

A revision of the west Palaearctic pear psyllids (Hemiptera: Psyllidae)

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Abstract

The status and taxonomy of the west Palaearctic *Pyrus*-feeding psyllids are reviewed, and keys for the identification of adults and larvae are given. The species, now referred to the genus *Cacopsylla*, have been much confused. They are shown to comprise seven distinct species: *C. pyrisuga* (Förster), *C. pyri* (L.) (summer form *pyrarboris*, winter form *pyri*), *C. pyricola* (Förster) (summer form *pyricola*, winter form *simulans*), *C. bidens* (Sulc) (summer form *vasilevi* syn. n., winter form *bidens*), *C. notata* (Flor) sp. rev., *C. permixta* sp. n. (= *simulans* sensu Loginova and Gegechkori nec Förster) and *C. fera* (Baeva). *Psylla horvathii* Sulc and *P. vicina* Šulc are synonymized with *C. pyricola*; *P. picta* is regarded as a nomen dubium. Information is given on the host-plants and distribution of each species.

Introduction

Psyllids are among the most important pests of cultivated pear (*Pyrus communis*) throughout Europe, Asia and North America. The taxonomic status of the various species, however, is poorly understood and some major problems were highlighted by Hodkinson (1984). This present paper, based on the subsequent examination of a wide range of both adult and larval material including all available type specimens, tries to present a clear summary of the status and means of identification of each described *Pyrus*-feeding species in the west of the Palaearctic Region. We hope it will stimulate interested economic entomologists to look much more closely at the taxonomy and biology of the species with which they are dealing.

Eight species of *Pyrus*-feeding psyllids, here referred to the genus *Cacopsylla* Ossiannilsson, were recognized from the Palaearctic Region west of China prior to this present study (Klimaszewski, 1973; Šulc, 1915). Several other species had been sunk in synonymy (Hodkinson, 1984). The recognized species were *C. pyricola* (Förster), *C. pyri* (L.), *C. pyrisuga* (Förster), *C. vasilevi* (Šulc), *C. vicina* (Šulc), *C. bidens* (Šulc), *C. horvathii* (Šulc) and *C. fera* (Baeva). *Psylla picta* Förster also appears to belong to this group. *C. pyricola* is recorded as an introduction into both North and South America and, together with *C. pyrisuga* and *C. pyri*, is recorded from the temperate far east. The published geographical distributions and host-plant records of all the above species are summarized by Hodkinson (1984).

Historically, all the pear-feeding psyllids have been placed in *Psylla* s.l. However, several characters of the larva and adult, taken in conjunction with their host-plant association with the Rosaceae, suggest that they do not form a monophyletic group with

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the type species *P. alni* (L.) and its near relatives which feed on Betulaceae and Buxaceae. Ossiannilsson (1970) divided the Swedish species of *Psylla* into subgenera and included *pyri*, *pyricola* and *pyrisuga* in *Hepatopsylla*. Loginova (1978) subsequently removed *pyrisuga* to become the type of the new subgenus *Thamnopsylla* and added *vasilevi* and *fera* to *Hepatopsylla*. Klimaszewski (1972), however, suggested that *Psylla* s.l. should be split into the genera *Psylla* s.s. and *Cacopsylla*, including among others the subgenera *Hepatopsylla* and *Thamnopsylla*. We here formally propose that all the pear-feeding species should be referred to *Cacopsylla* sensu Klimaszewski.

C. pyricola and *C. pyri* are both seasonally dimorphic, existing as distinct summer and winter forms which were at one time considered separate species. The dimorphism is controlled primarily by photoperiod. The summer form of *C. pyricola* (form *pyricola*) is small with clear wings: the winter form (*simulans*) is significantly larger with a more oblong-oval clouded wing bearing reduced fields of surface spinules (Slingerland, 1892; Mally, 1894; Schaefer, 1949; Klimaszewski, 1963, 1964, 1973; Wong & Madsen, 1967; Oldfield, 1970). Similarly, the summer form of *C. pyri* (*pyrarboris*) is distinguished from the winter form (*pyri*) by the absence of brown clouding in the forewing, by the presence of denser and more widespread forewing spinules and by its smaller size (Klimaszewski, 1975; Bonnemaison & Missonnier, 1956a, b; Ossiannilsson, 1952a, b; Wille, 1950). The remaining species have not previously been shown to exhibit seasonal dimorphism.

In addition to the typically west Palaearctic species listed above, Yang & Li (1981) and Li & Yang (1984) have described a further 18 *Psylla* species nominally associated with *Pyrus* species in China (see Hodkinson, 1986). These species are usually based on a few adult specimens from a single locality, often collected on a single date. They are not discussed relative to the existing species and no consideration is given to possible polymorphism or geographical variation, with the consequence that some of the specific differences appear trivial. It is also apparent from their morphology that not all the species belong to the *C. pyricola*/*C. pyri* group and that among those that do some may be synonymous with species discussed fully in this paper. Nevertheless, it is highly likely that among these Chinese species are further good biological species which feed on *Pyrus*. Much further collecting and observation will be required to determine whether this is so, and these species are, therefore, not considered further. There is also too little material available to make taxonomic judgements on the true identity and relationships of species described from *Pyrus* in India and the Primorskiy Territory of the USSR by Mathur (1975) and Konovalova (1979), respectively.

Despite earlier confusion, *C. pyrisuga* is clearly defined and it is the identity of species within the *C. pyri*/*C. pyricola* group which is problematical. European economic entomologists have usually applied the names *pyri* or *pyricola* to all members of the complex and have failed to recognize morphological and biological differences between the several species. Here we show that the *C. pyri*/*C. pyricola* group is a complex of related but distinct species with overlapping geographical distributions. The species are *C. pyri* (summer form *pyrarboris*, winter form *pyri*), *C. pyricola* (summer form *pyricola*, winter form *simulans*), which has been introduced into North America, *C. bidens* (summer form *vasilevi*, winter form *bidens*), *C. notata* (Flor) sp. rev., *C. fera* and *C. permixta* sp. n. The last three species show, as far as we can determine, only very slight seasonal dimorphism. *C. permixta* is the species which Gegechkori and Loginova referred to several times as *?simulans* (see later). The use of the name *simulans* has been particularly confused, having also been applied by Klimaszewski (1964) to a larva which is almost certainly that of *C. notata*. Finally, *Psylla horvathii* and *P. vicina* are shown to be synonymous with *C. pyricola* and the position of *P. picta* as a nomen dubium is confirmed; the single female type specimen is damaged beyond recognition.

