

The psyllids (Homoptera: Psylloidea) of Alaska

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ABSTRACT. A key is provided for the identification of the thirty-eight psyllid species recorded from Alaska. Additional notes on host plant and distribution are given for each species. The species are: *Aphalara manitobaensis* Cald., *A. nigra* Cald., *Craspedolepta alaskensis* (Ash.), *C. nebulosa* (Zett.) ssp. *kincaidi* (Ash.), *C. schwarzi* (Ash.), *C. subpunctata* (Förster), *Psylla alaskensis* Ash., *P. betulaenanae* Oss., *P. breviata* Patch, *P. fibulata* Crawf., *P. floccosa* Patch, *P. galeaformis* Patch, *P. haliaeeti* sp.nov., *P. hamata* Tuthill, *P. highwoodensis* sp.nov., *P. jenseni* sp.nov., *P. kananaskensis* Hod., *P. ledi* Flor., *P. longiforceps* sp.nov., *P. minor* Crawf., *P. macleani* sp.nov., *P. myrtilli* Wag. ssp. *canadensis* Hod., *P. palmeni* Löw, *P. phlebophyllae* sp.nov., *P. rara* Tuthill, *P. rufipennis* sp.nov., *P. sinuata* Crawf., *P. striata* Patch, *P. stricklandi* Crawf., *P. toolikensis* sp.nov., *P. zaecevi* Sulc, *Trioza albifrons* Crawf., *Trioza artica* sp.nov., *T. atkasookensis* sp.nov., *T. incerta* Tuthill, *T. salicivora* Reut. (= *T. maura* auctt. N.Amer.), *T. stylifera* Patch, *Trioza* sp.nov. (undescribed). All the newly described species were collected on *Salix*.

The Alaskan fauna is made up of four major components: 1, true Arctic species; 2, Arctic/subarctic species; 3, subarctic/alpine species; 4, northern forest zone species. Eight of the Alaskan psyllids exhibit an holarctic distribution and there is a strong faunal affinity with similar areas in northern Scandinavia: the same four genera recur throughout the northern holarctic. There is strong circumstantial evidence that certain psyllid species are parthogenetic over part of their range, particularly in arctic/alpine situations.

Introduction

Alaska stands at the cross-roads between the Palaearctic and Nearctic zoogeographical regions. Recent evidence suggests that the Beringia land bridge provided a corridor for significant faunal migration between the two regions (Hopkins, 1967). Hence studies on the Alaskan fauna are likely to provide strong circumstantial evidence of such past migrations.

Prior to this study the Alaskan psyllid fauna, and that of the North American

arctic/subarctic in general, was very poorly known. Ashmead (1904) described four new species from Alaska, *Psylla alaskensis*, *Aphalara schwarzi*, *Aphalara kincaidi* and *Aphalara alaskensis*. The latter three species were transferred to the genus *Craspedolepta* by Russell (1973) and *C. kincaidi* is now recognized as a sub-species of the palaearctic *C. nebulosa*.

Crawford (1914), in his monograph on the American psyllids, redescribed Ashmead's species but failed to add to the faunal list. Tuthill (1943) added *Trioza incerta*, *T. albifrons* and *T. maura* to the Alaskan fauna and Weber (1950) added *Psylla sinuata*. Jensen (1951) and Weber (1950) provide

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additional localities for known species, while both Weber (1950) and Robinson (1953) almost certainly mention species which are described as new in this paper.

The present paper reflects intensive collecting in four main areas: the North Slope, the Fairbanks region, the Mount McKinley National Park and along the Trans-Alaska pipeline southwards from Prudhoe Bay through the Brooks Range to just south of the Yukon River. In addition I have also examined, through courtesy of the U.S. National Museum, Washington (USNM), a long series of mainly southern Alaskan psyllids collected as part of the Alaska Insects Project by Dr R. I. Sailer and co-workers. Altogether thirty-eight species of psyllid are now recorded for the region, ten of which are new to science. The holotypes of most of these species are deposited in the British Museum (Natural History) (BMNH).

Nomenclature of host plants follows Hultén (1968) and the initials (AP) are used throughout to indicate localities on the Alaska pipeline route, with the figure following indicating distance in miles N (+) or S (−) of the Yukon River crossing. Full locality data is too extensive to be included for the commoner species but is available in mimeograph form from the author.

The only other psyllid species recorded from the American arctic are *Psylla arctica* (Walker), described from Albany River, Hudson's Bay, and *Aphalara nigra* and *A. manitobaensis*, described from Churchill, Manitoba. *Psylla arctica* appears to be a *Salix*-feeding species but the three female types deposited in the British Museum are inseparable from other *Salix*-feeding species and in the absence of males *P. arctica* must be regarded as a nomen dubium. Both *A. nigra* and *A. manitobaensis* occur in Alaska.

Klimaszewski (1975) split the genus *Psylla* as presently conceived into *Psylla* sensu stricto and *Cacopsylla* Ossianilsson, a previously recognized subgenus. This division does not appear to hold on a world basis and has not been followed here. However, all the new *Psylla* species described in this paper fall within the subgenus *Cacopsylla*.

The thirty-eight species recorded from Alaska represent a fairly complete list of the total species present in all genera except *Trioza*. Intensive collecting in Southern

Alaska would probably increase the number of representatives of this genus.

The Alaskan psyllid fauna contains a large holarctic element which has not previously been recognized. All the eight species involved are associated with plants having an established holarctic distribution. In wet tundra areas on the North Slope and in alpine areas such as McKinley Park the psyllid fauna is almost identical with that of similar areas in Scandinavia. For instance, Ossianilsson (1975) lists *P. palmeni*, *P. betulaenanae*, *P. zaecevi*, *P. myrtilli* and *C. nebulosa* in the fauna of the Hardangervidda plateau in Norway.

Furthermore the genera represented in Alaska are the same four genera that are found in northern Scandinavia and Siberia and in alpine regions of North America and northern Europe (e.g. Lindberg & Ossianilsson, 1960).

Four major components can be recognized in the Alaskan psyllid fauna (Table 1).

1. True arctic insects found only on the tundra regions of the Arctic Slope.
2. Arctic/subarctic species which do not generally extend far onto the Arctic Slope but which probably reach their southern limit in Alaska or equivalent latitudes.
3. Sub-arctic/alpine species which reach their northern limit in Alaska but which extend down the mountain chains of western Canada and the lower U.S.A.
4. Species associated with the northern forest zone, found right across North America, also extending south along the major mountain chains.

A fifth category of species with unknown distributions has been added for completeness.

The opening of the trans-Alaska pipeline provided a unique opportunity for the study of the distribution of psyllids (and other insects) relative to their host plants along a north-south transect across the Arctic Slope through the Brooks Range into the boreal forest zone. While results of the full insect survey will be discussed elsewhere a preliminary observation on the psyllids is of interest.

In several species such as *Psylla betulaenanae*, *P. galeaformis*, *P. ledi* and *P. myrtilli* the host plant appears to extend further north than the psyllid, suggesting that climate and not host plant availability is limiting the distribution of these species.

TABLE 1. Classification of elements within the Alaskan psyllid fauna based on existing distribution data

Arctic	Arctic/subarctic	Sub-arctic/alpine	Northern forest	Unknown
<i>Psylla palmeni</i>	<i>Aphalara manitobaensis</i>	<i>Craspedolepta alaskensis</i>	<i>Craspedolepta subpunctata</i>	<i>Craspedolepta schwarzi</i>
<i>P. toolikensis</i>	<i>A. nigra</i>	<i>C. nebulosa</i>	<i>Psylla breviata</i>	<i>Psylla longiforceps</i>
<i>P. zaezevi</i>	<i>Psylla betulaenanae</i>	<i>Psylla alaskensis</i>	<i>P. floccosa</i>	<i>Trioza</i> sp. nov.
<i>Trioza atkasookensis</i>	<i>P. haliaeeti</i>	<i>P. fibulata</i>	<i>P. galeaformis</i>	
	<i>P. jenseni?</i>	<i>P. hamata</i>	<i>P. rara</i>	
	<i>P. ledi</i>	<i>P. highwoodensis</i>	<i>P. sinuata</i>	
	<i>P. macleani</i>	<i>P. kananaskensis</i>	<i>P. striata</i>	
	<i>P. phlebophyllae</i>	<i>P. minor</i>	<i>Trioza albifrons</i>	
	<i>Trioza arctica</i>	<i>P. myrtilli</i>	<i>T. salicivora</i>	
		<i>P. rufipennis</i>	<i>T. stylifera?</i>	
		<i>P. stricklandi</i>		
		<i>Trioza incerta</i>		

The Alaskan *Salix*-feeding *Psylla* are particularly diverse and individual species often occur at extremely high densities. Many species are catkin feeders as nymphs and for *Psylla palmeni*, feeding on *Salix pulchra* in northern Alaska, densities of over 200 nymphs per catkin were recorded. This represents an average weight of 1 g of psyllid for every 90 g of catkin!

For a long time it has been thought that *P. myrtilli* in Europe was parthenogenetic as no males had ever been taken, even in very large collections (Linnavuori, 1951; Lauterer, 1963). However, occasional males have been taken in Russia and China (Kuwayama & Miyatake, 1971; Ossianilsson, 1975), and Hodkinson (1976) described a sexual sub-species from Canada. Similarly a number of Alaskan species were collected in large numbers only as females despite intensive searches for males. These included *Psylla myrtilli*, *P. ledi* and *P. rara*. In addition I observed a colony of *Psylla rara* in the Kananaskis Valley, Alberta, Canada, over a 1 year period and never found a single male. Similarly a colony of *Trioza pletschi* Tuthill on Highwood Pass Summit, Alberta, yielded no males. The males of all these species have been found at lower altitudes or latitudes.

