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# The generic affiliation of Japanese species of the subfamily Psyllinae (Hemiptera: Psyllidae) with a revised checklist

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# The generic affiliation of Japanese species of the subfamily Psyllinae (Hemiptera: Psyllidae) with a revised checklist

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The generic affiliations of all the Japanese species of the psyllid subfamily Psyllinae are re-examined under the current generic recognition of the subfamily based mainly on adult morphological characters. Twenty-two species of the genus *Psylla* Geoffroy are newly combined with the genus *Cacopsylla* Ossiannilsson. *Psylla wulinensis* Yang and *Aphalara akebiae* Shinji are newly synonymized with *Psylla multipunctata* Miyatake and *Cacopsylla hakonensis* (Kuwayama), respectively. In addition, *Cacopsylla toddaliae* (Yang) is newly recorded from Japan. In all, 62 species of the Japanese Psyllinae are recognized and classified into three genera *Psylla*, *Cacopsylla* and *Chamaepsylla* Ossiannilsson, which include 11, 50 and one species, respectively. A key to Japanese psylline genera and a revised checklist of all the Japanese species of Psyllinae are presented with their distribution and host plant information and also with their synonymies.

**Keywords:** *Cacopsylla*; *Chamaepsylla*; *Psylla*; Psylloidea



## Introduction

The jumping plant lice of the psyllid subfamily Psyllinae (*sensu* Klimaszewski 1975; Ossiannilsson 1992) currently comprise 61 known species in Japan (excluding the South Kuril Islands) (Kuwayama 1908; Miyatake 1963, 1964a, 1965a, 1969, 1982a, b; Matsumoto 1995; Miyatake and Usuba 1997; Inoue and Miyatake 2001; Inoue 2004a, b) and is considered the largest subfamily in the superfamily Psylloidea, which includes 155 Japanese species. All the Japanese psylline species had been formerly placed in the genus *Psylla* Geoffroy, 1762 [*sensu lato* (*s.l.*) as in Ossiannilsson 1970], except the seven species that were originally described in the genus *Cacopsylla* Ossiannilsson, 1970 (Inoue and Miyatake 2001; Inoue 2004a,b). Of these 54 *Psylla* (*s.l.*) species, 20 species have been transferred to the genus *Cacopsylla* and one species to the genus *Chamaepsylla* Ossiannilsson, 1970, which were raised from the subgenera of the genus *Psylla* (*s.l.*) (Klimaszewski 1975; Lauterer 1976; Burckhardt 1979; Hodkinson 1980; Park et al. 1995; Park 1996; Inoue 2004b), and only three species, i.e. *Psylla alni* (Linnaeus, 1758), *Psylla betulae* (Linnaeus, 1758) and *Psylla carpinicola* Crawford, 1914 have been recognized as belonging to *Psylla* [*sensu stricto* (*s.s.*)] (Hodkinson 1988). Consequently, the remaining 30 species in *Psylla* (*s.l.*) have not been reviewed.

In the present study, the generic affiliation of all the Japanese species of Psyllinae is reviewed in light of the current definition of the psylline genera (Ossiannilsson 1992). The revised checklist provides the complete distribution and host-plant

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information for each of the species and also includes synonymies and bibliographies referring to the distribution in Japan. Further classification including subgeneric division and phylogenetic relationships is not mentioned in this paper and would be based on subsequent studies that involve nymphal morphological researches.

## Materials and methods

The materials used in the present study were based chiefly on specimens deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU) and the author's collection that is presently in the Kuchinotsu Citrus Research Station, National Institute of Fruit Tree Science, Nagasaki, Japan (NIFTS). Materials preserved in the following institutions were also used: Laboratory of Systematic Entomology, Faculty of Agriculture, Hokkaido University, Sapporo, Japan (SEHU); National Institute for Agro-Environmental Sciences, Tsukuba, Japan (NIAES); Osaka Museum of Natural History, Osaka, Japan (OMNH); and Kurashiki Museum of Natural History, Kurashiki, Japan (KURA). In the case of some species where no specimens were examined, descriptions in the literature were used to confirm their morphological features. Morphological terminology follows mainly Ossiannilsson (1992).



## Results and discussion

Of the 30 *Psylla* (*s.l.*) species whose generic combinations should be revised, 22 species are newly transferred to the genus *Cacopsylla* in the latter list on the basis of the diagnostic characteristics of the genus (Ossiannilsson 1992). Two out of the remaining eight species, i.e. *Psylla morimotoi* Miyatake, 1963 and *Psylla omogoensis* Miyatake, 1963, are recognized as belonging to *Psylla* (*s.s.*). The remaining six species, *Psylla chujoi* Miyatake, 1982, *Psylla kuwayamai* Crawford, 1911, *Psylla magnifera* Kuwayama, 1908, *Psylla multipunctata* Miyatake, 1964, *Psylla yasumatsui* Miyatake, 1963 and *Psylla ziozankeana* Kuwayama, 1908, are provisionally retained in *Psylla* (*s.l.*) mainly because the adult morphological features of these species do not clearly fit any of the existing psylline genera (see the notes for the respective species). In addition, *Cacopsylla toddaliae* (Yang, 1984) is newly recorded from Japan. In all, 62 species of Psyllinae are recognized in Japan and classified into three genera *Psylla* (including *s.l.*), *Cacopsylla* and *Chamaepsylla*, each of which includes 11, 50 and one species, respectively.

The following two psylline species that have been recorded only once from mainland Japan by Kuwayama (1908) are not dealt with in the checklist because of strong suspicions of misidentification. A European *Psylla salicicola* Foerster, 1848, which is now treated as a junior synonym of a European willow-feeding species *Cacopsylla saliceti* (Foerster, 1848) (= *Psylla saliceti*) (Aulmann 1913; Klimaszewski 1973) has been recorded in Japan from Hokkaido and Honshu by Kuwayama (1908); however, the morphological features of the Japanese "*P. salicicola*" materials in the Kuwayama collection at SEHU obviously differ from those of *C. saliceti* of Europe in that the former bears a few characteristics such as prominent black marking near the "anal break" of the forewing and relatively long genal cones. Kuwayama (1908) also recorded *Psylla foersteri* Flor, 1861, which is currently combined with the genus *Baeopelma* Enderlein, 1926, on the basis of the materials from Hokkaido and Honshu,

Japan. However, these specimens deposited in SEHU were merely distinguished from *Psylla alni* (Linnaeus) by trivial differences in coloration; for this reason, Kuwayama's "*P. foersteri*" of Japan is a likely misidentification of *P. alni*.

The following seven psylline species, *Psylla araliae* Konovalova, 1981, *Psylla cunashiri* Konovalova, 1981, *Psylla fumosa* Konovalova, 1979, *Psylla octomaculata* Konovalova, 1982, *Cacopsylla amabilis* (Ossiannilsson, 1975), *Cacopsylla melanoneura* (Foerster, 1848) and *Cacopsylla moscovita* (Andrianova, 1948) have been recorded in Japan only from the South Kuril Islands, namely islands of Etorofu (Iturup), Kunashiri (Kunashir) and Shikotan (Ossiannilsson 1975; Konovalova 1988; Labina 2006), which the Japanese government claims. However, these species are not included in the latter checklist because no materials from the islands were examined.



**Key to genera of the subfamily Psyllinae in Japan**

1. Body larger, overall length (up to tip of folded wings) more than 4 mm; antenna more than twofold (usually 2.5- to 3-fold) as long as width of head (Figure 1A); metatibia with a prominent basal spine, with six or more (mostly six to eight) spurs apically (Figure 1B, C); paramere slender, often clavate apically (Figure 1D); female terminalia long and slender (Figure 1F),