Material examined

Relevant type-material is preserved in the following collections: British Museum (Natural History) (BMNH), I. D. Hodkinson, Liverpool Polytechnic (IDH), Institut

Zoologii Parasitologii, Tadjikistan (IZPT), Moravian Museum, Brno (MMB), Museum of Comparative Zoology, Boston (MCZ), Muséum d'Histoire Naturelle, Geneva (MHNG), Naturhistorisches Museum, Vienna (NHMV), Termesztudományi Múzeum, Budapest (TM), Zoological Institute, Leningrad (ZI) and Zoological Museum of the University, Helsinki (ZMH). In addition, material from a large number of museums and collections was examined (see acknowledgements).

KEY TO SPECIES OF ADULT PEAR PSYLLIDS

Morphological terminology mainly follows Hodkinson & White (1979). Measurements and ratios are given in Table I.

TABLE I. *Measurements (in mm) of adults and final (fifth)-instar larvae of pear psyllids*

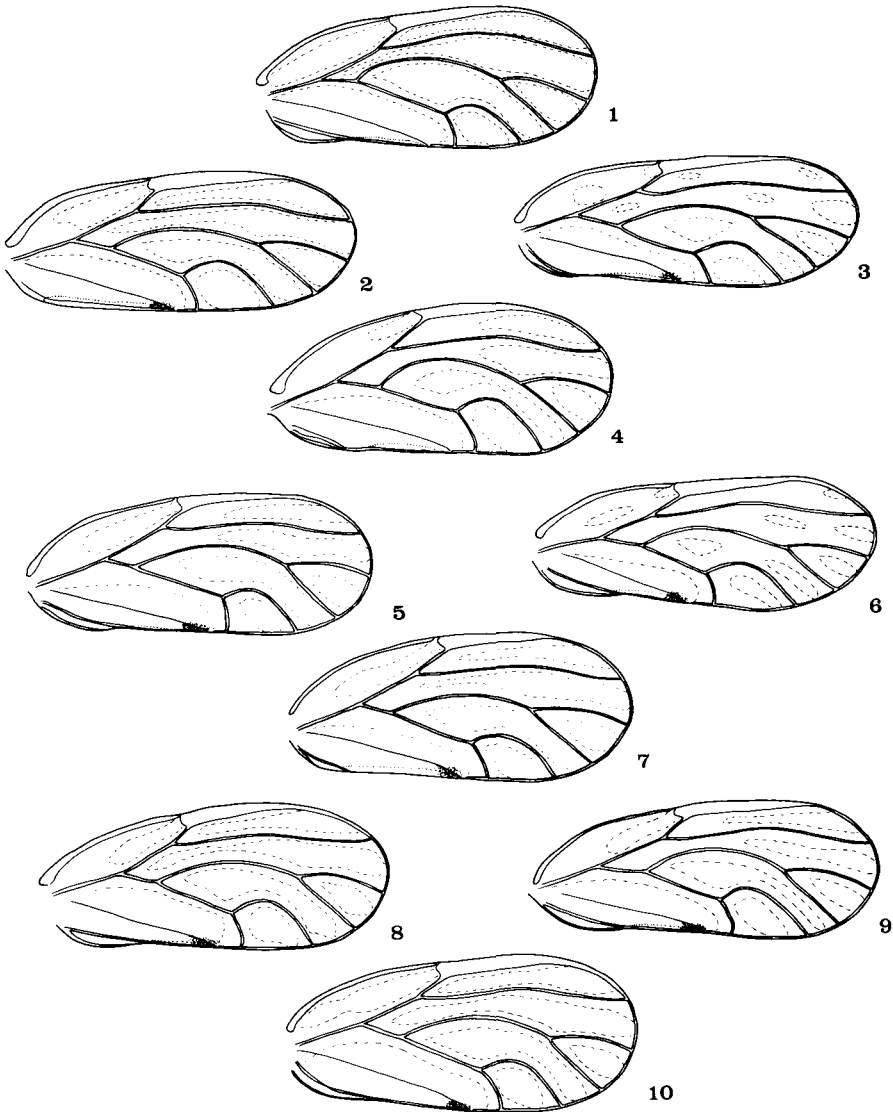
	<i>C. pyrisuga</i>	<i>C. pyri</i>	<i>C. bidens</i>	<i>C. pyricola</i>	<i>C. notata</i>	<i>C. permixta</i>	<i>C. fera</i>
Adults							
Head width	0.76–1.00	0.71–0.86	0.61–0.89	0.60–0.73	0.55–0.71	0.62–0.76	0.62–0.64
Wing length	2.88–3.25	2.21–2.94	1.71–2.70	1.62–2.54	1.38–2.09	1.77–2.34	1.69–1.76
Antennal length / head width	1.46–1.50	1.36–1.77	1.25–1.67	1.31–1.79	1.12–1.57	1.30–1.50	1.34
Larvae							
Body length	1.67–2.40	1.34–2.01	1.31–2.07	1.45–2.08	1.10–1.76	1.32–1.76	Unknown
Antennal length	0.78–0.88	0.68–0.78	0.60–0.78	0.66–0.78	0.49–0.66	0.52–0.63	
Wing pad length	0.91–1.03	0.63–0.76	0.63–0.80	0.56–0.77	0.47–0.66	0.54–0.63	