A possible alternative explanation of this phenomenon is that after mating males die leaving the females to oviposit. However Burts & Fischer (1967) showed that in *Psylla pyricola* Förster repeated mating is necessary for a female to produce a full egg complement, and in most psyllids males are almost as long-lived as females.

I suggest, therefore, that there is strong circumstantial evidence that certain psyllids may be facultatively parthenogenetic under more severe climatic regimes, and as one moves into alpine/tundra regions, such as Alaska, the incidence of parthenogenesis increases. This is a subject worthy of further investigation.

Keys to the Alaskan psyllids

For a full explanation of all characters used readers should consult Hodkinson & White (1978). As an additional check on accuracy

of identification reference is made in the keys (following the specific epithet) to the most complete description available for each species.

Key to genera

- 1 Genae developed into conspicuous anteriorly directed processes, the genal cones (Figs. 2 and 76). Frons greatly reduced and enveloped between the bases of the genal cones, median ocellus visible in dorsal view. Metatibia with at most six thick black apical spines. Male proctiger, a simple tube (Fig. 3) or at most with triangular posterior projections (Fig. 77). 2
 - Genal cones absent, genae smoothly rounded, or at most forming small tubercles ventral to the antennal sockets. Frons, which bears median ocellus clearly visible as a free sclerite on the ventral surface of the head. Metatibia with at least seven apical spines. Male protiger with long narrow 'finger-like' posterior projections (Aphalaridae). 3
- 2 Forewing (Fig. 75) with veins Cu₁ and M not having a common stem, each arising separately from a common origin at vein R, costal break absent, gap in anal vein some distance from apex of vein Cu_{1b}; wing apex more or less angular. Basal metatarsus without thick black spines (Triozae). *Trioza*
 - Forewing (Fig. 1) with veins Cu₁ and M having a common stem arising from vein R, costal break present; gap in anal vein adjacent to apex of vein Cu_{1b}; apex of wing rounded. Basal metatarsus with two thick black saltatorial spines (Psyllidae). *Psylla*
- 3 Clypeus in lateral view long and cylindrical, projecting to anterior margin of head. Genae forming small rounded tubercles ventral to antennal sockets. *Aphalara*
 - Clypeus in lateral view shorter, subglobose or pyriform, not reaching anterior margin of head. Genae smooth, not forming rounded tubercles ventral to antennal sockets. *Craspedolepta*

Aphalara Förster

The host plants of the Alaskan species are unknown but are most probably *Polygonum* or *Rumex* spp.

Key to species

- 1 Forewing with transverse black or brown colour pattern in apical half, remainder of membrane clear to translucent white. Male parameres with an obvious inner tooth at anterior apical margin *manitobaensis* Caldwell (1938)

- Forewing without a black or brown colour pattern, membrane uniform yellow to dark amber. Male parameres without an inner tooth
nigra Caldwell (1937)

Aphalara manitobaensis Caldwell

Found at four localities in southern and central Alaska. Previously known only from the type locality, Churchill, Manitoba.

Aphalara nigra Caldwell

Known from two localities in central and north Alaska. Previously known only from the type locality, Churchill, Manitoba.

Craspedolepta Enderlein

The three known Alaskan species are all associated with *Epilobium angustifolium*. In the absence of original illustration and type specimens *C. schwarzi* is somewhat problematical and is not included in the key. Crawford (1914) states that it close to and probably synonymous with *C. alaskensis*.

Key to species

- 1 General body coloration green. Forewing without conspicuous brown or black colour pattern. Male and female genitalia very close to *alaskensis*.
subpunctata Förster (Hodkinson & White, 1978)
- General body coloration black and pale yellow or black and yellowish green. Forewing with conspicuous brown or black colour pattern . . . 2
- 2 Posterior projection of male proctiger lanceolate. Male paramere in lateral view more or less parallel-sided basally, apex directed anteriorly, without a large inner posteriorly directed projection. Female proctiger in lateral view with dorsal margin sinuate; apex subcylindrical; ventral valve in lateral view with a distinct bulge at mid-length
nebulosa (Förster) subsp. *kincaidi* (Ashmead) (Crawford, 1914)
- Posterior projection of male proctiger evenly narrowed to apex. Male paramere in lateral view somewhat triangular with apex directed posteriorly, large inner posteriorly directed projection present. Female proctiger in lateral view with dorsal margin evenly convex, apex with a deep notch; ventral valve in lateral view without a distinct bulge at mid length
alaskensis (Ashmead) (Crawford, 1914)

Craspedolepta alaskensis (Ashmead)

Fairly common in southern and central Alaska, extends south through the Rocky Mountains into Colorado.

Craspedolepta nebulosa (Zetterstedt) subsp. *kincaidi* (Ashmead)

Common in southern and central Alaska, extends through Canada into the northern U.S.A. Subspecies *nebulosa* is widespread throughout the palaearctic.

Craspedolepta subpunctata (Förster)

An holarctic species common in southern and central Alaska, extending down through Canada into the U.S.A. and across the palaearctic to Europe.

Psylla Geoffroy

Only ten of the twenty-five recorded Alaskan species are included in Tuthill's (1943) key to North American species. This is a particularly difficult genus and males are required for exact specific determination.

Key to species

- 1 Antennae longer than twice head width 2
- Antennae shorter than twice head width 5
- 2 Male paramere in lateral view club shaped, slightly curved anteriorly, parallel sided basally, expanded into rounded apex in apical third, apex with two equal inner denticles 3
- Male paramere in lateral view straight, gradually narrowed from base to apex; apex acute, bearing a single denticle. 4
- 3 Forewing membrane clear, antennae at least 2.6X head width. On *Alnus*
galeaformis Patch (Tuthill, 1943)
- Forewing membrane yellow, antennae less than 2.6X head width. On *Betula*
betulaenanae Ossiannilsson (1970)
- 4 Forewing membrane yellow, to amber, veins concolorous, dorsal margin of female proctiger weakly sinuous to straight in lateral view; ventral valve without large basal bulge. On *Betula* *striata* Patch (Tuthill, 1943)

- Forewing membrane clear, veins brown, dorsal margin of female proctiger deeply concave at mid length, ventral valve with a distinct basal bulge. On *Alnus* *floccosa* Patch (Tuthill, 1943)
- 5 Forewing oval, narrow, broadest at mid point, apex narrowly rounded; vein Cu_{1a} weakly arched to straight. 6
- Forewing oblong-oval, broadest in apical third, apex broadly rounded; vein Cu_{1a} strongly arched. 7
- 6 Apex of male paramere with large anteriorly directed hook visible in lateral view. On *Salix* *alaskensis* Ash. (Tuthill, 1943)
- Apex of male paramere with a small denticle not visible in lateral view. On *Salix* *palmeni* Löw (Loginova, 1964)
- 7 Forewing (Fig. 1) with longitudinal grey clouds present in cells, most distinct in apical half. On *Salix* *haliaeeti* sp. nov.
- Forewing without grey clouds (Fig. 10). 8
- 8 Male paramere in lateral view broad, parallel sided, slightly bent anteriorly at about one-third length, apex broadly rounded. Inner face of paramere with a large flap like process bearing a very broad apical denticle, which originates at about mid length and which is separate from paramere. On *Salix* *zaeevi* Sulc (Loginova, 1967; Mathur, 1975)
- Male paramere not parallel sided, apex in lateral view not evenly rounded, inner face of paramere with at most a small separate apical tooth. 9
- 9 Forewing membrane (Fig. 19) with surface spinules confined to radular areas around apical margins 10
- Forewing membrane (Fig. 37) with surface spinules present throughout. 12
- 10 Male paramere in lateral view (Fig. 30) with apex formed by a posteriorly directed finger like extension. On *Salix* . . *highwoodensis* sp. nov.
- Male paramere without finger-like apical extension 11
- 11 Male paramere (Fig. 21) about half length of proctiger. In dorsal view (Fig. 27) apical denticle not appearing separate from apex. Genal cones (Fig. 20) divergent. On *Salix* . . *jenseni* sp. nov.
- Male paramere about three-quarters length of proctiger. In dorsal view apical denticle appearing separate from apex. Genal cones not divergent. On *Salix* *kananakensis* Hodkinson (1976)
- 12 Forewing membrane yellow, amber or yellow brown, veins concolorous 13
- Forewing membrane clear, veins dark brown, reddish brown or black 17
- 13 Anal vein with prominent brown or black streak proximal to anal break. When wings folded over abdomen this mark coincides with dark patch on dorsum of abdomen (rest of abdomen usually reddish). On *Viburnum edule* *rara* Tuthill (1944)
- Anal vein without prominent black streak . . . 14
- 14 Pterostigma short, Vein R_s meeting costa before point of bifurcation of vein M. Costa very strongly curved throughout. On *Sheperdia canadensis* *stricklandi* Caldwell (Tuthill, 1943)
- Pterostigma long, vein R_s meeting costa beyond point of bifurcation of vein M. Costa weakly arched in region of pterostigma (Fig. 37). On other hosts 15
- 15 Forewing (Fig. 37) with surface spinules completely covering membrane, not leaving spinule free bands along margin of veins. Male paramere in lateral view (Fig. 40) with a distinct basal notch in anterior margin, in dorsal view apex produced as slender hook (Fig. 46). Female proctiger at least 1.1X head width *phlebophyllae* sp. nov.
- Forewing with spinules absent from narrow bands adjacent to veins. Male paramere without basal notch, apex in dorsal view with broad denticle. Female proctiger less than 1.1X head width 16
- 16 General body coloration rust red to red with brown or black markings. Female terminalia long, slender. On *Vaccinium* spp. . . *myrtilli* Wagner subsp. *canadensis* Hod. (Hodkinson, 1976)
- General body coloration orange or brownish orange. Female terminalia wedge shaped. On *Ledum palustre* . . *ledi* Flor (Vondracek, 1957)
- 17 Male paramere in lateral view (Fig. 13) with flap-like process on outer face; in dorsal view (Fig. 18) apex formed by long truncate finger-like posteriorly directed process. On *Salix* *macleani* sp. nov.
- Male paramere without flap-like processes; apex either directed anteriorly or with hook-like denticle 18
- 18 Male paramere shaped like a figure 6, with a slender curved anterior portion which forms the apex and a round basal posterior projection. On *Salix* *fibulata* Crawf. (Tuthill, 1943)
- Male paramere not as above. 19
- 19 Male paramere bottle shaped, with basal portion narrowing at three-quarters length to a narrow neck and then evenly expanded to a truncate apex; apical portion approximating an inverted isosceles triangle . . *minor* Crawf. (Tuthill, 1943)
- Male paramere not bottle shaped. 20
- 20 Male paramere in lateral view with apical third bent anteriorly 21
- Male paramere not curved anteriorly in apical third, at most with an anteriorly directed apical hook (Fig. 50) 22
- 21 Male paramere in lateral view with apical third gradually and evenly tapered to apex, forming an angle c. 45° with remainder of paramere. On *Salix* *breviata* Patch (Jensen, 1951)
- Male paramere with apical third not evenly tapered, swollen at mid length, forming an angle of c. 90° with remainder of paramere. On *Salix*.. *hamata* Tuthill (Tuthill, 1943, as *uncata*)