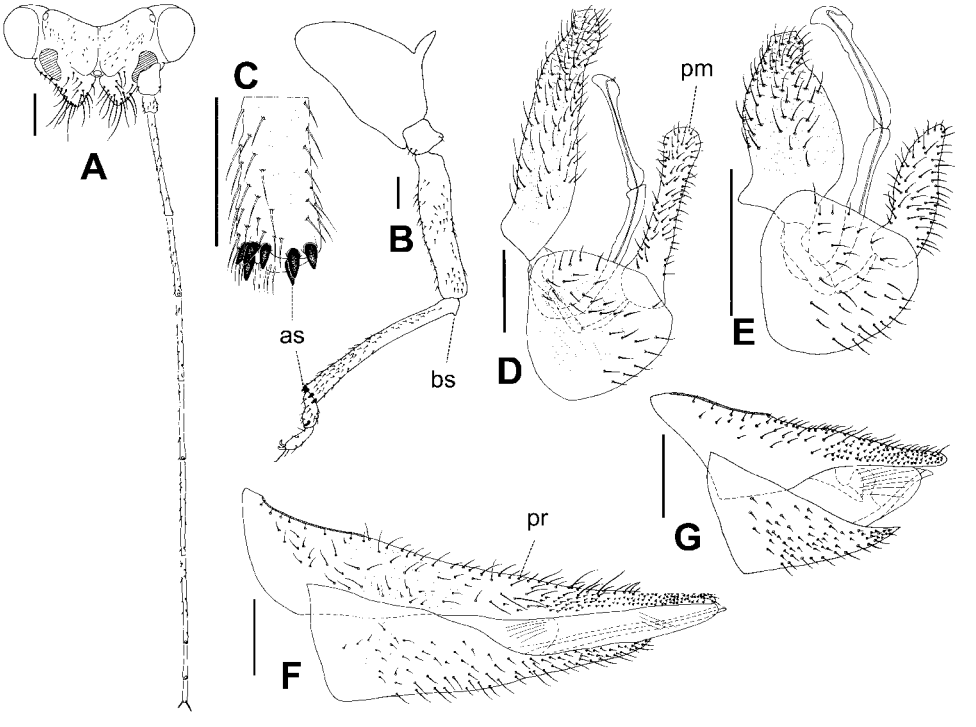


Figure 1. Characters of Japanese Psyllinae. (A–D, F) *Psylla alni* (Linnaeus); (E, G) *Cacopsylla coccinea* (Kuwayama). (A) Head, frontal aspect; (B) left hind leg; (C) apex of metatibia; (D, E) male terminalia, lateral aspect; (F, G) female terminalia, lateral aspect; as, apical spurs of metatibia; bs, basal spine of metatibia; pm, paramere; pr, proctiger. Scale bars 0.25 mm.

mostly longer than the rest of abdomen. (Nymphs: anus located terminally; circumanal pore field conspicuously large, distinctly extending to the dorsum of abdomen.) . . . . . *Psylla* Geoffroy
Body small to moderate in size, overall length less than 4 mm; antenna less than twofold as long as width of head; metatibia with a small or (rarely) without basal spine, with five or fewer spurs apically; paramere varied in shape, usually simple and tapered (Figure 1E); female terminalia mostly shorter than the rest of abdomen (Figure 1G). (Nymphs: anus located ventrally; circumanal pore field small to moderate in size, usually not extending to the dorsum of abdomen.) . . . . . 2

2. Metatibia with or (rarely) without basal spine, with five spurs apically; female terminalia relatively small and stout, mostly shorter than the rest of abdomen; dorsal margin of female proctiger sinuate or curved. (Nymphs: antenna seven-segmented, terminal segment with two rhinaria.). . . . . *Cacopsylla* Ossiannilsson
Metatibia without basal spine, with four spurs apically; female terminalia distinctly longer than the rest of abdomen; dorsal margin of female proctiger nearly straight. (Nymphs: antenna eight-segmented, terminal segment with one rhinarium) . . . . . .*Chamaepsylla* Ossiannilsson



**List of the Japanese genera and species of the subfamily Psyllinae**

## Genus ***Psylla*** Geoffroy

*Psylla* Geoffroy 1762, p 482.

Type species: *Chermes alni* Linnaeus, 1758, by subsequent designation under the Plenary Powers of the International Commission on Zoological Nomenclature.

### ***Psylla alni*** (Linnaeus)

*Chermes alni* Linnaeus 1758, p 454. Type locality: Sweden.

*Psylla alni*: Kuwayama 1908, p 169; Oshanin 1912, p 127; Aulmann 1913, p 9; Tuthill 1943, p 460; Sasaki 1954, p 33; Miyatake 1963, p 334; 1964b, p 25; 1969, p 73; 1972b, p 101; Klimaszewski 1973, p 200; Miyatake 1979, p 216; Kwon 1983, p 40; Konovalova 1988, p 517; Ossiannilsson 1992, p 102; Matsumoto 2004, p 275; Labina 2006, p 53.

*Distribution.* Holarctic. Japan (Hokkaido, Honshu, Kunashiri Island, Shikotan Island), Korea, Russian Far East, Europe, North America (USA, Canada).

*Host plants. Alnus japonica* (Thunb.) Steud. (Betulaceae) and *Alnus hirsuta* Turcz. in Japan (Miyatake 1963); *Alnus glutinosa* (L.) Gaertn., *Alnus incana* (L.) Mnch. and *Alnus viridis* (Vill.) Lam. et. DC. in Europe; *Alnus rhombifolia* Nutt. in North America (Ossiannilsson 1992).

### ***Psylla betulae*** (Linnaeus)

*Chermes betulae* Linnaeus 1758, p 454. Type locality: Sweden.

*Psylla betulae*: Kuwayama 1908, p 170; Oshanin 1912, p 127; Aulmann 1913, p 11; Sasaki 1954, p 33; Miyatake 1963, p 339; Kuwayama 1967, p 64; Klimaszewski 1973, p 201; Hodkinson and White 1979, p 55; Konovalova 1988, p 517; Ossiannilsson 1992, p 103; Labina 2006, p 53.

*Distribution.* Japan (Hokkaido, Honshu, Etorofu Island, Kunashiri Island, Shikotan Island), Mongolia, Russian Far East, Europe, North America (Canada).

*Host plants. Betula platyphylla* var. *japonica* (Miq.) Hara (= *Betula tauscii* Koidz.) (Betulaceae) (Sasaki 1954) and **Betula ermanii* Cham. (new record) (Betulaceae) in Japan; *Betula verrucosa* Ehrh. and *Betula pubescens* Ehrh. in Europe (Ossiannilsson 1992).

*Adults and nymphs were confirmed on *B. ermanii* at Mount Kita-dake, Ashiyasu, Yamanashi Prefecture, Honshu, Japan on 12 July 2001 by H. Inoue (NIFTS).

### ***Psylla carpinicola*** Crawford

*Psylla carpinicola* Crawford 1914, p 151 (replacement name for *Psylla carpini* Fitch, 1851, nec Foerster, 1848); Miyatake 1964a, p 14; Klimaszewski 1973, p 203; Hodkinson 1988, p 1217. Type locality: USA.

*Distribution.* Japan (Honshu), North America (USA, Canada).

*Host plant.* Unknown in Japan. *Carpinus caroliniana* Walt. (Betulaceae) in North America (Tuthill 1943).

### ***Psylla morimotoi*** Miyatake

*Psylla morimotoi* Miyatake 1963, p 336; 1964b, p 27; 1969, p 74; Baba and Miyatake 1971, p 9; Klimaszewski 1973, p 216; Miyatake 1979, p 217; Inoue and Yamauchi 2001, p 55. Type locality: Japan (Honshu).

See the notes for the next species.

*Distribution.* Japan (Honshu, Sado Island).

*Host plant. Prunus grayana* Maxim. (Rosaceae) (Miyatake 1969).

### ***Psylla omogoensis*** Miyatake

*Psylla omogoensis* Miyatake 1963, p 335; 1969, p 73; Klimaszewski 1973, p 218; Miyatake 1979, p 217; Matsumoto 2004, p 276. Type locality: Japan (Shikoku).

The correct number of apical metatibial spurs of *P. morimotoi* and *P. omogoensis* is not "five" as originally described in Miyatake (1963), but "six" based on the holotypes and many determined specimens of both species. Furthermore, the nymphal

characteristics of the two species exactly fit the genus *Psylla* (*s.s.*) as follows: antenna eight-segmented; anus located terminally; circumanal pore field very large, distinctly extending to the dorsum of abdomen.

*Distribution.* Japan (Honshu, Shikoku).

*Host plant.* **Prunus buergeriana* Miq. (Rosaceae) (new record).

*Nymphs and newly emerged adults were collected from *P. buergeriana* at Ooi, Shinano, Nagano Prefecture, Honshu, Japan in June 2001 by S. Usuba (NIFTS).

The generic positions of the following six species are not properly settled based only on adults and nymphs are unknown except for *Psylla kuwayamai* Crawford and *Psylla multipunctata* Miyatake. Accordingly, I leave these six species in the genus *Psylla* (*s.l.* as in Ossiannilsson, 1970) until nymphal morphological studies have been finished.



### ***Psylla* (*s.l.*) *chujoi*** Miyatake

*Psylla chujoi* Miyatake 1982b, p 169. Type locality: Japan (Yakushima Island).