- 1 Forewings longer than 2.8 mm and clavus without apical brown patch. Mesopraescutum along the mid-line about twice as long as pronotum, distinctly shorter than mesoscutum. Paramere (Fig. 25) longer than distal segment of aedeagus (Fig. 18) *C. (T.) pyrisuga* (Förster)
- Forewings shorter than 2.7 mm; if longer (in some *C. pyri* adults, cf. Table I) then clavus with apical brown patch. Mesopraescutum and mesoscutum along the mid-line of sub-equal length, more than twice as long as pronotum. Paramere as long as or shorter than distal segment of aedeagus 2
- 2 Parameres sickle-shaped (Fig. 26). Female proctiger with strong constriction in the middle (Fig. 39) *C. (H.) pyri* (L.)
- Paramere in profile lamellar. Female proctiger cuneate. 3
- 3 Forewings without apical brown patch on clavus. Apex of paramere bent backwards (Figs. 27 & 33) *C. (H.) fera* (Baeva)
- Forewings with brown apical patch on clavus. Apex of parameres bent inwards and/or forwards 4
- 4 Head (Fig. 14) with blunt genal processes. Parameres (Figs. 28, 29 & 34) with a long forward-directed and a shorter inwardly-directed tooth at apex, fore-margin with wide lobe. Distal segment of aedeagus (Fig. 21) with very broad, weakly curved apical dilatation. Dorsal margin of female proctiger (Fig. 43) with a small hump in the middle, apex blunt or subacute *C. (H.) bidens* (Sulc)
- Head (Figs. 15–17) with subacute genal processes. Paramere and aedeagus not as above. Dorsal margin of female proctiger (Figs. 45, 47 & 49) concave 5
- 5 Paramere (Figs. 30 & 35) with forward directed apical tooth; fore-margin constricted in basal third. Distal segment of aedeagus (Fig. 22) with weakly curved apical dilatation. Female proctiger (Fig. 45) often clearly exceeding subgenital plate *C. (H.) permixta* sp. n.
- Paramere (Figs. 31, 32, 36 & 37) with inwardly directed blunt apex, fore-margin not

constricted. Distal segment of aedeagus (Figs. 23 & 24) with apical dilatation forming a hook. Female proctiger (Figs. 47 & 49) only slightly exceeding subgenital plate

- 6 Forewings with yellow to brown or dark brown veins. Larger species (cf. Table I) *C. (H.) pyricola* (Förster)
 — Forewings with white veins. Smaller species (cf. Table I) *C. (H.) notata* (Flor)

This final separation is difficult and reference should be made to larvae whenever possible.



Figs. 1–10.—Forewing; 1, *C. pyrisuga* (Förster); 2, *C. pyri* (L.) (summer-form *pyrarboris*); 3, *C. pyri* (winter form *pyri*); 4, *C. fera* (Baeva); 5, *C. bidens* (Sulc) (summer form *vasilevi*); 6, *C. bidens* (winter form *bidens*); 7, *C. permixta* sp. n.; 8, *C. pyricola* (Förster) (summer form *pyricola*); 9, *C. pyricola* (winter form *simulans*); 10, *C. notata* (Flor).

KEY TO FIFTH-INSTAR LARVAE OF PEAR PSYLLIDS

The larvae of *C. fera* are unknown. Morphological terminology follows White & Hodkinson (1982). Measurements are given in Table I.

- 1 Abdomen with three large lateral and three medio-lateral free sternites on either side of mid-line (Fig. 50). Hind margin of abdomen with 3 + 3 sectasetae *C. (T.) pyrisuga* (Förster)
- Abdomen with two large lateral and two smaller, medio-lateral free sternites (Figs. 55 & 56). Hind margin of abdomen without sectasetae 2
- 2 Dorsal surface of caudal plate covered in long capitate setae (Fig. 56). Margin of forewing pads with more than 3 capitate setae *C. (H.) notata* (Flor)
- Dorsal surface of caudal plate without capitate setae (Fig. 55). Margin of forewing pads with at most 3 capitate setae 3
- 3 Lateral capitate setae of abdominal margin distinctly shorter than terminal ones (Fig. 57) *C. (H.) permixta* sp. n.
- Lateral and terminal marginal setae of abdomen subequal (Fig. 55) 4
- 4 Forewing pads with 2–3 marginal capitate setae (Fig. 55) *C. (H.) bidens* (Šulc) and *C. (H.) pyricola* (Förster)
- Forewing pads only with 1 marginal capitate seta (Fig. 51) *C. (H.) bidens* (Šulc) and *C. (H.) pyri* (L.)

The last separation is again difficult as the number of capitate setae in *C. bidens* is variable.

***Cacopsylla (Thamnopsylla) pyrisuga* (Förster) (Figs. 1, 11, 18, 25, 38 & 50)**

Psylla pyrisuga Förster, 1848: 78. Lectotype ♂, GERMAN FEDERAL REPUBLIC, Aachen, *Pyrus communis* (NHMV), here designated (examined).

Psylla austriaca Flor, 1861b: 372. Lectotype ♂, AUSTRIA: Steiermark, Laibach, *Abies alba* (G. Flor) (NHMV), here designated (examined). Synonymized by Löw (1883: 233).

Psylla aurantiaca Goureau, 1861: 122. Syntypes adults, FRANCE (?depository). Synonymized by Löw (1883: 233).

Psylla rufitarsis Meyer-Dür, 1871: 394. Lectotype ♂, SWITZERLAND: Burgdorf, 28.iii., *Pinus*, type 14394 (MCZ), designated by Burckhardt (1983: 59) (examined). Synonymized by Löw (1883: 249).

Psylla rutila Meyer-Dür, 1871: 394. Lectotype adult, SWITZERLAND: Jura (NHMV), designated by Burckhardt (1983: 59) (examined). Synonymized by Löw (1883: 249).

Diagnosis. Head (Fig. 11) with broad blunt genal processes. Forewings (Fig. 1) clear with brown veins. Surface spinules present in all cells, leaving narrow free stripes along the veins. Parameres (Fig. 25) lanceolate with inward- and forward-directed apical hook. Distal segment of aedeagus (Fig. 18) with short curved apical dilatation. Dorsal margin of female proctiger sinuous, apex rounded.

Comments. *C. pyrisuga* is easily recognizable by the size (Table I). It is univoltine, and adults overwinter on conifers.

Host-plants. *Pyrus communis*, *P. amygdaliformis* and *P. salicifolia*.