- 22 Male paramere in lateral view with a conspicuous posterior lobe in basal two-thirds; apical third, slender parallel-sided, gently curved posteriorly to rounded apex. Anterior margin evenly convex in apical two-thirds, straight to slightly concave in basal third, posterior margin gently concave in apical third, then forming an angle of c. 90° with margin of broader basal posterior lobe, basal two-thirds sinuous. On *Salix*

sinuata Crawf. (Tuthill, 1943)

- Male parameres not as above, without a distinct posterior lobe, not deeply excavate posteriorly, at most evenly concave. 23
- 23 Larger species, head width greater than 0.75 mm. Male paramere very long, total length greater than proctiger length, in lateral view (Fig. 68) with apical portion slender, gently curved posteriorly. On *Salix*. . . . *longiforceps* sp. nov.
- Smaller species head width less than 0.74 mm. Male parameres shorter than proctiger, in lateral view either with apex broadly rounded bearing a small denticle (Fig. 60) or with a conspicuous anteriorly directed hook (Fig. 50) 24
- 24 Male paramere in lateral view (Fig. 51) with a conspicuous anteriorly directed apical hook, in dorsal view apex slender (Fig. 56). On *Salix toolikensis* sp. nov.
- Male paramere in lateral view (Fig. 60) with an inconspicuous apical denticle, in dorsal view truncate (Fig. 65). On *Salix*. . *rufipennis* sp. nov.

Psylla haliaeeti sp. nov.

Head (Fig. 2) as broad as thorax; vertex 0.42–0.50 times as long as broad; genal cones with apical portion, slender, acute, slightly divergent, 0.81–0.94 times as long as vertex along mid line. Antennae of typical *Psylla* form, ten segmented 1.15–1.37 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

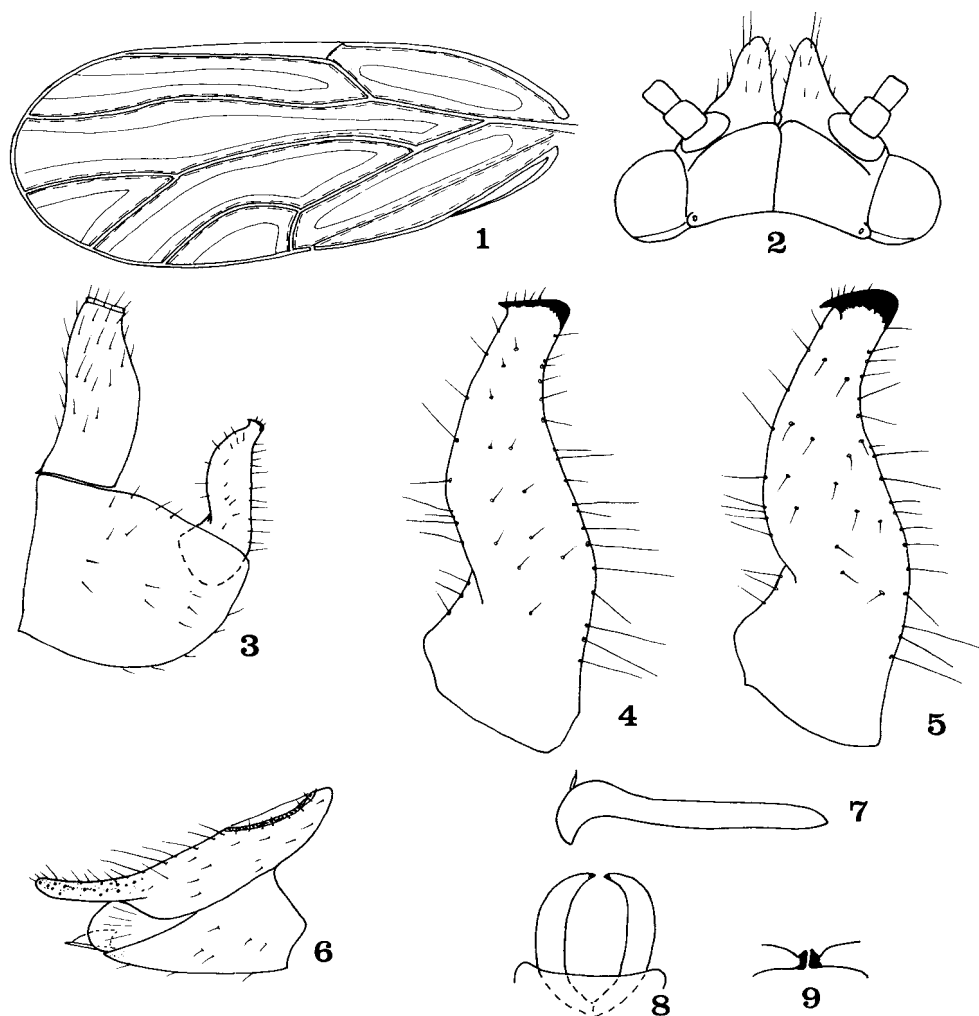
Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 1) membranous 2.29–2.61 times as long as broad, with typical *Psylla* venation, 3.29–3.74 times as long as head width; pterostigma long and narrow, meeting costal margin beyond the point of bifurcation of vein M, maximum width about one-third that of cell r_1 ; costal break present; vein R_s long and sinuous; cells m_1 and cu_1 subequal in area; basal width to height ratio of cell cu_1 1.84–2.20; dense light-coloured spinules completely covering membrane, not leaving spinule free bands adjacent to veins; longitudinal grey or light brown clouds present in all cells of forewing. Hind wings membranous of typical *Psylla*

form. Fore and mid legs simple; hind legs saltatorial, meracanthi well developed; apex of metatibia with four or five (variable) thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 3) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male paramere (Figs. 3–5) simple, shorter than proctiger; in lateral view anterior margin deeply excavate at about one-third length then convex to apex, posterior margin convex basally, becoming concave apically; apex bearing an inner anteriorly directed tooth which is partially hidden in outer lateral view; in dorsal view apical tooth (Fig. 9) appearing broad and blunt; parameres in posterior view (Fig. 8) straight in basal two-thirds and then strongly arched to apex, base of parameres completely hidden within subgenital plate; apical portion of penis (Fig. 7) similar to other *Salix*-feeding *Psylla* species.

Female terminalia (Fig. 6) similar to other *Salix*-feeding *Psylla* spp., proctiger 0.86–0.98 times as long as head width, perianal pore ring with two unequal rows of pores, 0.25–0.29 the length of proctiger, apex of proctiger strongly curved upwards, a characteristic feature of the species; ventral valve shorter than proctiger; ovipositor and valvulae ventralis only partially extending beyond the palps.

Coloration. Mature specimens — vertex brick red, with white markings along posterior margin and mid line. Antennae dirty yellow to pale brown basally, apices of segments darkened; segments 6–10 (variable) completely brown. Genal cones dirty yellow. Eyes and ocelli plum. Pronotum bone-white, lateral extremities with red or brown streaks. Mesothoracic prescutum brick red with mid line and posterior margin streaked with white. Mesothoracic scutum brick red with four prominent and two indistinct longitudinal white stripes. Legs dirty yellow, apical tarsal segments and base of femora brown. Forewing membrane clear except for longitudinal grey or brown clouds in all cells; veins yellow brown, pterostigma pale yellow. Abdominal sclerites reddish to dark brown, intersegmental membranes pale; terminalia yellow brown to dark brown.



FIGS. 1–9. *Psylla haliaeeti* sp. nov. 1, forewing; 2, head dorsal view; 3, ♂ genitalia lateral view; 4, ♂ paramere outer view; 5, ♂ paramere inner view; 6, ♀ terminalia lateral view; 7, apical portion of ♂ penis; 8, ♂ parameres posterior view; 9, ♂ parameres dorsal view.

Psylla haliaeeti shows the typical coloration of a *Salix*-feeding *Psylla* sp. and the full mature coloration may take several months to develop. Hence one would expect younger specimens to exhibit a range of colour variation from teneral orange specimens to the fully coloured adult described above.