Miyatake (1982b) remarked that *P. chujoi* "seems to be closely related to *Psylla buxi* (Linnaeus, 1758)", which occurs in Europe and North America and feeds on *Buxus sempervirens* L. However, I cannot find the morphological similarity of the two *Buxus*-feeders except the elongated female terminalia as the result of the direct comparison between the paratypes (three males and three females) of *P. chujoi* and the specimens (four males and two females) of *P. buxi* collected from North America (New Hampshire, USA). Furthermore, the female proctiger is strongly acute and upturned apically in *P. chujoi* and moderately acute and somewhat downcurved apically in *P. buxi*. The characteristics of the female terminalia of *P. chujoi* appear to be similar to those of *Psylla yasumatsui* Miyatake, 1963 and *Psylla ziozankeana* Kuwayama, 1908, both of which are placed in *Psylla* (*s.l.*) in this study. Because the nymphs of *P. chujoi* are so far unknown, I will leave this species in *Psylla* (*s.l.*) until nymphs become available.

*Distribution.* Japan (Yakushima Island).

*Host plant. Buxus microphylla* var. *japonica* (Muell. Arg. ex Miq.) Rehder et Wils. (Buxaceae) (Miyatake 1982b).

### ***Psylla* (*s.l.*) *kuwayamai*** Crawford

*Psylla tripunctata* Kuwayama 1908, p 174 (primary junior homonym of *Psylla tripunctata* Fitch, 1851). Type locality: Taiwan.

*Psylla kuwayamai* Crawford 1911, p 432 (replacement name for *P. tripunctata* Kuwayama nec Fitch); Miyatake 1963, p 356; Klimaszewski 1973, p 213; Miyatake 1981, p 59; Yang 1984, p 68; Matsumoto 2004, p 276.

Adults of this species possess short antennae, short female terminalia and six to eight apical metatibial spurs. These morphological features do not fit the genus *Psylla* (*s.s.*)

or any other existing genera of Psyllinae. For this reason, I leave this species in *Psylla* (*s.l.*) until further research including nymphal morphological study. Adult important morphological characteristics of *P. kuwayamai* of Japan were illustrated in Miyatake (1981), and appear to be different from those of Taiwan, which is the type locality of this species, in genal cones and male terminalia (cf. Yang 1984). *Psylla kuwayamai* seems to form a well-organized group with the *Neolitsea*-feeders, *Psylla neolitseae* Miyatake, 1981 (Nepal) and *Psylla deflua* Yang, 1984 (Taiwan).

*Distribution.* Japan (Honshu, Shikoku, Kyushu), Taiwan.

*Host plant. Neolitsea sericea* (Bl.) Koidz. (= *Litsea glauca* Sieb.) (Lauraceae) in Japan (Miyatake 1963); *Neolitsea parvigenna* (Hay.) Kanehira in Taiwan (Yang 1984).



### ***Psylla* (*s.l.*) *magnifera*** Kuwayama

*Psylla magnifera* Kuwayama 1908, p 170; Oshanin 1912, p 127; Aulmann 1913, p 19; Sasaki 1954, p 34; Miyatake 1963, p 334; Klimaszewski 1973, p 213; Konovalova 1988, p 517. Type locality: Japan (Hokkaido).

This species has never been recorded from Japan with additional specimens after the original description, but it has been recorded from Russian Far East (Sakhalin Island) (Konovalova 1988). It is regrettable that I was not able to find the syntypes (a male and a female) of this species in the Kuwayama's psylloid collection in SEHU on 2 July 2001. The confirmation of the existence of the syntypes is absolutely essential for the stability of the scientific name of this species. According to the descriptions of *P. magnifera* by Kuwayama (1908) and Miyatake (1963), the antennae are more than threefold as long as the width of the head (a key character for the genus *Psylla s.s.*), but the female terminalia are shorter than the rest of the abdomen. Nymphs are unknown. No material was examined so this species is placed in *Psylla* (*s.l.*) for the present.

*Distribution.* Japan (Hokkaido, Honshu), Russian Far East (Sakhalin Island).

*Host plant. Alnus japonica* (Thunb.) Steud. (Betulaceae) (Sasaki 1954).

### ***Psylla* (*s.l.*) *multipunctata*** Miyatake

*Psylla multipunctata* Miyatake 1964a, p 21; Klimaszewski 1973, p 216; Matsumoto 2004, p 276. Type locality: Japan (Kyushu).

*Psylla wulinensis* Yang 1984, p 67. Type locality: Taiwan. syn. nov.

As the adult of this species is similar to *P. kuwayamai* except for four apical metatibial spurs, *P. multipunctata* has also been temporarily retained in *Psylla* (*s.l.*). *Psylla wulinensis* Yang, 1984, which was described from Taiwan on the basis of females obtained from *Neolitsea parvigemma* (Hayata) Kanehira (Lauraceae), is identical to *P. multipunctata*.

*Distribution.* Japan (Honshu, Kyushu), Taiwan.

*Host plant. Neolitsea sericea* (Bl.) Koidzumi (Lauraceae) in Japan (Matsumoto 2004).

### ***Psylla* (*s.l.*) *yasumatsui*** Miyatake

*Psylla yasumatsui* Miyatake 1963, p 342; Klimaszewski 1973, p 229; Miyatake 1990, p 16; Matsumoto 2004, p 277. Type locality: Japan (Kyushu).

Although the antennae of this species are very short (nearly as long as the width of the head), the number of the apical metatibial spurs is five to six (mostly six) and the female terminalia are distinctly longer than the rest of the abdomen. Nymphs were not examined so this species is placed in *Psylla* (*s.l.*) for the present.

*Distribution.* Japan (Honshu, Kyushu).

*Host plant. Prunus buergeriana* Miq. (Rosaceae) (Matsumoto 2004).

### ***Psylla* (*s.l.*) *ziozankeana*** Kuwayama

*Psylla ziozankeana* Kuwayama 1908, p 173; Oshanin 1912, p 128; Aulmann 1913, p 29; Sasaki 1954, p 36; Miyatake 1964a, p 23; 1969, p 77; Klimaszewski 1973, p 230; Miyatake 1979, p 218; Matsumoto 2004, p 278. Type locality: Japan (Hokkaido).

Although the antennae of this species are short (about 1.2-fold as long as the width of the head), the number of the apical metatibial spurs is five to six and the female terminalia are distinctly longer than the rest of the abdomen. Hence, this species is placed in *Psylla* (*s.l.*) for the present. Nymphs are unknown.

*Distribution.* Japan (Hokkaido, Honshu).

*Host plant.* Unknown.

## Genus ***Cacopsylla*** Ossiannilsson

*Psylla* (*Cacopsylla*) Ossiannilsson 1970, p 140.

Type species: *Chermes mali* Schmidberger, 1836, by original designation.

*Cacopsylla*: Klimaszewski 1972, p 14.

### ***Cacopsylla abieti*** (Kuwayama) comb. nov.

*Psylla abieti* Kuwayama 1908, p 175; Oshanin 1912, p 128 (*P. abietis* [sic]); Aulmann 1913, p 8; Sasaki 1954, p 33; Miyatake 1964a, p 9; 1964b, p 24; 1969, p 72; Baba and Miyatake 1971, p 9; Kuwayama and Miyatake 1971, p 53; Klimaszewski 1973, p 198; Miyatake 1972b, p 102; 1979, p 216; Inoue and Yamauchi 2001, p 55; Matsumoto 2004, p 277. Type locality: Japan (Hokkaido, Honshu).

*Psylla albopontis* Kuwayama 1908, p 164; Aulmann 1913, p 9; Sasaki 1954, p 33. Type locality: Japan (Hokkaido). Synonymized by Miyatake 1964a, p 9.

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu, Sado Island), northern China.

*Host plants. Acer* sp. (Aceraceae) (Miyatake 1979); **Acer sieboldianum* Miq. (new record). The host plant records of Pinaceae, *Abies mariesii* Masters, *Picea glehnii* (Fr. Schm.) Masters and *Picea jezoensis* (Sieb. et Zucc.) Carrière (Miyatake 1964a), on which nymphs have not been confirmed, are erroneous (see the host plant notes for *Cacopsylla haimatsucola*).

*Adults and nymphs were confirmed on *A. sieboldianum* at Mount Yamizo, Daigo, Ibaraki Prefecture, Honshu, Japan from 8 to 23 May 2004 by H. Inoue (NIFTS).



***Cacopsylla aisanensis*** (Miyatake) comb. nov.

*Psylla aisanensis* Miyatake 1963, p 355; 1969, p 76; Klimaszewski 1973, p 199; Miyatake 1979, p 218. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Hokkaido, Honshu).

*Host plant. Sorbus commixta* Hedl. (Rosaceae) (Miyatake 1963).