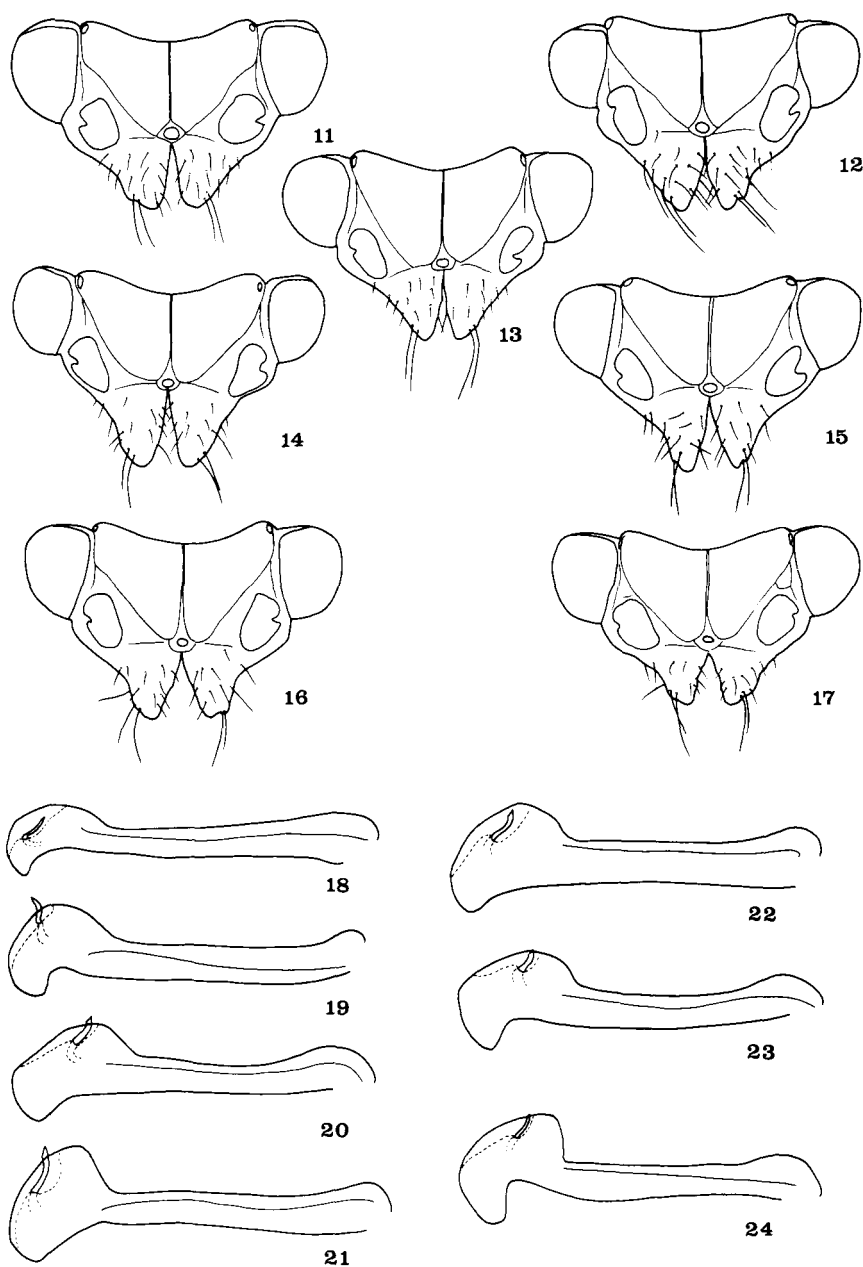
Distribution. Material examined from Austria, France, German Democratic Republic, German Federal Republic, Great Britain, Greece, Italy, Switzerland, Turkey and USSR (Georgia).

***Cacopsylla (Hepatopsylla) pyri* (L.) (Figs. 2, 3, 12, 19, 26, 39, & 51)**

Chermes pyri L., 1761: 262. Syntypes adults, SWEDEN (?depository).

Apiopsylla Amyot, 1847: 459. Unavailable uninominal name proposed for *Chermes*.

Psylla pyrarboris Šulc, 1910: 34. Lectotype ♂, CZECHOSLOVAKIA: Ostrava-Hermanice, 19.ix.1904, Invent.c.2233 (MMB), here designated. Synonymized by Ossiannilsson (1952a: 194).



Figs. 11–17.—Head. Figs. 18–24.—Distal segment of aedeagus. Figs. 11, 18—*C. pyrisuga* (Förster); 12, 19, *C. pyri* (L.); 13, 20, *C. fera* (Baeva); 14, 21, *C. bidens* (Šulc); 15, 22, *C. permixta* sp. n.; 16, 24, *C. pyricola* (Förster); 17, 23, *C. notata* (Flor).

Diagnosis. Head (Fig. 12) with blunt or subacute genal processes, always with subapical constriction. Forewings (Figs. 2 & 3) with dark veins; in summer form membrane clear, surface spinules forming extended fields, in winter form centre of cells with dark clouds, surface spinules largely reduced. Parameres (Fig. 26) and female proctiger (Fig. 39) are distinct from all other species. Distal segment of aedeagus (Fig. 19) with strongly hooked apex.

Comments. Adults of *C. pyri* differ greatly from other pear psyllids in their genital morphology. However, no reliable characters are known that separate the larvae of *C. pyri* and *C. bidens*. Polyvoltine; adults overwinter on the host-plant.

Host-plants. *Pyrus communis* and *P. elaeagnifolia*.

Distribution. Material examined from Austria, Czechoslovakia, France, German Democratic Republic, German Federal Republic, Great Britain, Greece (Crete), Italy, The Netherlands, Switzerland and Turkey.

***Cacopsylla (Hepatopsylla) fera* (Baeva) (Figs. 4, 13, 27, 33, 40 & 41)**

Psylla fera Baeva, 1968: 52. Holotype ♂, USSR: Tadzhik SSR: Sangardak, 16.vi.1966, *Pyrus bucharica* (V. Baeva) (IZPT).