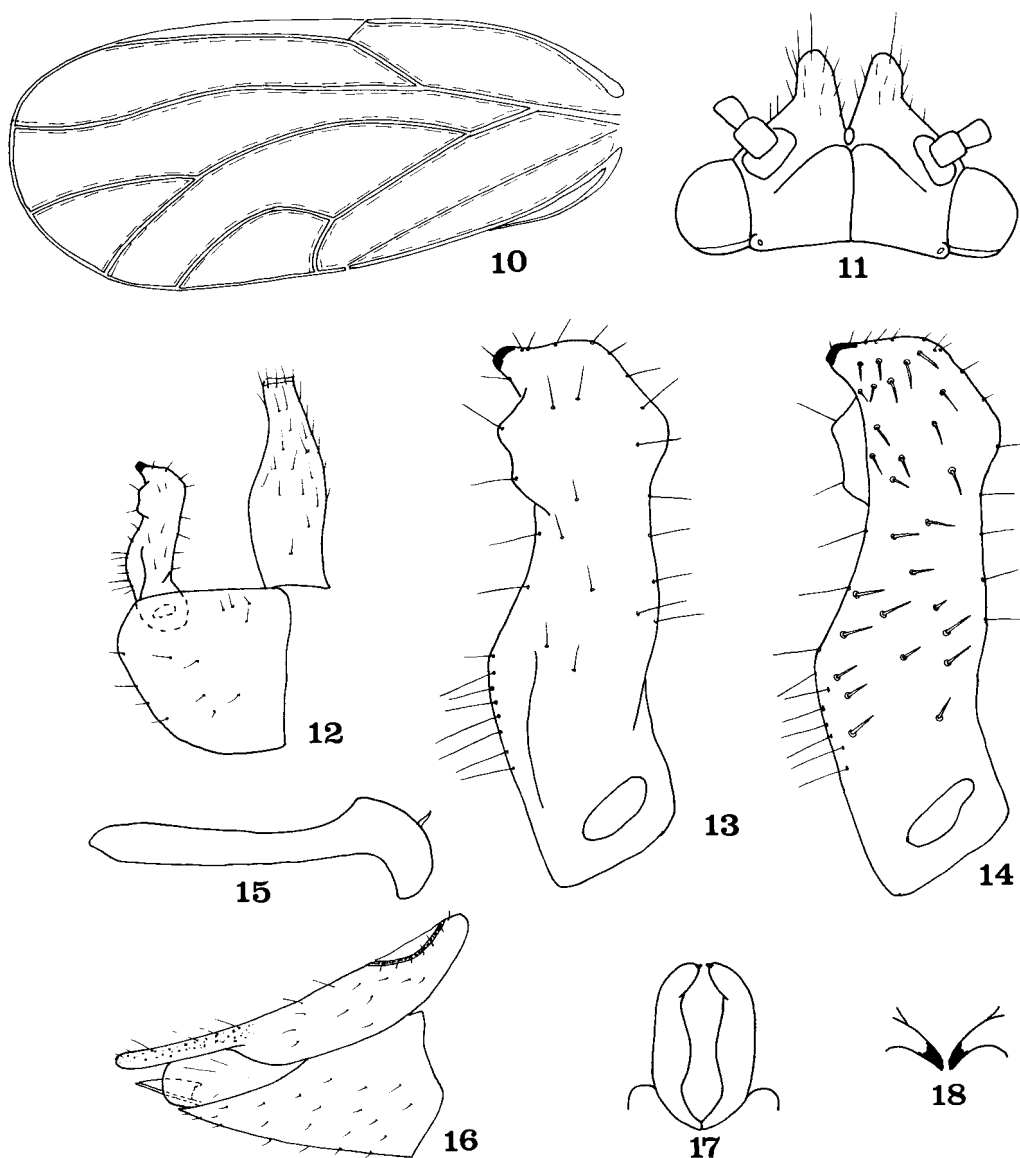
Size. Head width ♂ 0.65–0.72 mm, ♀ 0.69–0.76 mm. Antennal length ♂ 0.77–0.93 mm, ♀ 0.84–0.99 mm. Forewing length ♂ 2.26–2.56 mm, ♀ 2.43–2.65 mm. Female proctiger length 0.62–0.71 mm. Male proctiger length

0.27–0.33 mm. Male paramere length (including basal portion within subgenital plate) 0.22–0.26 mm. Length of apical portion of penis 0.22–0.24 mm.

Host plant. *Salix depressa* subsp. *rostrata*.

Holotype ♂, mounted on slide in balsam, on *Salix depressa*, Eagle Summit, Steese Highway, Alaska, 2.vi.76 (*S. F. MacLean*).

Paratypes. Several hundred specimens from the following localities, all collected on *Salix* spp.: Eagle Summit, Steese Highway, 2.vi.76; Washington Creek (AP-50), 17.vi.76;



FIGS. 10–18. *Psylla macleani* sp. nov. 10, forewing; 11, head dorsal view; 12, ♂ genitalia lateral view; 13, ♂ paramere outer view; 14, ♂ paramere inner view; 15, apical portion of ♂ penis; 16, ♀ terminalia lateral view; 17, ♂ parameres posterior view; 18, ♂ parameres dorsal view.

Mile 31 Elliot Highway, 17.vi.77; Mile 38 Steese Highway, 4.vii.77.

Additional material not designated as types, 1 ♂, 2 ♀ Mile 53 Steese Highway, 3.ix.48 (*G. Jefferson*) (USNM).

Holotype and fifty paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Psylla haliaeeti is a very distinct species which can be separated from all known *Psylla* species by the following combination of characters: the distribution of the forewing spinules, the presence of grey clouds in the forewing, the form of the male genitalia and the upturned apex to the female proctiger.

Psylla macleani sp. nov.

Head (Fig. 11) as broad as thorax; vertex 0.44–0.50 times as long as broad; genal cones robust, divergent, obliquely truncate apically, 0.87–1.07 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.42–1.66 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 10) membranous, 2.39–2.62 times as long as broad, with typical *Psylla* venation, 3.30–3.78 times as long as head width; pterostigma long and narrow, meeting costal margin beyond the point of bifurcation of vein M, maximum width about one-third that of cell r_1 ; costal break present; vein R_s long and sinuous; cells m_1 and cu_1 subequal in area; basal width to height ratio of cell cu_1 1.75–2.08; dense light-coloured spinules present in all cells of forewing, leaving only narrow spinule free bands along the veins. Hind wings membranous of typical *Psylla* form. Fore and mid legs simple, hind legs saltatorial, meracanthi well developed; apex of metatibia with four or five (variable) thick, black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 12) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male paramere (Figs. 12–14) complex, shorter than proctiger, in lateral view with a conspicuous flap-like process on posterior apical outer face, anterior margin sinuous in basal two-thirds, with a small anterior bulge subapically; posterior margin with a slight bulge basally, apical third hidden by flap-like process; apex formed by a relatively narrow posteriorly directed process; in dorsal view (Fig. 18) apex formed by long narrow truncate finger-like processes; in posterior view (Fig. 17) parameres straight, basally, strongly arched in apical quarter, inner margins defining an elongate figure-of-eight shape; apical portion of penis (Fig. 15) resembling other *Salix*-feeding *Psylla* spp.

Female terminalia (Fig. 16) very similar to other *Salix*-feeding *Psylla* spp., proctiger 1.01–1.09 times as long as head width, perianal pore ring with two unequal rows of

pores, 0.22–0.28 the length of proctiger; ventral valve shorter than proctiger; ovipositor and valvulae ventralis only partially extending beyond the palps.

Coloration. Mature specimens as *P. haliaeeti* except the forewing is clear, without grey clouds.

Size. Head width ♂ 0.67–0.76 mm, ♀ 0.70–0.80 mm. Antennal length ♂ 1.01–1.19 mm, ♀ 1.01–1.23 mm. Forewing length ♂ 2.21–2.87 mm, ♀ 2.43–2.87 mm. Female proctiger length 0.72–0.88 mm. Male proctiger length 0.32–0.41 mm. Male paramere length (including basal portion within subgenital plate) 0.29–0.33 mm. Length of apical portion of penis 0.25–0.30 mm.

Host plants. *Salix alaxensis* subsp. *alaxensis*; *Salix depressa* subsp. *rostrata*.

Holotype. ♂, mounted on slide in balsam, from *Salix alaxensis*, Meade River, 90 km S of Point Barrow, Alaska, 16.viii.76.

Paratypes. Several hundred specimens from the following localities: On *S. alaxensis*, Meade River, 16.viii.76; University of Alaska campus, Fairbanks, 12.vii.76, 17.viii.76. On *Salix* sp., Eielson Visitor Center and Polychrome Pass, McKinley Park, 10.viii.76; Farmers Loop Rd (AP –75), 13.viii.76; Washington Creek (AP –50), 4.vi.77, 17.vi.77; Deitrich Campground (AP + 152), 14.viii.76; Budweiser Mountain (AP + 201), 19.viii.76; Atigun River Crossing (AP + 220), 18.viii.76; Toolik Lake (AP + 236), 15.viii.76; Slope Mountain (AP + 260), 15.viii.76; Happy Valley Cut (AP + 280), 15.viii.76; Sagwon (AP + 300), 15.viii.76; Franklin Bluffs (AP + 329), 16.viii.76. On *Salix depressa*, Eagle Summit, Steese Highway, 17.v.77, 2.vi.77.