***Cacopsylla albigena*** (Miyatake) comb. nov.

*Psylla albigena* Miyatake 1964a, p 10; 1964b, p 25; 1969, p 78; Baba and Miyatake 1971, p 9; Klimaszewski 1973, p 199; Miyatake 1977, p 245; 1979, p 219; Inoue and Yamauchi 2001, p 55; Inoue 2002, p 496; Matsumoto 2004, p 278. Type locality: Japan (Honshu).

*Distribution.* Japan (Honshu, Kyushu, Sado Island).

*Host plants. Viburnum plicatum* var. *tomentosum* (Thunb. ex Murray) Miq. (Caprifoliaceae) (Miyatake 1979) and *Viburnum sieboldii* Miq. (Miyatake 1977).

***Cacopsylla albovenosa*** (Kuwayama) comb. nov.

*Psylla albovenosa* Kuwayama 1908, p 176; Oshanin 1912, p 128; Aulmann 1913, p 9; Sasaki 1954, p 33; Miyatake 1964a, p 4; 1969, p 75; Klimaszewski 1973, p 199; Miyatake 1977, p 245; 1979, p 217; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 278. Type locality: Japan (Honshu).

*Distribution.* Japan (Honshu, Shikoku, Kyushu).

*Host plants. Malus toringo* (Sieb.) Sieb. ex Vriese (= *Malus sieboldii* Rehd.) (Rosaceae) (Miyatake 1964a); **Pourthiaea villosa* var. *laevis* (Thunb.) Stapf. (Rosaceae) (new record).

*Adults and nymphs were confirmed on *Pourthiaea villosa* var. *laevis* at Mount Sefuri, Saga Prefecture, Kyushu, Japan from 12 to 13 May 2002 by H. Inoue (NIFTS).

***Cacopsylla amakusensis*** (Kuwayama) comb. nov.

*Psylla amakusensis* Kuwayama 1939, p 536; Sasaki 1954, p 33; Miyatake 1963, p 341; 1964c, p 124; 1965a, p 176; Klimaszewski 1973, p 200; Hodkinson 1986, p 357. Type locality: Japan (Kyushu).

Although the antennae of this species are remarkably long (about 2.3-fold as long as the width of the head), other adult morphological features fit in the genus *Cacopsylla*. Nymphs are unknown.

*Distribution.* Japan [Honshu, Shikoku, Kyushu, Ryukyus (Ishigaki Island and Iriomote Island)].

*Host plant.* Unknown.

***Cacopsylla ambigua*** (Foerster)

*Psylla ambigua* Foerster 1848, p 74; Kuwayama 1908, p 173; Oshanin 1912, p 127; Aulmann 1913, p 10; Sasaki 1954, p 33; Miyatake 1964a, p 18; Klimaszewski 1973, p 200; Konovalova 1988, p 526. Type locality: Germany (Aachen).

*Cacopsylla ambigua*: Klimaszewski 1975, p 195; Labina 2006, p 53.

*Psylla melina* Flor: Kuwayama 1908, p 172.

*Distribution.* The whole Palaearctic, Europe to Japan (Hokkaido, Honshu, Kunashiri Island, Shikotan Island), Russian Far East.

*Host plants.* Unknown in Japan. Various *Salix* species (Salicaceae) in Europe (Ossiannilsson 1992).

***Cacopsylla boninofatsiae*** Inoue and Miyatake

*Cacopsylla boninofatsiae* Inoue and Miyatake 2001, p 465; Karube et al. 2004, p 70. Type locality: Japan (Ogasawara Islands).

*Distribution.* Japan [Ogasawara Islands (Haha-jima Island, Chichi-jima Island and Mukô-jima Island), Iwo Islands (Kita-iwo-jima Island)].

*Host plant. Fatsia oligocarpella* (Nakai) Koidzumi (Araliaceae) (Inoue and Miyatake 2001).

***Cacopsylla coccinea*** (Kuwayama)

*Psylla coccinea* Kuwayama 1908, p 171; Oshanin 1912, p 127; Aulmann 1913, p 14; Sasaki 1954, p 34; Miyatake 1964a, p 15; 1964b, p 25; 1965a, p 176; 1966, p 328; 1969, p 77; 1971, p 2; Baba and Miyatake 1971, p 9; Klimaszewski 1973, p 203; Miyatake 1976, p 491; 1979, p 219; Hodkinson 1983, p 357; Kwon 1983, p 63; Yang 1984, p 122; Hodkinson 1986, p 325; Konovalova 1988, p 526; Miyatake 2000, p 204; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 276. Type locality: Japan (Hokkaido, Honshu, Kyushu).

*Cacopsylla coccinea*: Park et al. 1995, p 158.

Miyatake (1964a) synonymized *Psylla akebiae* (Shinji, 1942) (= *Aphalara akebiae*, the type of which was not designated) with *Psylla coccinea*. However, Shinji's original description of the former species (Shinji 1942b) evidently coincides with that of *Psylla hakonensis* Kuwayama, 1908, which is transferred to *Cacopsylla* later in this paper.

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu, Sado Island, Hachijô Island, Tsushima Islands, Ryukyus: Amami-Ôshima Island), Taiwan, Korea, Russian Far East (Southern Primorsky).

*Host plants. Akebia quinata* (Thunb.) Decne. (Lardizabalaceae), *Akebia trifoliata* (Thunb.) Koidz. and *Stauntonia hexaphylla* (Thunb.) Decne. (Lardizabalaceae) (Miyatake 1964a).

***Cacopsylla elaeagni*** (Kuwayama)

*Psylla elaeagni* Kuwayama 1908, p 164; Oshanin 1912, p 127 (*P. eleagni* [sic]); Aulmann 1913, p 14; Kuwayama 1943, p 509; Sasaki 1954, p 34; Miyatake 1964a, p 7; 1969, p 79; 1971, p 2; Kuwayama and Miyatake 1971, p 55; Klimaszewski 1973, p 205 (*P. eleagni* [sic]); Miyatake 1976, p 492; 1979, p 219; Kwon 1983, p 51; Hodkinson 1986, p 326; Konovalova 1988, p 519; Miyatake 2000, p 204; Matsumoto 2004, p 277. Type locality: Japan (Hokkaido, Honshu, Kyushu).

*Cacopsylla elaeagni*: Park 1996, p 271.

*Distribution.* Japan [Hokkaido, Honshu, Shikoku, Kyushu, *Izu Islands (new record), Tsushima Islands, Yakushima Island], northern China, Korea, Russian Far East (Sakhalin Island).

*Host plants. Elaeagnus umbellata* Thunb. (Elaeagnaceae) and *Elaeagnus multiflora* Thunb. in Japan (Miyatake 1964a); other *Elaeagnus* spp. in Korea (Kwon 1983).

*Two males four females, Ako-Igaya, Miyake Island, Tokyo Metropolis, Japan, 5 May 1997, N. Takahashi coll. (NIFTS); two males two females, Uramigataki, Hachijô Island, Tokyo Metropolis, Japan, 3 May 1997, N. Takahashi coll. (NIFTS).

***Cacopsylla elaeagnicola*** (Miyatake)

*Psylla elaeagnicola* Miyatake 1963, p 352; 1969, p 79; 1971, p 2; Klimaszewski 1973, p 205 (*P. eleagnicola* [sic]); Miyatake 1979, p 219; 1982a, p 19; Kwon 1983, p 53; Miyatake 2000, p 204; Matsumoto 2004, p 277. Type locality: Japan (Kyushu).

*Cacopsylla elaeagnicola*: Park et al. 1995, p 156.

*Distribution.* Japan (Honshu, Shikoku, Kyushu), Korea.

*Host plants. Elaeagnus umbellata* Thunb. (Elaeagnaceae) (Miyatake 1963) and *Elaeagnus multiflora* Thunb. in Japan (Miyatake 1982a); other *Elaeagnus* spp. in Korea (Kwon 1983).

***Cacopsylla elegans*** Inoue

*Cacopsylla elegans* Inoue 2004b, p 404. Type locality: Japan (Kyushu).

*Distribution.* Japan (Honshu, Kyushu).

*Host plant. Sorbus japonica* (Decne.) Hedlund (Rosaceae) (Inoue 2004b).

***Cacopsylla elegantula*** (Zetterstedt)

*Chermes elegantula* Zetterstedt 1840, p 310. Type locality: Sweden (Lapponia).

*Psylla elegantula*: Miyatake 1964a, p 24; Klimaszewski 1973, p 205.

*Cacopsylla elegantula*: Klimaszewski 1975, p 186; Ossiannilsson 1992, p 204; Lauterer 1999, p 79.