Diagnosis. Head (Fig. 13) with evenly tapering subacute genal processes. Forewings (Fig. 4) clear with brown veins; surface spinules in basal parts of cells often reduced, leaving broad free stripes along the veins. Parameres (Fig. 27) with blunt backward-directed apex. Distal segment of aedeagus (Fig. 20) with weakly curved apical dilatation. Dorsal margin of female proctiger (Fig. 40) straight or convex, apex blunt. Proctiger in dorsal view (Fig. 40) cuneate.

Comments. *C. fera* differs from other species of the *C. pyri/C. pyricola* complex in the lack of a brown patch on the clavus of the forewings. It is easily separated from *C. pyrisuga* by its smaller size. Larvae are unknown. Polyvoltine; adults overwinter (Baeva, 1985).

Host-plants. *Pyrus bucharica*.

Distribution. Material examined from Tadzhik SSR, USSR. Recorded from the Tadzhik SSR and Uzbek SSR, USSR (Baeva, 1985).

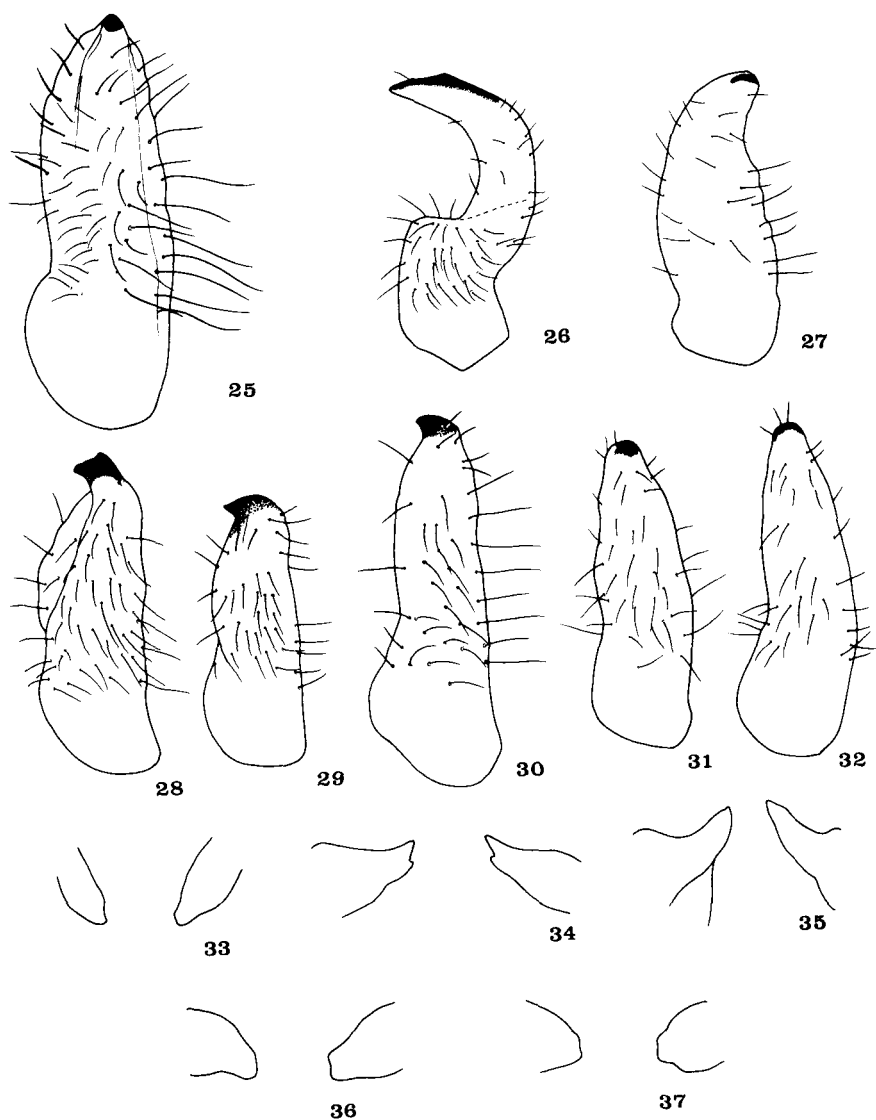
***Cacopsylla (Hepatopsylla) bidens* (Šulc) (Figs. 5, 6, 14, 21, 28, 29, 34, 42, 43 & 51)**

Psylla bidens Šulc, 1907: 110. Lectotype ♂, FRANCE: Hautes Alpes, Serres (Lombard) (MMB), designated by Klimaszewski (1963: 426).

Psylla vasiljevi Šulc, 1915: 26. Lectotype ♀, USSR: Turkmen SSR, Tashkent 15.vi.1913, *Pyrus communis*, 743 (*J. Vasiljev*) (MMB), here designated. **Syn. n.**

Diagnosis. Head (Fig. 14) with blunt genal processes. General body colour in summer form yellow or ochreous with more or less extended red and dark brown pattern; in winter form darker. Forewings (Figs. 5 & 6) in summer form clear with brown veins and large fields of surface spinules, in winter form often with infuscated cell centres and partially reduced surface spinules. Parameres (Figs. 28, 29 & 34) relatively stout bearing a large anterior forward-directed and a smaller posterior inwards-directed tooth at apex; fore-margin broadly lobed. Distal segment of aedeagus (Fig. 21) with strong apical dilatation, which is always straight and slightly inclined. Dorsal margin of female proctiger (Fig. 43) with shallow hump in the middle, apex blunt; in dorsal view (Fig. 42) with almost parallel margins in the middle and strongly tapering apically, whereas in the other species of the *C. pyri/C. pyricola* complex the proctiger (Figs. 40, 44, 46 & 48) is more evenly tapering.

Comments. The number of marginal capitate setae on the forewing pads of the fifth-instar larva of *C. bidens* seems to vary from 1 to 3 and, therefore, the larva can be confused with those of both *C. pyri* and *C. pyricola*. No larval characters were found that would define *C. bidens*.



Figs. 25–32.—Inner surface of paramere, fore-margin on the left. Figs. 33–37.—Parameres, dorsal aspect, anterior margin above. Fig. 25.—*C. pyrisuga* (Förster); 26, *C. pyri* (L.); 27, 33, *C. fera* (Baeva); 28, 29, 34, *C. bidens* (Šulc); 30, 35, *C. permixta* sp. n.; 31, 36, *C. pyricola* (Förster); 32, 37, *C. notata* (Flor).