Additional material not designated as paratypes: Steese Highway MP.84 4.ix.48 (*G. Jefferson*); Eagle River Flats, Anchorage, on willow, 9.iv.48 (*K. M. Sommerman*) (USNM). Holotype and fifty paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Psylla macleani is close to *Psylla propinqua* Schaefer, *Psylla subpropinqua* Loginova and *Psylla moscovita* Andrianova, a group of closely related palaearctic species which feed on *Salix* (vide Loginova, 1967). Together they form a particularly difficult group in which

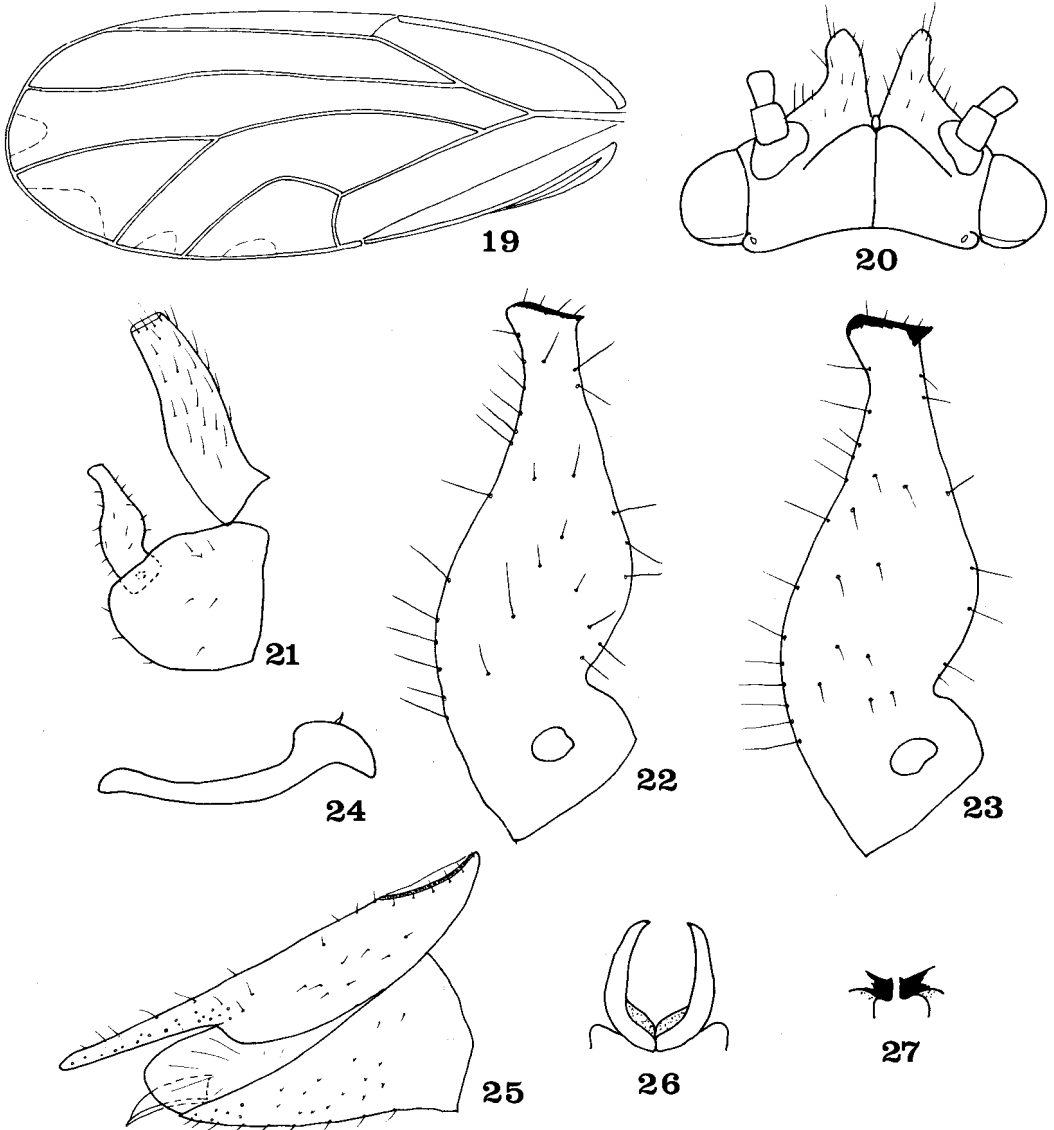
the species can only be reliably separated on the form of the male parameres. *Psylla macleani* has no close North American relative.

Psylla jenseni sp. nov.

Head (Fig. 20) as broad as thorax; vertex 0.40–0.42 times as long as broad; genal cones very long and slender, widely divergent, 1.00–

1.07 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.40–1.61 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 19) membranous, oblong-oval, 2.54–2.66 times as long as broad, with typical *Psylla* venation, 3.70–4.16 times as long as head width; pterostigma long and



FIGS. 19–27. *Psylla jenseni* sp. nov. 19, forewing; 20, head dorsal view; 21, ♂ genitalia lateral view; 22, ♂ paramere outer view; 23, ♂ paramere inner view; 24, apical portion of ♂ penis; 25, ♀ terminalia lateral view; 26, ♂ parameres posterior view; 27, ♂ parameres dorsal view.

narrow, meeting costal margin beyond the point of bifurcation of vein M, maximum width about one-third that of cell r_1 ; costal break present; vein R_s weakly sinuous; cells m_1 and cu_1 large, subequal in area; basal width to height ratio of cell cu_1 2.15–2.33; forewing membrane lacking surface spinules except in radular areas around wing margin. Hind wings membranous of typical *Psylla* form. Fore and mid legs simple, hind legs saltatorial, meracanthi well developed; apex of metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 21) exceptionally long, simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male parameres (Figs. 21–23) short, in lateral view about half the length of proctiger, simple, anterior margin deeply excavate basally, convex at mid length then straight to apex; posterior margin convex in basal two-thirds becoming concave in apical third; apex truncate, slightly bent posteriorly, with a large truncate inner denticle; in dorsal view (Fig. 27) apical denticle appearing broad and truncate; parameres in posterior view (Fig. 26) moderately arched to acute apices, anterior margin rounded inwards basally, visible; apical portion of penis (Fig. 24) similar to other *Salix*-feeding *Psylla* spp. but with shaft slightly more curved.

Female terminalia (Fig. 25) long, similar to other *Salix* feeding *Psylla* spp., proctiger long and straight, 1.18–1.20 times as long as head width, peri-anal pore ring with two unequal rows of pores, 0.19–0.20 times length of proctiger; ventral valve shorter than proctiger, ovipositor and valvulae ventralis strongly curved, only partially extended beyond the palps.

Coloration. Similar to *P. haliaeeti* but generally darker. Genal cones dark brown, prothorax with brown markings along anterior margin, thoracic dorsum with additional dark brown longitudinal streaks, femora and tarsi completely brown. Wings clear, veins dark brown, pterostigma pale brown. Abdominal sclerites dark brown, intersegmental membranes reddish, terminalia dark brown.

Size. Head width ♂ 0.66–0.73 mm, ♀ 0.79–0.81 mm. Antennal length ♂ 1.06–1.13 mm, ♀ 1.13–1.18 mm. Forewing length ♂

2.57–2.78 mm, ♀ 2.87–3.47 mm. Female proctiger length 0.96–0.98 mm. Male proctiger length 0.37–0.38 mm. Male parameres length (including basal portion with subgenital plate) 0.28–0.30 mm. Length of apical portion of penis 0.24–0.25 mm.

Host plant. Most probably *Salix* spp.

Holotype. ♂, mounted on slide in balsam, from *Salix phlebophylla*, Eagle Summit, Steese Highway, Alaska, 3.vi.77 (T. S. Jensen) (BMNH).

Paratypes. 2 ♀ same data as holotype, 1 ♂ Eagle Creek, Steese Highway, swept from *Picea glauca*, 2.viii.76 (BMNH).