*Distribution.* The whole Palaearctic, Europe to Japan (Hokkaido).

*Host plants.* Unknown in Japan. Various *Salix* species (Salicaceae) in Europe (Ossiannilsson 1992).

***Cacopsylla evodiae*** (Miyatake) comb. nov.

*Psylla evodiae* Miyatake 1965a, p 176; Hodkinson 1983, p 358; Yang 1984, p 108; Hodkinson 1986, p 326; Inoue et al. 2006, p 66. Type locality: Japan (Ryukyus).

*Cacopsylla evodiae* is probably most closely related to an Indian species *Psylla murrayi* Mathur, 1975, which feeds on *Murraya koenigii* (L.) Spreng. (Rutaceae) (Mathur 1975) and should be transferred to the genus *Cacopsylla* in the future. In addition, *Cacopsylla evodiae* is similar to two Taiwanese Rutaceae-feeding species, *Cacopsylla toddaliae* (Yang, 1984), which feeds on *Toddalia asiatica* (L.) Lam. and is newly recorded from Japan in the present study, and also to *Psylla fagarae* Fang and Yang, 1986, which feeds on *Fagara cuspidata* (Champ.) Engl. (Fang and Yang 1986) and should be transferred to the genus *Cacopsylla* in the future, particularly in the nymphal morphological features.

*Distribution.* Japan {*Honshu [new record], *Shikoku [new record], Kyushu, Yakushima Island, Ryukyus [*Amami-Ôshima Island (new record), *Tokunoshima Island (new record), Okinawa Island, Ishigaki Island, Iriomote Island]}, Taiwan.

*Host plant. Euodia meliifolia* (Hance) Benth. (= *Evodia glauca* Miq.) (Rutaceae) (Miyatake 1965a), *Murraya paniculata* (L.) Jack. and *Zanthoxylum beecheyanum* var. *alatum* (Nakai) Hara. (Inoue et al. 2006) (Rutaceae) and ***Toddalia asiatica* (L.) Lam. (Rutaceae) (new record).

*Honshu: 16 males seven females, Tômyôzaki, Taiji, Wakayama Prefecture, 19 October 2005, on *E. meliifolia*, H. Inoue coll. (NIFTS); Shikoku: eight males nine females, Asakura-nishimachi, Kôchi City, Kôchi Prefecture, 13 October 2005, on *E. meliifolia*, H. Inoue coll. (NIFTS); one female, Usachô-ryû, Tosa City, Kôchi Prefecture, 12 October 2005, on *E. meliifolia*, H. Inoue coll. (NIFTS); 33 males 19 females and many nymphs, Uranouchi, Susaki City, Kôchi Prefecture, 12–13 October 2005, on *E. meliifolia*, H. Inoue coll. (NIFTS); Ryukyus: two males three females, Heda, Uken-son, Amami-Ôshima Island, Kagoshima Prefecture, 19 June 2008, on *E. meliifolia*, H. Inoue coll. (NIFTS); 10 males eight females, Tete, Tokunoshima-chô, Tokunoshima Island, Kagoshima Prefecture, 22 May 2009, on *E. meliifolia*, H. Inoue coll. (NIFTS). **Adults and nymphs were collected from *T. asiatica* at Kadena, Okinawa Island, the Ryukyus, Japan on 22 March 2007 by K. Kawamoto and S. Sukenari (NIFTS).

### ***Cacopsylla fatsiae*** (Jensen)

*Psylla fatsiae* Jensen 1957, p 21; Miyatake 1964a, p 13; 1964b, p 25; Klimaszewski 1973, p 206; Miyatake 1976, p 491; Kwon 1983, p 55; Yang 1984, p 90; Hodkinson 1986, p 326; Miyatake 2000, p 204; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 275. Type locality: USA (California).

*Cacopsylla fatsiae*: Hodkinson 1988, p 1187.

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima Islands), Taiwan, Hong Kong, Korea; USA (introduced).

*Host plants. Fatsia japonica* (Thunb.) Decne. et Planch. (Araliaceae) in Japan and USA (Jensen 1957; Miyatake 1963a), *Fatsia polycarpa* Hayata in Taiwan (Yang 1984).

### ***Cacopsylla fulguralis*** (Kuwayama)

*Psylla fulguralis* Kuwayama 1908, p 177; Oshanin 1912, p 128; Aulmann 1913, p 16; Kuwayama 1943, p 507; Sasaki 1954, p 34; Miyatake 1963, p 342; 1964b, p 25; 1964c, p 124; 1965a, p 178; 1966, p 329; Baba and Miyatake 1971, p 9; Miyatake 1972a, p 13; Klimaszewski 1973, p 207 (*P. fulgularis* [sic]); Miyatake 1976, p 492; 1979, p 220; 1982a, p 19; Hodkinson 1983, p 358; Kwon 1983, p 50; Hodkinson 1986, p 326; Yang 1984, p 83; Fang and Yang 1986, p 125; Konovalova 1988, p 525; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 277. Type locality: Japan (Honshu).

*Cacopsylla fulguralis*: Park 1996, p 271; Labina 2006, p 53.

In recent years this species has been introduced into various parts of Europe, in France, England, the Channel Islands, Italy, the Netherlands and Belgium, and has caused serious damage to ornamental *Elaeagnus* species planted in parks and private gardens (Baugnee 2003; Malumphy and Halstead 2003; Süss and Savoldelli 2003).

*Distribution.* Japan {Honshu, Kyushu, Shikoku, Kunashiri Island, Sado Island, Hachijô Island, Tsushima Islands, Yakushima Island, Ryukyus [Amami-Ôshima Island, Okinawa Island, Ishigaki Island, Iriomote Island, *Yonaguni Island (new record)]}, Taiwan, China, Korea, Philippines (Mindanao Island); Europe (introduced).

*Host plants. Elaeagnus glabra* Thunb. (Elaeagnaceae), *Elaeagnus macrophylla* Thunb. and *Elaeagnus pungens* Thunb. in Japan (Miyatake 1963); *Elaeagnus oldhamii* Maxim. in Taiwan (Fang and Yang 1986); *Elaeagnus cuprea* Elm. in Philippines (Miyatake 1972a); *Elaeagnus commutata* Bernh. ex Rydb. and *Elaeagnus* x *ebbingei* Boom. in Europe (Malumphy and Halstead 2003).

*Two males, Mount Donan-dake, Yonaguni Island, the Ryukyus, Japan, 10 March 1995, Y. Okushima coll. (KURA).

***Cacopsylla haimatsucola*** (Miyatake) comb. nov.

*Psylla haimatsucola* Miyatake 1964a, p 1; 1972b, p 102; Klimaszewski 1973, p 209; Konovalova 1988, p 522; Labina 2006, p 55. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Hokkaido, Honshu, Kunashiri Island), Russian Far East (Primorsky, Sakhalin Island).

*Host plant.* Unknown. Miyatake (1964a) recorded *Pinus pumila* (Pallas) Regel (Pinaceae) as the host plant of this psyllid species. However, the host plant information must be erroneous because the nymph of *C. haimatsucola* has never been collected on this plant species. Habits such as adults gathering on non-host coniferous plants are commonly known among many psylloid species (Hodkinson 1974).

***Cacopsylla hakonensis*** (Kuwayama) comb. nov.

*Psylla hakonensis* Kuwayama 1908, p 176; Sasaki 1954, p 34; Miyatake 1964a, p 23; 1964b, p 26; 1969, p 72; 1979, p 216; Matsumoto 2004, p 276. Type locality: Japan (Honshu).

*Aphalara akebiae* Shinji 1942b, p 354; Sasaki 1954, p 33 (combined with *Psylla*); Miyatake 1964a, p 15 (synonymized with *Psylla coccinea*). Type locality: Japan (Honshu). syn. nov.

The characteristics of *Aphalara akebiae*, the type not designated in the original description (Shinji 1942b), agrees well with those of *Cacopsylla hakonensis*, e.g. the unique brown-spotted maculation of the forewing and also the host plant (*Akebia*

*quinata*), rather than *Cacopsylla coccinea* (Kuwayama), which has been treated as a senior synonym of *A. akebiae* (= *Psylla akebiae*) by Miyatake (1964a). Hence, *A. akebiae* is newly synonymized with *C. hakonensis* in this study.

*Distribution.* Japan (Honshu, Shikoku, Kyushu).

*Host plants. Akebia trifoliata* (Thunb.) Koidz. (Lardizabalaceae) (Miyatake 1979) and *Akebia quinata* (Thunb.) Decne. (Matsumoto 2004).