This species has been confused in the past with *C. pyricola*. For example, the *P. pyricola* of Dobreanu & Manolache (1962) is almost certainly *C. bidens*. It can be separated most easily from *C. pyricola* by the shape of the parameres and aedeagus. The female terminalia, and the genal processes which resemble those of *C. pyri*, are also characteristic.

Material from the USSR, Czechoslovakia, Israel and Iran referred to as *C. vasiljevi* and specimens from France and Italy of *C. bidens* are morphologically so close, that there is no

justification for retaining both as separate species and they are synonymized. Minor morphological differences are assumed to be geographical variation.

C. bidens is dimorphic, as are *C. pyri* and *C. pyricola*, as evidenced by material collected at different seasons from the same site in northern Italy. The types of *C. vasilievi* and *C. bidens* thus represent the summer and winter forms, respectively, of the same species.

Polyvoltine, adults overwinter on the host-plant.

Host-plants. *Pyrus communis*, *P. pyrausta* and *P. syriaca*. There is a series of adults and larvae from Iran (BMNH) labelled as collected off *Prunus persica*, but the identification of this host is doubtful.

Distribution. Material examined from France, Greece, Iran, Israel, Italy and USSR (Crimea and Armenian SSR).

***Cacopsylla (Hepatopsylla) permixta* sp. n.** (Figs. 7, 15, 22, 30, 35, 44, 45 & 57)

Psylla simulans sensu Gegechkori 1984: 38; Loginova, 1964: 467; nec Förster (1848).

Diagnosis. Head (Fig. 15) with subacute genal processes, which are subapically indented. General body colour predominantly light; yellow and orange with dark brown abdominal tergites, winter form darker. Forewings (Fig. 7) with extended fields of surface spinules in summer form, almost entirely lacking in winter form. Parameres (Figs. 30 & 35) lamellar, with a relatively large forward-directed apical hook and with a constriction in the basal third on fore-margin. Distal segment of aedeagus (Fig. 22) with weakly curved apical dilation, intermediate between *C. bidens* and *C. pyricola*. Dorsal margin of female proctiger (Fig. 45) concave, apex a little dilated and blunt. Proctiger often distinctly exceeding subgenital plate.

Comments. *C. permixta* is morphologically closest to *C. bidens* and *C. pyricola* and has been confused with them. It is most easily recognized by the shape of its parameres; the other characters (aedeagus, female terminalia) are often insufficient to recognize the species. The larval material examined comes from only one locality, and it is not certain, therefore, that the setal character used to separate this species from *C. bidens*, *C. pyri* and *C. pyricola* is constant throughout the range of the species.

Polyvoltine; the species overwinters as an adult on the host-plant.

Host-plants. *Pyrus communis*, *P. elaeagnifolia* and *P. salicifolia*.

Material examined. Holotype ♂, TURKEY: Adana, 1964, *Pyrus communis*, C.I.E. A443: No. 4 (*Plant. Prot. Inst.*) (BMNH). Paratypes. TURKEY: 5 ♂, 3 ♀, same data as holotype; 1 ♂, 2 ♀, Konya, 25.iv.1979, Ahlat (\equiv *Pyrus elaeagnifolia*) (*N. Lodos*). USSR: 2 ♂, 2 ♀, East Georgia, David Garekhi, 25.v.1972, *Pyrus salicifolia* (*A. M. Gegechkori*) (BMNH, IDH, MHNG).

***Cacopsylla (Hepatopsylla) pyricola* (Förster)** (Figs. 8, 9, 16, 24, 31, 36, 46, 47 & 53–55)

Psylla pyricola Förster, 1848: 77. Lectotype ♀, GERMAN FEDERAL REPUBLIC: Soden nr. Frankfurt (*Heyden*) (NHMV), here designated (examined).

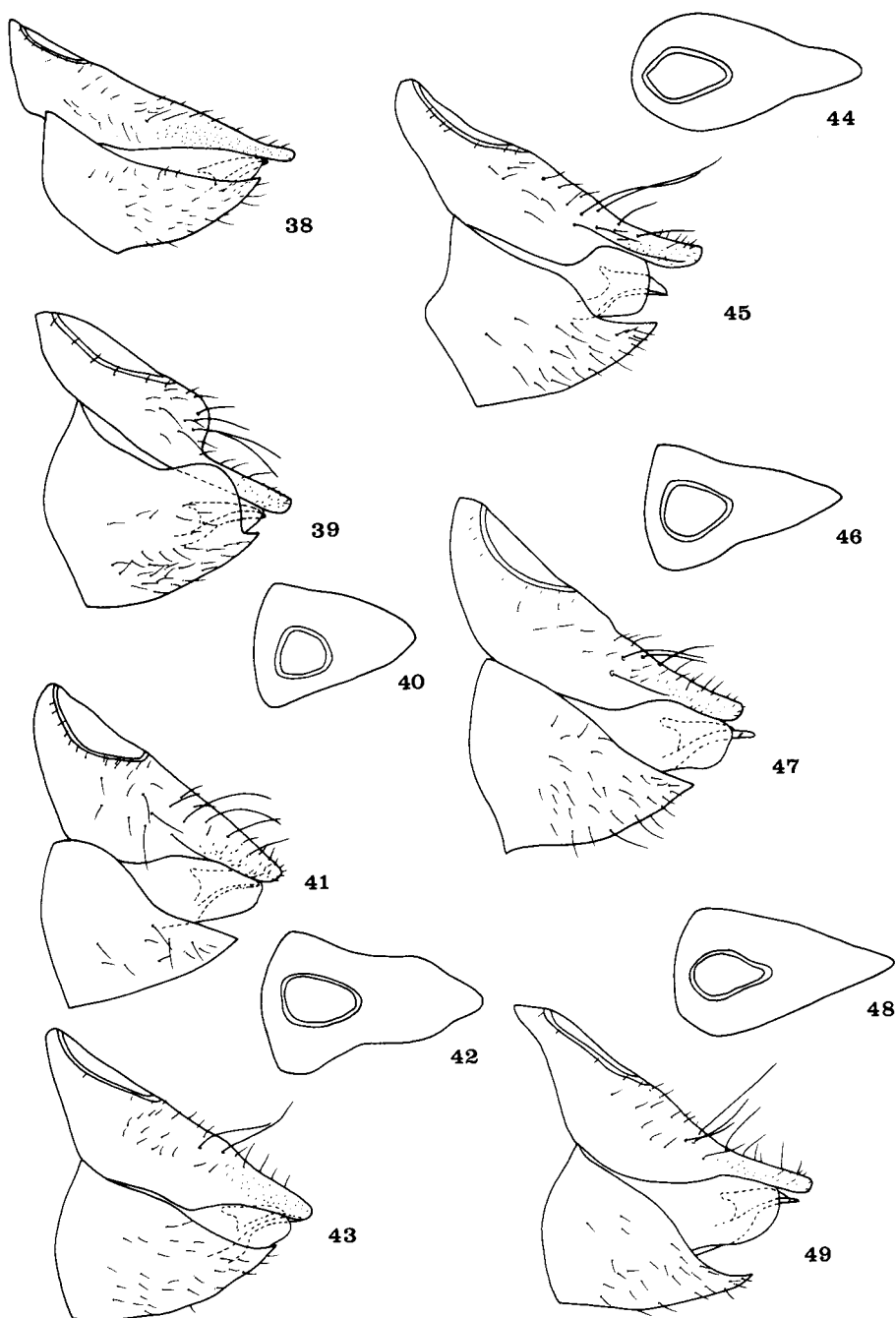
Psylla apiophila Förster, 1848: 78. Lectotype ♂, GERMAN FEDERAL REPUBLIC: Frankfurt (NHMV), here designated (examined). Synonymized by Löw (1883: 232).