Comment

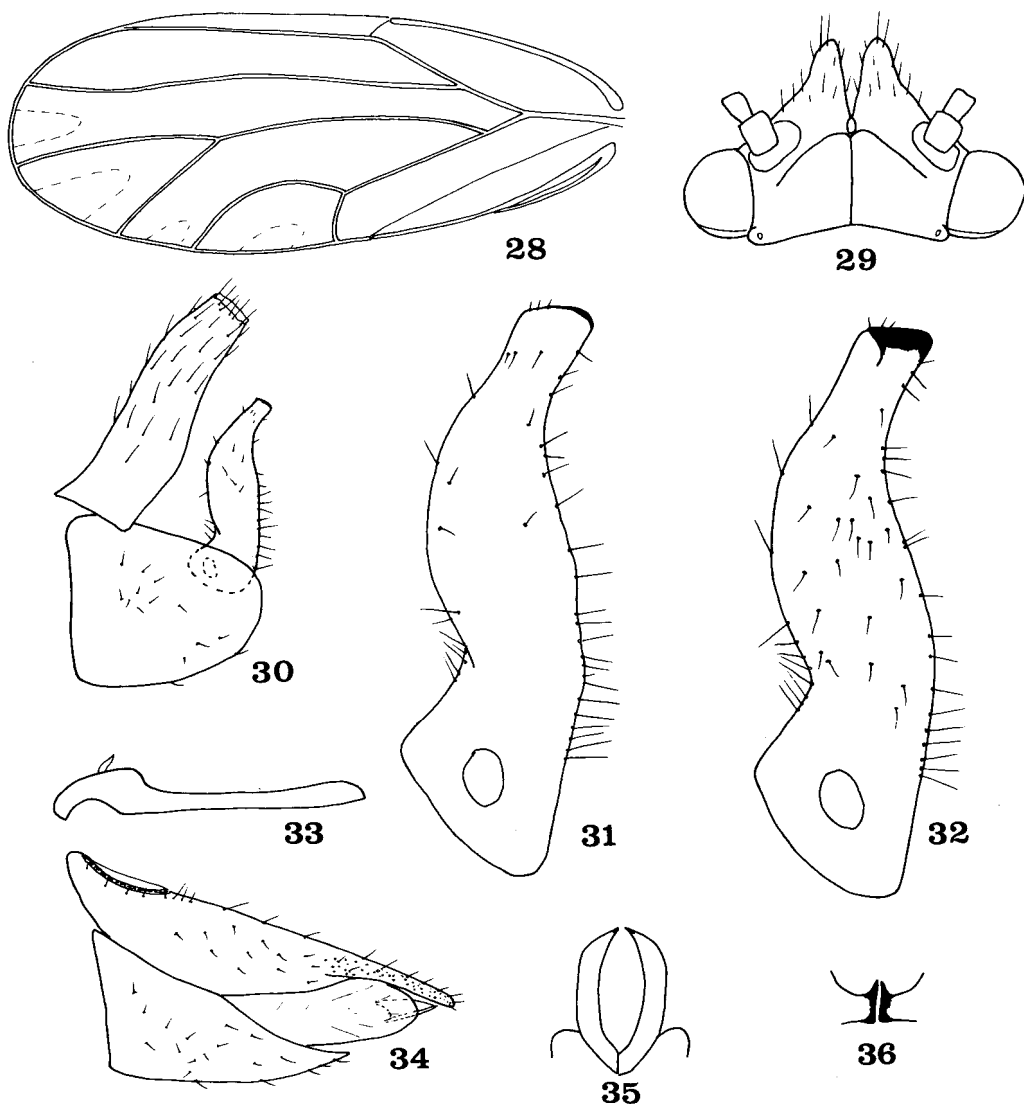
The immature stages of this species were not collected but *P. jenseni* is similar to the typical *Salix* feeding species, suggesting that *Salix* is most probably the host plant. Taxonomically *P. jenseni* is close to the following species, *P. highwoodensis*, and their taxonomic position is discussed later.

Psylla highwoodensis sp. nov.

Head (Fig. 29) as broad as thorax; vertex 0.42–0.50 times as long as broad; genal cones long, divergent, apical portion slender, obliquely truncate, 0.83–0.95 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.20–1.42 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 28) membranous, oblong-oval, 2.30–2.59 times as long as broad, with typical *Psylla* venation, 3.43–4.08 times as long as head width; pterostigma long and narrow, meeting costal margin beyond point of bifurcation of vein M, maximum width one-third that of cell r_1 ; costal break present; vein R_s sinuous; cells m_1 and cu_1 large, m_1 slightly larger than cu_1 ; basal width to height ratio of cell cu_1 1.73–2.19; forewing membrane lacking surface spinules except in radular areas around wing margin. Hind wings membranous of typical *Psylla* form.

Fore and mid legs simple, hind legs saltatorial, meracanthi well developed; apex of



FIGS. 28–36. *Psylla highwoodensis* sp. nov. 28, forewing; 29, head dorsal view; 30, ♂ genitalia lateral view; 31, ♂ paramere outer view; 32, ♂ paramere inner view; 33, apical portion of ♂ penis; 34, ♀ terminalia lateral view; 35, ♂ parameres posterior view; 36, ♂ parameres dorsal view.

metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 30) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male parameres (Figs. 30–32) long, about three-quarters length of proctiger, simple, with apical portion narrow, subparallel, deflexed posteriorly; anterior margin deeply excavate basally, becoming convex

at mid length then straight to apex; posterior margin sinuous in basal two-thirds becoming concave subapically; apex bearing a large sharp inner tooth which is hidden in lateral view; in dorsal view (Fig. 36) apical teeth appearing separate from paramere apex, long and slender; in posterior view (Fig. 35) parameres straight basally then arched in apical third to narrowly acute apices; apical portion of penis (Fig. 33) similar to other *Salix*-feeding species.

Female terminalia (Fig. 34) long, similar to other *Salix*-feeding *Psylla* spp., proctiger long and straight, 1.15–1.23 times head width, peri-anal pore ring with two unequal rows of pores, 0.18–0.23 times length of proctiger, ventral valve shorter than proctiger, ovipositor and valvulae ventralis barely extending beyond the palps.

Coloration. Similar to *P. haliaeeti*. General body colour rust red rather than brick-red. Forewing clear, veins brown, pterostigma reddish brown. Abdominal sclerites dark brown, intersegmental membranes red, terminalia brown.

Size. Head width ♂ 0.70–0.76 mm, ♀ 0.77–0.84 mm. Antennae length ♂ 0.87–1.03 mm, ♀ 0.98–1.13 mm. Forewing length ♂ 2.47–3.00 mm, ♀ 3.08–3.26 mm. Female proctiger length 0.88–0.98 mm. Male proctiger length 0.34–0.38 mm. Male paramere length (including basal portion within subgenital plate) 0.26–0.31 mm. Length of apical portion of penis 0.22–0.24 mm.

Host plant. *Salix* spp.

Holotype. ♂, mounted on slide in balsam, on *Salix* sp., Highwood Pass, Alberta, Canada, 16.vii.73.

Paratypes. 2 ♂, 17 ♀ same data as holotype; 6 ♂ on *Salix* sp., Kananaskis Valley, Alberta, Canada, 6.v.74; 1 ♂ Eielson Visitor Center, McKinley Park, Alaska, 10.viii.76.

Holotype and ten paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Psylla highwoodensis is close to *P. jenseni* and *P. kananaskensis* Hodkinson, and these three species form a distinct group which is characterized by the absence of surface spinules from the forewing membrane. They can be easily separated on the form of the male parameres, which nevertheless have a common basic form. The specific differences, however, remain constant over a wide geographical area.

Psylla phlebophyllae sp. nov.

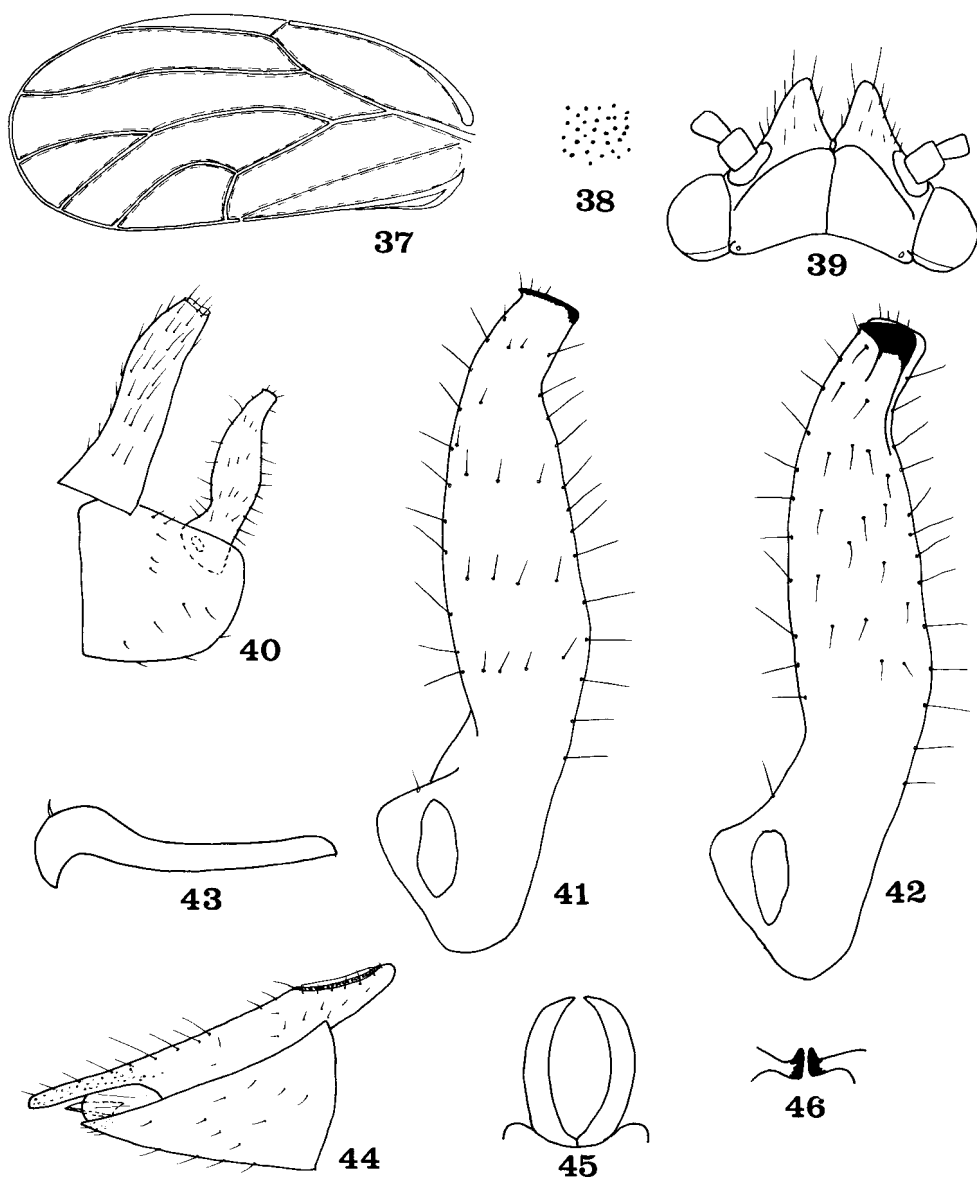
Head (Fig. 39) as broad as thorax, vertex 0.44–0.53 times as long as broad; genal

cones divergent, narrowly conical, 0.69–0.93 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.20–1.44 times head width, with rhinaria of segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 37) membranous oblong-oval, 2.09–2.36 as long as broad, with typical *Psylla* venation, very short, 2.64–3.09 times as long as head width; pterostigma long and narrow, meeting costal margin beyond point of bifurcation of vein M, maximum width one-third that of cell r_1 ; costal break present; vein R_s weakly sinuous, cells m_1 and cu_1 subequal; vein Cu_{1a} strongly arched; basal width to height ratio of cell cu_1 1.52–1.94; forewing membrane completely covered with very dense light coloured spinules (Fig. 38), without spinule free bands adjacent to the veins. Hind wings membranous of typical *Psylla* form. Fore and mid legs simple, hind legs saltatorial, meracanthi well developed; apex of metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 40) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male parameres (Figs. 40–42) long, about three-quarters the length of proctiger, simple; in lateral view anterior margin excavate basally and then convex to apex; posterior margin convex in basal three-quarters becoming concave subapically; apex bearing a large slender inner tooth which is almost completely hidden in lateral view; in dorsal view (Fig. 46) paramere drawn out as long slender posteriorly curved processes terminated by a slender anteriorly directed tooth; in posterior view (Fig. 45) parameres evenly arched to acute apices. Apical portion of male penis (Fig. 43) similar to other *Salix*-feeding species.