### ***Cacopsylla hederae*** (Miyatake)

*Psylla hederae* Miyatake 1964a, p 16; 1964b, p 26; Baba and Miyatake 1971, p 10; Klimaszewski 1973, p 209; Miyatake 1976, p 490; 1979, p 220; Kwon 1983, p 68; Miyatake 2000, p 205; Matsumoto 2004, p 276. Type locality: Japan (Kyushu).

*Cacopsylla hederae*: Park 1996, p 271.

*Distribution.* Japan (Honshu, Shikoku, Kyushu, Sado Island, Tsushima Islands), Korea.

*Host plant. Hedera rhombea* (Miq.) Bean (Araliaceae) (Miyatake 1964a).

### ***Cacopsylla horii*** (Kuwayama) comb. nov.

*Psylla horii* Kuwayama 1943, p 507; Sasaki 1954, p 34; Miyatake 1964a, p 26; Klimaszewski 1973, p 210; Miyatake 1976, p 491. Type locality: Japan (Yakushima Island).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Tsushima Islands, Yakushima Island).

*Host plant.* Unknown.

### ***Cacopsylla insularis*** Inoue and Miyatake

*Cacopsylla insularis* Inoue and Miyatake 2001, p 467; Karube et al. 2004, p 70. Type locality: Japan (Ogasawara Islands).

*Distribution.* Japan [Ogasawara Islands (Chichi-jima Island, Ani-jima Island, Haha-jima Island, Mukô-jima Island)].

*Host plant. Rhaphiolepis indica* var. *integerrima* (Hook. et Arn.) Kitamura (Rosaceae) (Inoue and Miyatake 2001).

### ***Cacopsylla japonica*** (Kuwayama) comb. nov.

*Psylla japonica* Kuwayama 1955, p 1; Miyatake 1964a, p 4; 1964b, p 26; 1969, p 71; Baba and Miyatake 1971, p 8; Klimaszewski 1973, p 212; Miyatake 1977, p 245;

1979, p 216; Konovalova 1988, p 525; Miyatake 2000, p 205; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 277. Type locality: Japan (Kyushu).

*Cacopsylla japonica* is probably closely related to *Cacopsylla abieti* (Kuwayama, 1908) and *Cacopsylla lineaticeps* (Kwon, 1983); the latter occurs in Korea and feeds on *Acer ginnala* Maxim. (Aceraceae) (Park 1996). All of them are associated with the plant genus *Acer* and are similar to each other in adult morphological features especially in genal cones and male and female terminalia, but not in the venation and coloration of forewings.

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu, Sado Island), Russian Far East (Southern Primorsky, Sakhalin Island).

*Host plants. Acer rufinerve* Sieb. et Zucc. (Aceraceae) and *Acer ukurunduense* Trautv. et Meyer (Miyatake 1964a).



***Cacopsylla jezoensis*** (Miyatake) comb. nov.

*Psylla jezoensis* Miyatake 1963, p 349; 1969, p 76; 1972b, p 102; Klimaszewski 1973, p 212; Miyatake 1979, p 218. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*. See the notes for *Cacopsylla moiwasana* (Kuwayama).

*Distribution.* Japan (Hokkaido, Honshu).

*Host plant.* Unknown.

***Cacopsylla kiushuensis*** (Kuwayama) comb. nov.

*Psylla kiushuensis* Kuwayama 1908, p 174; Oshanin 1912, p 128 (*P. kiushensis* [sic]); Aulmann 1913, p 18; Kuwayama 1931, p 128; Sasaki 1954, p 34; Miyatake 1964a, p 9; 1964b, p 26; 1965b, p 226; Klimaszewski 1973, p 212; Miyatake 1976, p 492; 1982a, p 19; Hodkinson 1983, p 358; 1986, p 327; Matsumoto 2004, p 277. Type locality: Japan (Kyushu) and Taiwan.

*Distribution.* Japan (Honshu, Shikoku, Kyushu, Tsushima Islands), Taiwan.

*Host plants. Elaeagnus pungens* Thunb. (Elaeagnaceae) and *Elaeagnus macrophylla* Thunb. (Miyatake 1964a).

***Cacopsylla kongoensis*** (Miyatake) comb. nov.

*Psylla kongoensis* Miyatake 1982a, p 16; 2000, p 205. Type locality: Japan (Honshu).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Honshu).

*Host plant. Elaeagnus montana* Makino (Elaeagnaceae) (Miyatake 1982a).

***Cacopsylla ledi*** (Flor)

*Psylla ledi* Flor 1861, p 473; Miyatake 1964a, p 20; Klimaszewski 1973, p 213; Konovalova 1988, p 522. Type locality: Livland.

*Cacopsylla ledi*: Hodkinson 1988, p 1189; Ossiannilsson 1992, p 171; Lauterer 1999, p 83.

*Distribution.* Japan (Hokkaido), Russian Far East (Khabarovsk, Primorsky), Europe, USA (Alaska).

*Host plant. Ledum palustre diversipilosum* var. *nipponicum* Nakai (Ericaceae) in Japan (Miyatake 1964a).

***Cacopsylla maculipennis*** Inoue and Miyatake

*Cacopsylla maculipennis* Inoue and Miyatake 2001, p 470; Karube et al. 2004, p 70. Type locality: Japan (Ogasawara Islands).

*Distribution.* Japan [Ogasawara Islands (Haha-jima Island), Iwo Islands (Kita-iwo-jima Island)].

*Host plant. Pittosporum boninense* Koidzumi (Pittosporaceae) (Inoue and Miyatake 2001).

***Cacopsylla mali*** (Schmidberger)

*Chermes mali* Schmidberger 1836, p 186 Type locality: Austria.

*Psylla mali*: Sasaki 1954, p 34; Miyatake 1964a, p 20; Klimaszewski 1973, p 214; Kwon 1983, p 44; Konovalova 1988, p 532.

*Cacopsylla mali*: Park 1996, p 271; Lauterer 1999, p 127; Labina 2006, p 53.

*Distribution.* The whole Palaearctic from Europe to Japan (Hokkaido, Honshu, Kunashiri Island), Russian Far East. Introduced into Canada and Australia.

*Host plants. Malus domestica* Borkh. (= *Malus pumila* Mill.) (Rosaceae) in Japan (Sasaki 1954); also *Malus silvestris* Mill. in Europe (Ossiannilsson 1992).

***Cacopsylla malivorella*** [Matsumura in (Sasaki)] comb. nov.

*Psylla malivorella* Matsumura in [Sasaki] 1915, p 301 (*Psylla malirorella* [sic] Mats.); Matsumura 1917, p 372; Sasaki 1954, p 35: Miyatake 1963, p 344; Klimaszewski 1973, p 214; Konovalova 1988, p 525; Matsumoto 2004, p 278; Labina 2006, p 55. Type locality: Japan (Honshu).

This species was published for the first time under the name "*Psylla malirorella* Mats." by [Sasaki] (1915) anonymously (see Miyatake 1963). However, the specific name "*malivorella*" has been used in Matsumura (1917), who was considered to have

been responsible for this scientific name (ICZN recommendation 51E; International Commission on Zoological Nomenclature 2000), and also in subsequent taxonomic literature (see above synonymies). Therefore, in the present paper, the name "*malivorella*" was adopted as a prevailing usage (ICZN article 33.3.1).

*Distribution.* Japan (Honshu, Kunashiri Island), Russian Far East (Southern Primorsky).

*Host plants. Malus domestica* Borkh. (= *Malus pumila* Mill.) (Rosaceae) ([Sasaki] 1915) and *Malus sieboldii* Rehd. (Miyatake 1963).

***Cacopsylla matsumurai*** (Miyatake) comb. nov.

*Psylla matsumurai* Miyatake 1964a, p 24; Klimaszewski 1973, p 214; Konovalova 1988, p 522; Labina 2006, p 55. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Hokkaido), Russian Far East (Northern Kuril Islands).

*Host plant. Salix reinii* Franch. et Savat. (Salicaceae) (Miyatake 1964a).

***Cacopsylla midoriae*** (Miyatake)

*Psylla midoriae* Miyatake 1963, p 339; Klimaszewski 1973, p 215. Type locality: Japan (Shikoku).

*Cacopsylla midoriae* (Miyatake) Inoue 2004b, p 400.

See the notes for the next species.

*Distribution.* Japan (Shikoku, Kyushu).

*Host plant. Sorbus japonica* (Decne.) Hedlund (Rosaceae) (Inoue 2004b).

