host plant. *Quercus myrsinifolia* Blume (Fagaceae).

Comments. New record for Korea.

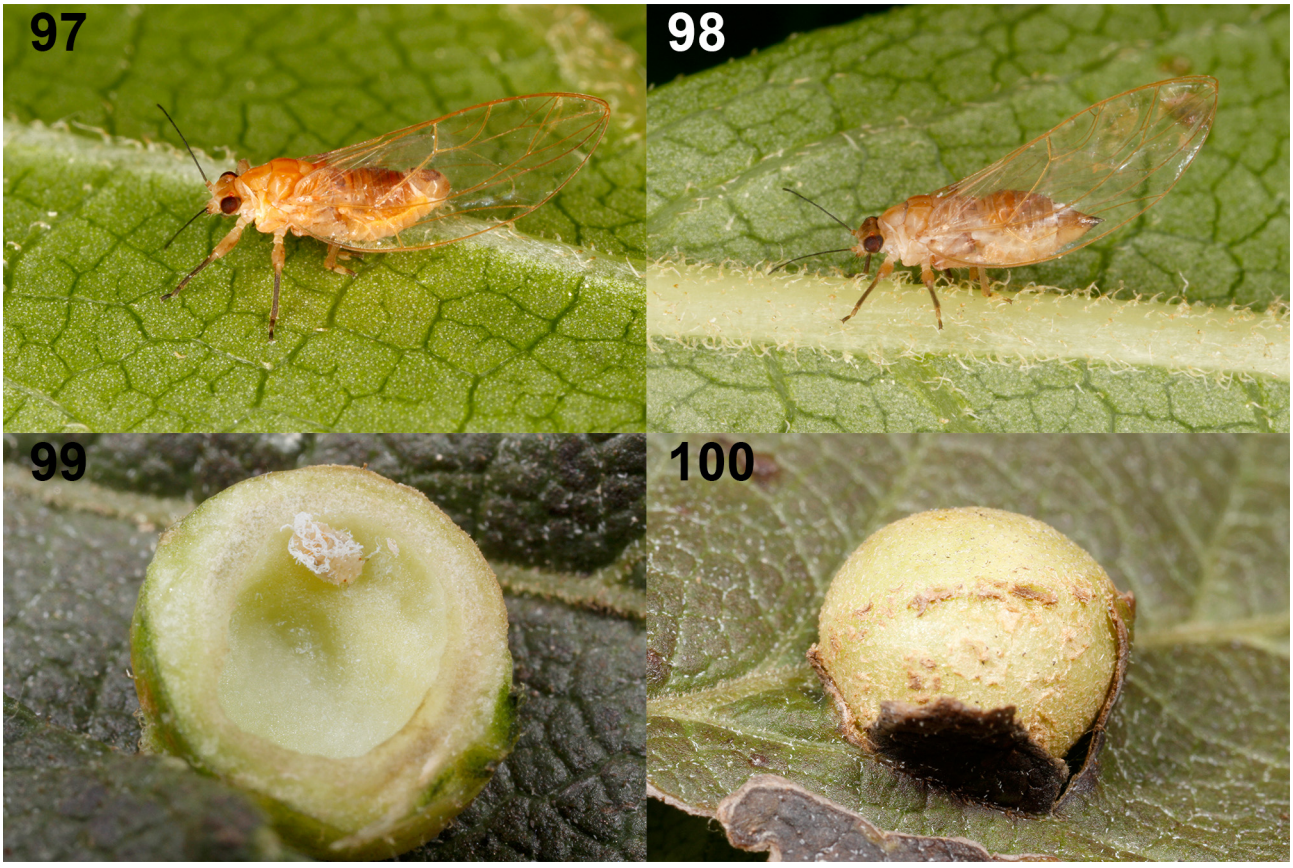
***Trioza stackelbergi* Loginova, 1967, comb. rev.**
(Figs. 97−100)

Trioza stackelbergi Loginova, 1967: 345.
Heterotrioza (*Dyspersa*) *ukogi*, sensu Kwon, 1983: 94, nec Shinji, 1940: 66, **misidentification**.
Trioza ukogi, sensu Park, 1996: 275, nec Shinji, 1940: 66, **misidentification**.
Metatriozidus stackelbergi, Kwon *et al.*, 2015d: 1.

Material examined. South Korea (GB, GG, GW, JN) (NHMB, SNU).

Host plant. *Eleutherococcus sessiliflorus* (Rupr. & Maxim.) S.Y.Hu (Araliaceae), confirmed by the presence of immatures.

Comments. *Trioza stackelbergi* was reported as new for Korea by Kwon *et al.* (2015a, d) which is not correct, as the species was already known from Korea under the name *Heterotrioza* (*Dyspersa*) or *Trioza ukogi* which is, in fact, a misidentification. For the use of *Metatriozidus* by Kwon *et al.* (2015a, d) see comments under *T. chilgia*.



FIGURES 97–100. Habitus. **97.** *Trioza stackelbergi*, adult male. **98.** *Trioza stackelbergi*, adult female. **99.** Immature of *Trioza stackelbergi*. **100.** Gall induced by immature of *Trioza stackelbergi*.

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