Female terminalia (Fig. 44) long, similar to other *Salix*-feeding *Psylla* spp. proctiger long and straight, 1.11–1.30 times head width, peri-anal pore ring with two unequal rows of pores, 0.18–0.25 times length of proctiger, ventral valve shorter than proctiger, ovipositor and valvulae ventralis barely extending beyond the palps.



FIGS. 37–46. *Psylla phlebophyllae* sp. nov. 37, forewing; 38, spinule density; 39, head dorsal view; 40, ♂ genitalia lateral view; 41, ♂ paramere outer view; 42, ♂ paramere inner view; 43, apical portion of ♂ penis; 44, ♀ terminalia lateral view; 45, ♂ parameres posterior view; 46, ♂ parameres dorsal view.

Coloration. Teneral specimens reddish orange throughout. Mature specimens similar to *P. haliaeeti*. Genal cones reddish yellow. Forewing membrane dull transparent yellow, veins yellow brown, slightly darker than membrane, pterostigma yellow. Femora completely brown. Abdominal sclerites brown,

intersegmental membranes red, terminalia brown.

Size. Head width ♂ 0.60–0.70 mm, ♀ 0.63–0.74 mm. Antennal length ♂ 0.75–0.89 mm, ♀ 0.82–0.92 mm. Forewing length ♂ 1.73–1.96 mm, ♀ 1.86–2.13 mm. Female proctiger length 0.72–0.86 mm. Male

proctiger length 0.32–0.37 mm. Male paramere length (including basal portion within subgenital plate) 0.31–0.34 mm. Length of apical portion of penis 0.25–0.27 mm.

Host plant. *Salix phlebophylla*.

Holotype. ♂, mounted on slide in balsam, on *Salix phlebophylla*, Meade River, 90 km south of Point Barrow, Alaska, 9.viii.76.

Paratypes. Several hundred specimens collected at the same locality as the holotype on 1.viii.76 to 16.viii.76; 6 ♂, 2 ♀, on *Salix phlebophylla*, Eagle Summit, Steese Highway, Alaska, 3.vi.77; 2 ♀ Sagwon (AP), 6.viii.77.

Holotype and twenty paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Psylla phlebophylla is close to the following species, *Psylla toolikensis* and the taxonomic position of the two is discussed together later.

Psylla toolikensis sp. nov.

Head (Fig. 49) as broad as thorax, vertex 0.41–0.47 times as long as broad; genal cones divergent, narrowly conical, 0.80–0.94 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.21–1.49 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 47) membranous, oblong-oval, 2.16–2.61 times as long as broad, with typical *Psylla* venation, 2.94–3.43 times head width; pterostigma long and narrow, meeting costal margin beyond the point of bifurcation of vein M, maximum width about a quarter that of cell r_1 ; costal break present; vein R_s sinuous; cells m_1 and cu_1 subequal, vein Cu_{1a} strongly arched; basal width to height ratio of cell cu_1 1.63–2.04; forewing membrane covered in light coloured spinules (Fig. 48), less dense than in *P. phlebophyllae* and absent from narrow bands adjacent to the veins. Hind wings membranous of typical *Psylla* form. Fore and mid legs simple, hind legs salta-

torial, meracanthi well developed; apex of metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 50) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male parameres (Figs. 50–52) long, about three-quarters the length of proctiger, simple, in lateral view anterior margin excavate basally then weakly convex to apex; posterior margin sinuous basally becoming concave subapically; apex slender, bearing a large inner anteriorly directed tooth, visible in lateral view; in dorsal view (Fig. 56) paramere drawn out as long straight processes terminated by a slender anteriorly directed tooth set at right angles to plane of apex; in posterior view (Fig. 55) parameres straight in basal three-quarters then strongly arched in apical quarter to acute black apices; apical portion of male penis (Fig. 53) similar to other *Salix*-feeding species.

Female terminalia (Fig. 54) long, similar to other *Salix*-feeding *Psylla* spp., proctiger long and straight, 1.11–1.24 times head width, peri-anal pore ring with two unequal rows of pores, 0.19–0.24 times length of proctiger, ventral valve shorter than proctiger, ovipositor and valvulae ventralis barely extending beyond the palps.

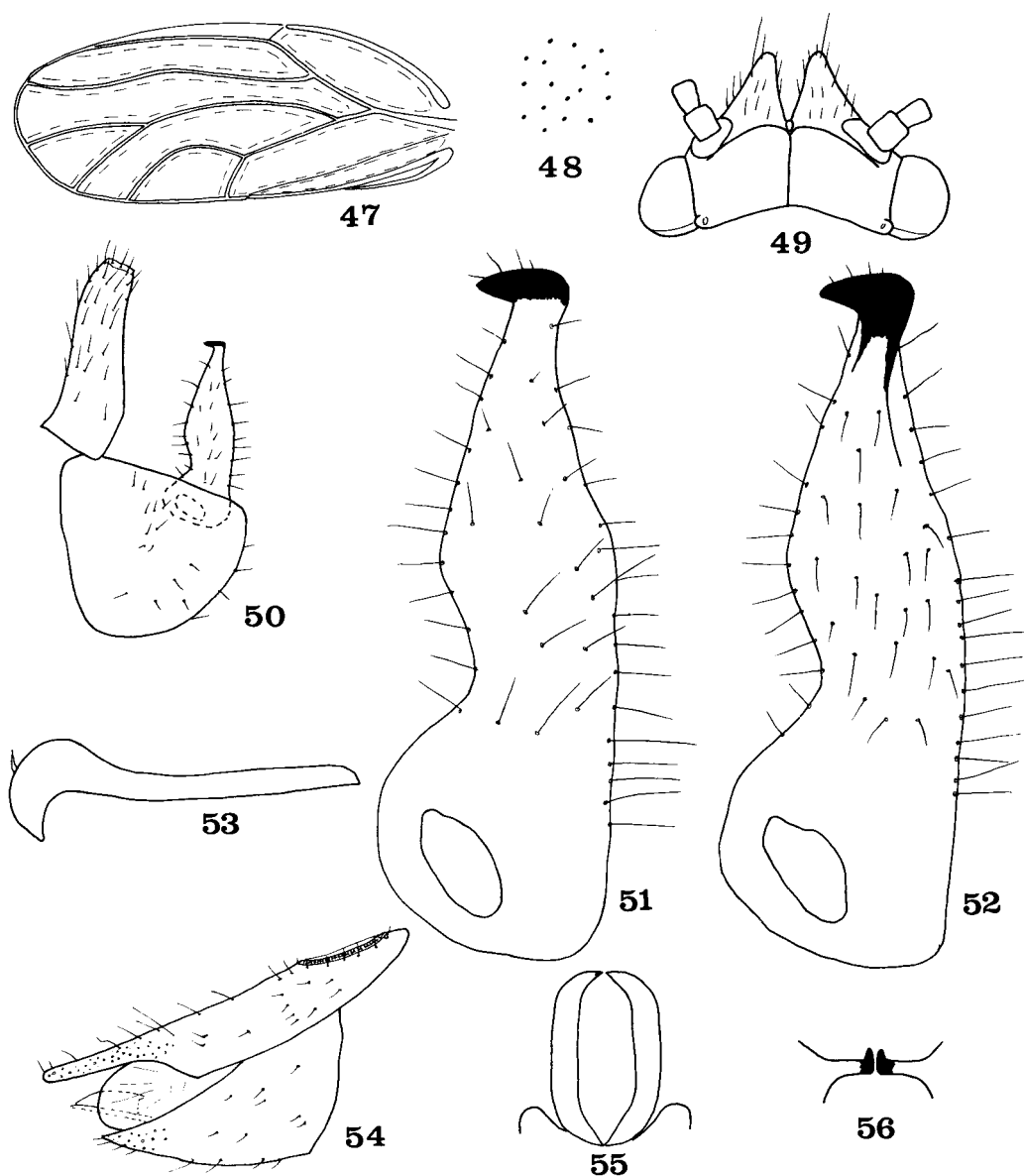
Coloration. Similar to *P. phaliaeeti*. Genal cones reddish yellow. Forewing membrane clear, veins dark brown, pterostigma clear. Femora completely brown. Abdominal sclerites brown, intersegmental membranes red, terminalia brown.