***Cacopsylla moiwasana*** (Kuwayama) comb. nov.

*Psylla moiwasana* Kuwayama 1908, p 175; Oshanin 1912, p 128; Aulmann 1913, p 20; Sasaki 1954, p 35; Miyatake 1964a, p 18; Klimaszewski 1973, p 215. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*. *Cacopsylla jezoensis*, *C. midoriae* and *C. moiwasana*, all of which are endemic to Japan and allopatrically distributed, are very similar to each other. Perhaps all or some of them will be synonymous.

*Distribution.* Japan (Hokkaido).

*Host plant.* Unknown.

***Cacopsylla nigriantennata*** (Kuwayama) comb. nov.

*Psylla nigriantennata* Kuwayama 1908, p 168; Oshanin 1912, p 127; Aulmann 1913, p 20; Sasaki 1954, p 35; Miyatake 1964a, p 24; 1969, p 77; Klimaszewski 1973, p 217; Miyatake 1979, p 218; Matsumoto 2004, p 278. Type locality: Japan (Honshu).

*Distribution.* Japan (Honshu, Shikoku, Kyushu)

*Host plants. Lyonia ovalifolia* var. *elliptica* (Sieb. et Zucc.) Hand.-Mazz. (Ericaceae) (Miyatake 1964a), *Enkianthus cernuus* f. *rubens* (Maxim.) Ohwi (Ericaceae) (Miyatake 1979) and *Enkianthus campanulatus* (Miq.) Nicholson and *Enkianthus perulatus* (Miq.) Schneider (Matsumoto 2004).



***Cacopsylla peregrina*** (Foerster)

*Psylla peregrina* Foerster 1848, p 74; Kuwayama 1908, p 166; Oshanin 1912, p 127; Aulmann 1913, p 22; Sasaki 1954, p 35; Miyatake 1964a, p 21; Konovalova 1988, p 532. Type locality: Germany (Aachen).

*Cacopsylla peregrina*: Ossiannilsson 1992, p 132; Lauterer 1999, p 133.

*Distribution.* The whole Palaearctic from Europe to Japan (Hokkaido, Honshu), Russian Far East; USA (introduced).

*Host plants.* Unknown in Japan. *Crataegus* spp. (Rosaceae) in Europe and USA (Ossiannilsson 1992; Wheeler and Stoops 2001).

***Cacopsylla pulchra*** (Zetterstedt)

*Chermes pulchra* Zetterstedt 1840, p 309. Type locality: Sweden (Lapponia).

*Psylla pulchra*: Miyatake 1964a, p 7; Baba and Miyatake 1971, p 10; Klimaszewski 1973, p 220; Miyatake 1979, p 220; Konovalova 1988, p 529.

*Cacopsylla pulchra*: Klimaszewski 1975, p 193; Ossiannilsson 1992, p 189; Lauterer 1999, p 89.

*Psylla sapporensis* Kuwayama 1908, p 166. Synonymized by Miyatake 1964a, p 7.

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu, Sado Island), Russian Far East, Europe.

*Host plants. Salix integra* Thunb. (Salicaceae) in Japan (Miyatake 1964a); various *Salix* species in Europe (Ossiannillson 1992).

***Cacopsylla pyricola*** (Foerster)

*Psylla pyricola* Foerster 1848, p 77; Kuwayama 1908, p 163; Aulmann 1913, p 24; Sasaki 1954, p 35; Klimaszewski 1973, p 221; Kwon 1983, p 67; Hodkinson 1988, p 1192; Konovalova 1988, p 521. Type locality: Germany (Aachen, Frankfurt).

*Cacopsylla pyricola*: Burckhardt and Hodkinson 1986, p 127; Ossiannilsson 1992, p 159.

*Distribution.* The whole Palaearctic, from Europe to Japan (Hokkaido, Honshu), Russian Far East (Khabarovsk, Primorsky); introduced into North America (USA, Canada) and South America (Argentina).

*Host plants. Pyrus ussuriensis* Maxim. (= *Pyrus simonii*) (Rosaceae) in Japan (Sasaki 1954); *Pyrus communis* L. and *Pyrus pyraster* Burgsd. in the other area (Burckhardt and Hodkinson 1986; Ossiannilsson 1992).

### ***Cacopsylla pyrisuga*** (Foerster)

*Psylla pyrisuga* Foerster 1848, p 78; Schwarz 1896, p 297; Kuwayama 1908, p 165; Oshanin 1912, p 127; Aulmann 1913, p 24; Sasaki 1954, p 35; Miyatake 1964a, p 27; 1969, p 75; Klimaszewski 1973, p 222; Miyatake 1979, p 217; Kwon 1983, p 42; Konovalova 1988, p 532. Type locality: Germany (Aachen, Boppard).

*Cacopsylla pyrisuga*: Burckhardt and Hodkinson 1986, p 123; Park 1996, p 272; Lauterer 1999, p 121.

*Distribution.* The whole Palaearctic from Europe to Japan (Hokkaido, Honshu, Shikoku, Kyushu), Russian Far East (Khabarovsk, Primorsky).

*Host plants. Pyrus pyrifolia* var. *culta* (Makino) Nakai (= *Pyrus serotina* Rehder) (Rosaceae) (Miyatake 1964a), *Marus domestica* Borkh. (= *Malus pumila*) (Sasaki 1954) in Japan; also *Pyrus* spp. in Europe (Burckhardt and Hodkinson 1986; Ossiannilsson 1992).

### ***Cacopsylla rhododendri*** (Puton)

*Psylla rhododendri* Puton 1871, p 436; Miyatake 1969, p 76; 1979, p 218; Kwon 1983, p 61; Konovalova 1988, p 529. Type locality: Switzerland (Engelberg).

*Cacopsylla rhododendri*: Ossiannilsson 1992, p 178; Park 1996, p 272.

*Distribution.* Japan (Honshu), Russian Far East, Korea, Europe.

*Host plants. Rhododendron tschonoskii* var. *tetramerum* (Makino) Komatsu (Ericaceae) in Japan (Miyatake 1979); *Rhododendron ferrugineum* L., *Rhododendron hirsutum* L., *Rhododendron kotschyi* Simonk. in Europe (Klimaszewski 1973).

### ***Cacopsylla satsumensis*** (Kuwayama) comb. nov.

*Psylla satsumensis* Kuwayama 1908, p 177; Oshanin 1912, p 128; Aulmann 1913, p 27; Sasaki 1954, p 36; Miyatake 1963, p 355; 1965a, p 178; Klimaszewski 1973, p 224; Miyatake 2000, p 205; Matsumoto 2004, p 277. Type locality: Japan (Kyushu).

*Distribution.* Japan (Honshu, Shikoku, Kyushu, Ryukyus [Miyako Island, Ishigaki Island]).

*Host plant. Rhaphiolepis indica* var. *umbellata* (Thunb. ex Murry) Ohashi (Rosaceae) (Miyatake 1963).

### ***Cacopsylla sorbicoccinea*** Inoue

*Cacopsylla sorbicoccinea* Inoue 2004b, p 409. Type locality: Japan (Kyushu).

*Distribution.* Japan (Hokkaido, Honshu, Kyushu).

*Host plant. Sorbus japonica* (Decne.) Hedlund (Rosaceae) (Inoue 2004b).



### ***Cacopsylla sorbicola*** (Miyatake) comb. nov.

*Psylla sorbicola* Miyatake 1963, p 347; 1964b, p 27; 1969, p 75; Klimaszewski 1973, p 225; Miyatake 1979, p 217; Konovalova 1988, p 526; Matsumoto 2004, p 278; Labina 2006, p 55. Type locality: Japan (Honshu).

*Distribution.* Japan (Hokkaido, Honshu), Russian Far East (Northern Primorsky, Northern Kuril Islands).

*Host plants. Sorbus commixta* Hedl. (Rosaceae) and *Sorbus sambucifolia* (Cham. et Schltdl.) Roemer (Miyatake 1963).

### ***Cacopsylla swidae*** Inoue

*Cacopsylla swidae* Inoue 2004a, p 144. Type locality: Japan (Honshu).

*Psylla melanoneura* Foerster: Miyatake 1963, p 354; Konovalova 1988, p 532; Inoue and Yamauchi 2001, p 56; Matsumoto 2004, p 276.

This species corresponds to the Japanese population that has been identified as a European species *Psylla melanoneura* Foerster, 1848, formerly (Inoue 2004a).

*Distribution.* Japan (Hokkaido, Honshu, Shikoku, Kyushu).

*Host plant. Swida controversa* (Hemsl.) Soják (Cornaceae) (Inoue 2004a).

### ***Cacopsylla tenuata*** (Jensen)

*Psylla tenuata* Jensen 1951, p 315; Miyatake 1963, p 354; Klimaszewski 1973, p 226. Type locality: USA (California).