Psylla argyrostigma Förster, 1848: 97. Lectotype ♀, GERMAN FEDERAL REPUBLIC: Aachen (NHMV), here designated (examined). Synonymized by Löw with *P. simulans* Förster (1883: 232).

Psylla simulans Förster, 1848: 80: Holotype ♀, GERMAN FEDERAL REPUBLIC: Aachen (*A. Förster*) (NHMV) (examined). Synonymized by Slingerland (1892: 174).

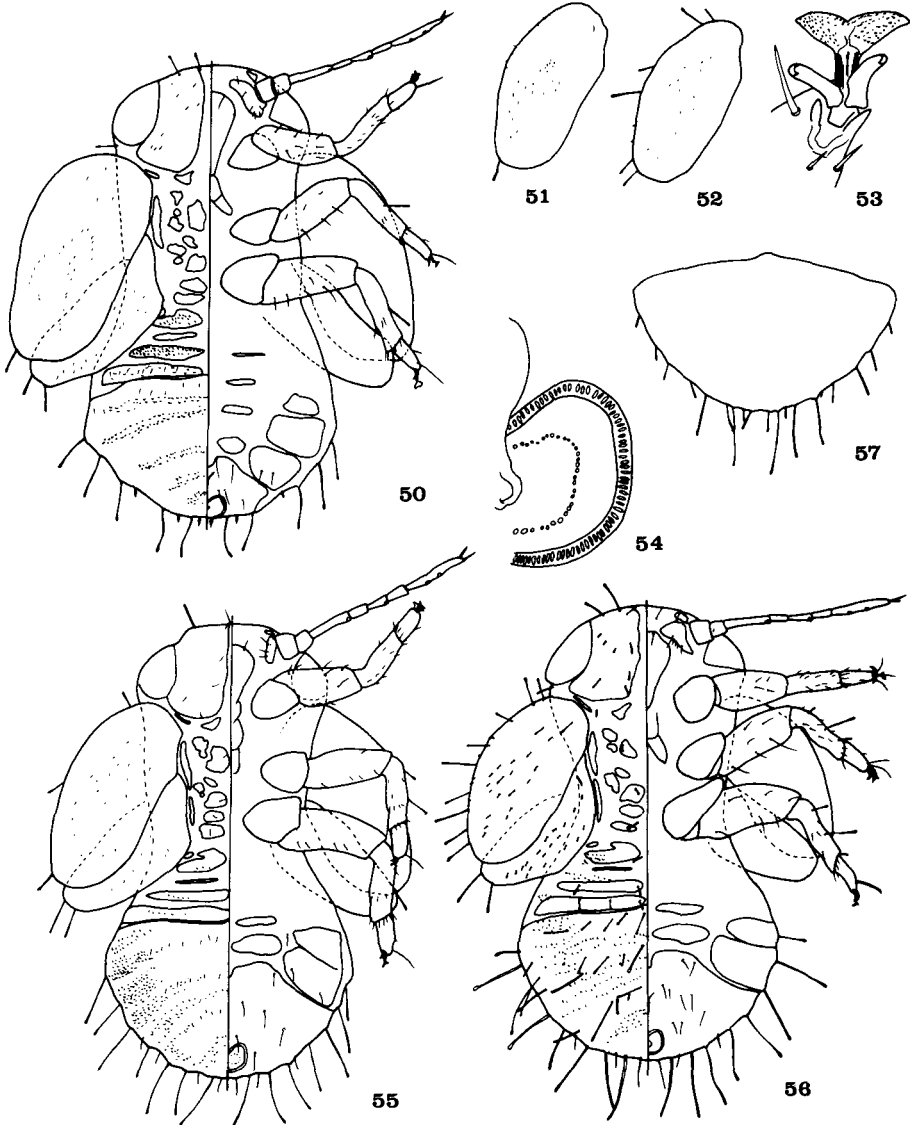
Psylla horvathii Šulc, 1913: 428. Lectotype ♂, HUNGARY: Szent-György nr. Pressburg, 9.ix.1893 (*G. Horvath*) (TM), here designated (examined). **Syn n.**

Psylla vicina Šulc 1915: 11. Lectotype ♂, GREECE: Corfu (*J. Sahlberg*) (MMB), here designated (examined). **Syn n.**



Figs. 38–49.—Female terminalia; 38, 39, 41, 43, 45, 47, 49, lateral view; 40, 42, 44, 46, 48, dorsal view. Fig. 38.—*C. pyrisuga* (Förster); 39, *C. pyri* (L.); 40, 41, *C. fera* (Baeva); 42, 43, *C. bidens* (Šulc); 44, 45, *C. permixta* sp. n.; 46, 47, *C. pyricola* (Förster); 48, 49, *C. notata* (Flor).

Diagnosis. Head (Fig. 16) as in *C. permixta*. Forewings (Figs. 8 & 9) in summer form clear with extended fields of surface spinules, in winter form more elongate with dark clouds in the middle of the cells and more restricted fields of surface spinules. Veins yellow, brown or dark brown, never white. Parameres (Figs. 31 & 36) lamellar with blunt inward-directed apex. Distal segment of aedeagus (Fig. 24) with strongly hooked apex. Dorsal margin of female proctiger (Fig. 47) concave, apex rounded barely exceeding the subgenital plate.



Figs. 50, 55, 56.—Fifth-instar larva, dorsal view left, ventral view right. Figs. 51, 52.—forewing-pad of fifth-instar larva. Fig. 53.—Apex of tarsus. Fig. 54.—Circumanal pore ring. Fig. 57.—Caudal plate. Fig. 50.—*C. pyrisuga* (Förster); 51, *C. bidens* (Šulc) or *C. pyri* (L.) from Avignon; 52, hybrid *C. pyricola* (Förster) from England \times *C. notata* (Flor) from southern France; 53–55, *C. pyricola*; 56, *C. notata*; 57, *C. permixta* sp. n.

Comment. *C. pyricola* has previously been confused with *C. bidens* and *C. notata*. It differs clearly from *C. bidens* in the genital morphology of the adult. The larvae, however, are not always easy to separate. On the other hand, *C. pyricola* is easily separated from *C. notata* in the larval stage. The adults, however, are similar but differ in the larger dimensions, the darker coloration, in particular the yellow or brown veins of the forewings, the larger apical hook of the distal segment of the aedeagus and the slightly longer genal processes.

Polyvoltine; overwinters as an adult on the host-plant.

Host-plants. *Pyrus communis* and *P. pyraeaster*.

Distribution. Material examined from Austria, France, German Democratic Republic, German Federal Republic, Great Britain, Greece, Italy, Sweden, Switzerland and the USA (California, New York, Utah, Virginia and Washington).

***Cacopsylla (Hepatopsylla) notata* (Flor) comb. n., sp. rev.** (Figs. 10, 17, 27, 32, 37, 48, 49 & 56)

Psylla notata Flor, 1861b: 365. Lectotype ♂, FRANCE: Marseille (NHMV), here designated (examined). Synonymized with *P. pyricola* by Löw (1883: 244).

Diagnosis. Head (Fig. 17) as in *C. pyricola* but genal processes a little shorter. Forewings (Fig. 10) broadly oval with white veins, surface spinules forming extended fields. Parameres (Figs. 32 & 37) as in *C. pyricola*. Distal segment of aedeagus (Fig. 23) with short apical hook. Female terminalia (Figs. 48 & 49) as in *C. pyricola*.

Comments. This is the species which Hodkinson (1984) suggested might be *C. vicina*. *C. notata* is defined mainly by its larval chaetotaxy (Fig. 56) and its normal host species *Pyrus amygdaliformis*. It is most closely related to *C. pyricola*, with which it has previously been confused and from which it differs in the adult stage in the white veins of the forewings, the less strongly hooked aedeagus, the shorter genal cones and its smaller body size (Table I). The specimens from Turkey off *Pyrus elaeagnifolia* and *P. communis* are attributed to *C. notata* only with hesitation as no larval material from the region is available.

Host-plants. *Pyrus amygdaliformis*, *P. communis* and *P. elaeagnifolia*.

Distribution. Material examined from France, Greece, Italy and Turkey.

Discussion

The findings outlined in this paper have important implications for the control of pear psyllids. The *C. pyri/C. pyricola* group, which in Europe has hitherto been regarded as a pair of species, is shown to be a complex of distinct species with overlapping geographical distributions. The fact that the ranges of some species overlap, without hybridization occurring, suggests that the species are reproductively isolated. For example, Lauterer (1979) records *C. pyricola* and *C. bidens* occurring together on the same trees in Central Europe, *C. notata* and *C. bidens* occur together in the south of France while *C. bidens* and *C. permixta* occur together in Soviet Central Asia. It appears that the geographical distribution of *C. pyricola* occupies northern, central and south-eastern Europe as well as temperate North and South America where it has been introduced. *C. bidens* occurs in Soviet Central Asia but extends into central Europe and the northern Mediterranean Basin, while *C. notata* appears to be a purely Mediterranean species. *C. permixta* extends from the Caucasus, through the Crimea to Turkey, whereas *C. fera* is known only from the Tadzhik SSR and Uzbek SSR. It appears that the different species have evolved separately in different geographical areas in association with wild *Pyrus* species. Following, the widespread cultivation of *P. communis* it seems probable that some species have transferred onto this hybrid cultivated variety and their ranges have expanded and overlapped accordingly.

Dr Fauvel has very kindly showed us the results of a preliminary laboratory experiment

in which he crossed *C. pyricola* from Britain collected off *P. communis* with *C. notata* from France collected off *P. amygdaliformis*. The crosses produced larvae with intermediate chaetotaxy between the parent species (Fig. 52), but these larvae did not grow to the adult stage. We have no evidence to suggest that such hybridization occurs in the field: all the evidence suggests that the two species remain distinct. However, it does intimate that the two species are only recently separated and that specific distinction appears to be maintained primarily by host-plant preference. We have no record of *C. pyricola* breeding on *P. amygdaliformis*.

Clearly more work remains to be done if we are to have a complete understanding of the pear psyllid complex. The distributions, host-plant relationships and biologies of the various species need to be determined more precisely and the western Palaearctic species need to be compared closely with the array of new species described from China.

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