*Cacopsylla tenuata*: Hodkinson 1980, p 136.

*Distribution.* Japan (Honshu), USA (California).

*Host plants. Salix* sp. (Salicaceae) in Japan (Miyatake 1963); *Salix laevigata* Bebb. in USA (Jensen 1951).

### ***Cacopsylla tobirae*** (Miyatake)

*Psylla tobirae* Miyatake 1964a, p 5; 1964c, p 125; 1965a, p 179; 1966, p 329; Klimaszewski 1973, p 226; Miyatake 1976, p 492; Hodkinson 1983, p 358; Kwon 1983, p 60; Yang 1984, p 102; Hodkinson 1986, p 329; Miyatake 2000, p 205; Matsumoto 2004, p 275. Type locality: Japan (Kyushu).

*Cacopsylla tobirae*: Park 1996, p 273.

*Distribution.* Japan {Honshu, Shikoku, Kyushu, Izu Islands [Hachijô Island], Tsushima Islands, Yakushima Island, Ryukyus [Amami-Ôshima Island, *Tokunoshima Island (new record), Okinawa Island, Ishigaki Island, Iriomote Island]}, Korea, Taiwan.

*Host plant. Pittosporum tobira* (Thunb. ex Murray) Aiton (Pittosporaceae) (Miyatake 1964a).

*Ryukyus: two males one female, Mount Inokawa-dake, Tokunoshima Island, Kagoshima Prefecture, Japan, 17 May 2001, on *Pittosporum tobira*, H. Inoue coll. (NIFTS); five males three females, Mikyô, Nishiagina, Amagi, Tokunoshima Island, Kagoshima Prefecture, Japan, 17 May 2001, on *Pittosporum tobira*, H. Inoue coll. (NIFTS).

### ***Cacopsylla toddaliae*** (Yang)

*Psylla toddaliae* Yang 1984, p 111. Type locality: Taiwan.

*Cacopsylla toddaliae*: Li 2005, p 165.

This species is newly recorded from Japan on the basis of the following materials preserved in NIFTS: one male two females, Yasura, Ishigaki Island, Okinawa Prefecture, Japan, 6 December 2001, on *Toddalia asiatica*, K. Kohno coll.; three nymphs (fifth instar), same data, 13 December 2001; seven males four females, same data, 10 January 2002; four males one female, same data, 11 January 2002; eight males five females, same data, 17 January 2002.

*Distribution.* Japan (new record) [Ryukyus (Ishigaki Island)], Taiwan.

*Host plant. Toddalia asiatica* (L.) Lam. (Rutaceae).

### ***Cacopsylla toroenensis*** (Kuwayama) comb. nov.

*Psylla toroenensis* Kuwayama 1908, p 172; Miyatake 1964a, p 14; 1964b, p 27; Klimaszewski 1973, p 226 (*P. toroensis* [sic]); Hodkinson 1986, p 329 (*P. toroensis* [sic]). Type locality: Taiwan.

A Taiwanese species *Psylla formosana* Yang, 1984, which feeds on *Hedera rhombea* var. *formosana* (Nakai) Li (Araliaceae) (Yang 1984) and should be transferred to the

genus *Cacopsylla* in the future, is probably most closely related to or perhaps a junior synonym of *C. toroenensis*.

*Distribution.* Japan (Honshu, Shikoku, Kyushu), Taiwan.

*Host plant. Hedera rhombea* (Miq.) Bean (Araliaceae) (Miyatake 1964a).

***Cacopsylla uenoi*** (Matsumoto) comb. nov.

*Psylla uenoi* Matsumoto 1995, p 203. Type locality: Japan (Hokkaido).

Although nymphs of this species are unknown, adult morphological features fit well in the genus *Cacopsylla*.

*Distribution.* Japan (Hokkaido).

*Host plant. Ulmus davidiana* var. *japonica* (Rehd.) Nakai (Ulmaceae) (Matsumoto 1995).

***Cacopsylla vaccinii*** (Miyatake) comb. nov.

*Psylla vaccinii* Miyatake 1964a, p 27; 1964b, p 27; 1965a, p 179; Klimaszewski 1973, p 227; Miyatake 1976, p 492; Miyatake 2000, p 205 Type locality: Japan (Shikoku).

*Distribution.* Japan [Honshu, Shikoku, Kyushu, Tsushima Islands, Ryukyus (Okinawa Island)].

*Host plant. Vaccinium bracteatum* Thunb. (Ericaceae) (Miyatake 1964a).

***Cacopsylla viburni*** (Löw)

*Psylla viburni* Löw 1876, p 194; Sasaki 1954, p 36 (*P. viburnii* [sic]); Miyatake 1963, p 341 (*P. viburnii* [sic]); Klimaszewski 1973 p 228; Mathur 1975, p 288; Hodkinson and White 1979, p 61; Miyatake 1979, p 218 (*P. viburnii* [sic]); Hodkinson 1986, p 329; Matsumoto 2004, p 278 (*P. viburnii* [sic]). Type locality: Austria, Switzerland (Helvetia).

*Cacopsylla viburni*: Lauterer 1976, p 117; 1999, p 99.

*Psylla viburni* Shinji 1942a, p 2 (primary junior homonym of *Psylla viburni* Löw, 1876).

The Japanese psyllid population that has been identified as "*Psylla viburni*" in the above-mentioned literature is unlikely to be identical with the European *Cacopsylla viburni* (see Miyatake 1969, 1979).

*Distribution.* Japan (Honshu, Shikoku, Kyushu), India, Nepal, Europe.

*Host plants. Viburnum dilatatum* Thunb. ex Murray (Caprifoliaceae) (Sasaki 1954), *Viburnum erosum* var. *punctatum* Franch. et Savat. and *Viburnum furcatum* Blume ex Maxim. (Miyatake 1963) in Japan; *Viburnum lantana* L. in Europe (Lauterer 1999).

### ***Cacopsylla visci*** (Curtis)

*Psylla visci* Curtis 1835, p 565; Miyatake and Usuba 1997, p 8 (*Psylla* sp. near *visci*); Inoue 2002, p 496. Type locality: England.

*Cacopsylla visci*: Klimaszewski 1975, p 197.

*Distribution.* Japan (Honshu, Kyushu), Europe, Morocco, Iraq, Caucasus.

*Host plants. Viscum album* L. (Loranthaceae) (Miyatake and Usuba 1997) in Japan; also *Viscum laxum* L. and *Loranthus europaeus* Jacq. (Loranthaceae) in other localities (Lauterer 1999).

### ***Cacopsylla yukawai*** Inoue

*Cacopsylla yukawai* Inoue 2004a, p 150. Type locality: Japan (Honshu).

*Distribution.* Japan (Honshu).

*Host plant.* **Sorbus commixta* var. *rufo-ferruginea* C. K. Schn. (Rosaceae) (new record).

*Adults and nymphs were confirmed on *S. commixta* var. *rufo-ferruginea* at Mount Nantai, Nikko City, Tochigi Prefecture, Honshu, Japan on 3 July 2004 by H. Inoue (NIFTS).

## Genus ***Chamaepsylla*** Ossiannilsson

*Psylla* (*Chamaepsylla*) Ossiannilsson 1970, p 140.

Type species: *Chermes hartigii* Flor, 1861, by original designation.

*Chamaepsylla*: Burckhardt 1979, p 113.

### ***Chamaepsylla hartigii*** (Flor)

*Psylla hartigii* Flor 1861, p 469; Miyatake 1964a, p 15; 1969, p 73; Klimaszewski 1973, p 209 (*P. hartigi* [sic]); Lauterer 1976, p 115 (*P. hartigi* [sic]); Hodkinson and White 1979, p 56 (*P. hartigi* [sic]); Konovalova 1988, p 525. Type locality: Livland.

*Cacopsylla hartigii*: Hodkinson 1988, p 1188; Labina 2006, p 53.

*Chamaepsylla hartigii*: Ossiannilsson 1992, p 117.

*Distribution.* The whole Palaearctic from Europe to Japan (Hokkaido, Honshu, Kunashiri Island, Shikotan Island), Sakhalin, North America (USA, Canada).

*Host plants. Betula platyphylla* var. *japonica* (Miq.) Hara (Betulaceae) in Japan (Miyatake 1969); *Betula alba* L., *Betula verrucosa* Ehrh., *Betula pubescens* Ehrh., *Betula tortuosa* Ledeb. in Europe (Klimaszewski 1973, Ossiannilsson 1992); *Betula populifolia* Marshall in North America (Hodkinson 1988).

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