Size. Head width ♂ 0.64–0.72 mm, ♀ 0.67–0.75 mm. Antennal length ♂ 0.89–1.00 mm, ♀ 0.86–1.05 mm. Forewing length ♂ 1.95–2.03 mm, ♀ 2.08–2.43 mm. Female proctiger length 0.78–0.93 mm. Male proctiger length 0.35–0.43 mm. Male paramere length (including basal portion within subgenital plate) 0.34–0.39 mm. Length of apical portion of penis 0.26–0.31 mm.

Host plant. *Salix* spp.

Holotype. ♂, mounted on slide in balsam, from *Salix* sp, Toolik Lake, Trans-Alaska Pipeline, 236 miles north of Yukon River, Alaska, 15.viii.76.

Paratypes. Several hundred specimens from



FIGS. 47–56. *Psylla toolikensis* sp. nov. 47, forewing; 48, spinule density; 49, head dorsal view; 50, ♂ genitalia lateral view; 51, ♂ paramere outer view; 52, ♂ paramere inner view; 53, apical portion of ♂ penis; 54, ♀ terminalia lateral view; 55, ♂ parameres posterior view; 56, ♂ parameres dorsal view.

the following localities, all collected on *Salix* sp.: Toolik Lake, Alaska, 15.viii.76; Atigun River Crossing (AP + 220), 18.viii.76; Slope Mountain (AP + 260), 15.viii.76; Happy Valley Cut (AP + 280), 15.viii.76; Sagwon (AP + 300), 15.viii.76; Franklin Bluffs (AP + 329), 16.viii.76.

Holotype and fifty paratypes in BMNH,

remaining paratypes in USNM and author's collection.

Comment

Psylla toolikensis is close to *P. phlebobhyllae*. The two species can be separated on the distribution of the forewing spinules and on

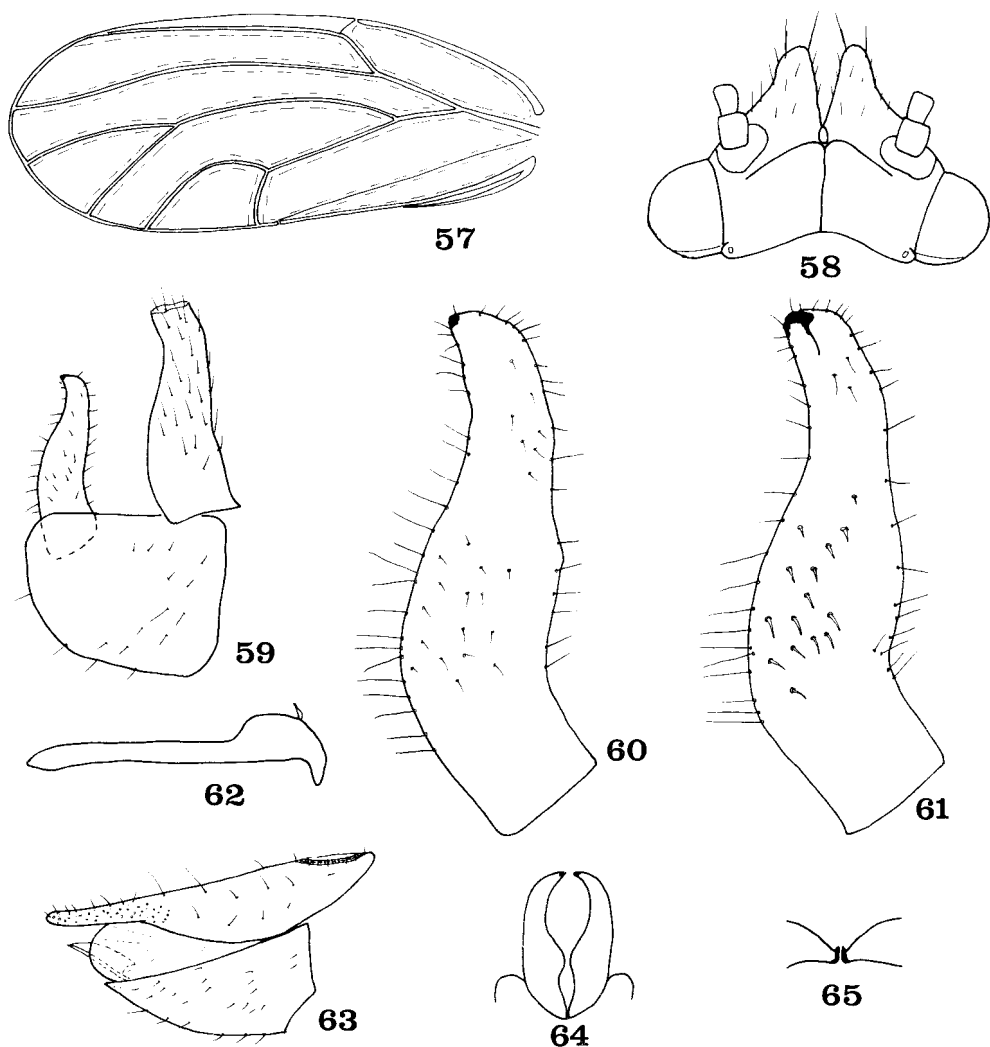
the form of the male genitalia. Both these species exhibit strong affinities with *Psylla groenlandica* Sulc from Greenland, but can be separated on the form of the male genitalia.

***Psylla rufipennis* sp.nov.**

Head (Fig. 58) as broad as thorax, vertex 0.45–0.52 times as long as broad, genal cones slightly divergent, apical portion obliquely truncate, 0.93–1.00 times as long as vertex at mid line; antennae of typical

Psylla form, ten segmented, 1.27–1.42 times head width, with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched. Forewing (Fig. 57) membranous, 2.33–2.54 times as long as broad, oblong-oval, with typical *Psylla* venation, 3.18–3.63 times head width; pterostigma long and narrow, meeting costal margin beyond point of bifurcation of vein M, maximum width about one-third that of cell r_1 ; costal break present; vein R_s sinuous; cells m_1 and cu_1 subequal, vein Cu_{1a} strongly arched; basal



FIGS. 57–65. *Psylla rufipennis* sp.nov. 57, forewing; 58, head dorsal view; 59, ♂ genitalia lateral view; 60, ♂ paramere outer view; 61, ♂ paramere inner view; 62, apical portion of ♂ penis; 63, ♀ terminalia lateral view; 64, ♂ parameres posterior view; 65, ♂ parameres dorsal view.

width to height ratio of cell cu_1 1.73–2.00; forewing membrane covered in dense, light-coloured spinules which are absent from narrow bands adjacent to veins. Hind wings membranous, of typical *Psylla* form. Fore and mid legs simple; hind legs saltatorial, meracanthi well developed; apex of metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 59) simple, cylindrical, sparsely hairy basally, densely hairy apically; subgenital plate simple, sparsely hairy. Male parameres (Figs. 59–61) long, about two-thirds the length of proctiger, simple, in lateral view anterior margin concave basally, becoming sinuous and then curving sharply posteriorly to apex; posterior margin bulged in basal two-thirds becoming concave in apical third; apex rounded truncate, bearing a small inner anteriorly directed tooth on inner surface, tooth only partially visible in lateral view; in dorsal view (Fig. 65) apex somewhat truncate, tooth broad and blunt; in posterior view (Fig. 64) posterior lobes of parameres confluent basally, inner paramere margins then diverging before arching to narrowly acute apices; apical portion of male penis (Fig. 62) similar to other *Salix*-feeding species.

Female terminalia (Fig. 63) long, similar to other *Salix*-feeding *Psylla* spp., proctiger long and straight, 0.94–0.98 times head width, peri-anal pore ring with two unequal rows of pores, 0.21–0.26 times length of proctiger, ventral valve shorter than proctiger, ovipositor and valvulae ventralis barely extending beyond the palps.

Coloration. Similar to *P. haliaeeti* except ground colour more rust-red. Forewing clear, veins reddish brown, pterostigma reddish brown. Femora completely brown. Abdominal sclerites dark brown, intersegmental membranes red, terminalia brown.

Size. Head width ♂ 0.67–0.71 mm, ♀ 0.68–0.74 mm. Antennal length ♂ 0.88–0.96 mm, ♀ 0.89–1.01 mm. Forewing length ♂ 2.26–2.43 mm, ♀ 2.43–2.61 mm. Female proctiger length 0.64–0.72 mm. Male proctiger length 0.32–0.34 mm. Male paramere length (including basal portion within subgenital plate) 0.27–0.31 mm. Length of apical portion of penis 0.22–0.24 mm.

Host plant. *Salix depressa* subsp. *rostrata*.

Holotype. ♂, mounted on slide in balsam, from *Salix depressa*, Eagle Summit, Steese Highway, Alaska, 2.vi.77.

Paratypes. Alaska: 2 ♂, 2 ♀ on *Salix depressa*, Eagle Summit, 2.vi.77; 1 ♂, 3 ♀ on *Salix depressa*, Washington Creek (AP –50), 4.vi.77; 1 ♂, Fairbanks, 14.v.48. (*R. I. Sailer*); 1 ♂, Anchorage, Otter Lake Marsh, 18.v.48 (*R. I. Sailer*); 1 ♂, Fort Richardson, 10.vii.48 (*R. I. Sailer*); Canada, Alberta, Kananaskis Valley: 3 ♂ on *Salix* sp.; 2 ♂ from *Pinus* sp., 6.v.74; 1 ♂ from *Pinus*, 7.x.72; 1 ♂, Ribbon Creek, 7.vii.73.

Holotype and eight paratypes in BMNH, three male paratypes in USNM, remaining paratypes in author's collection.

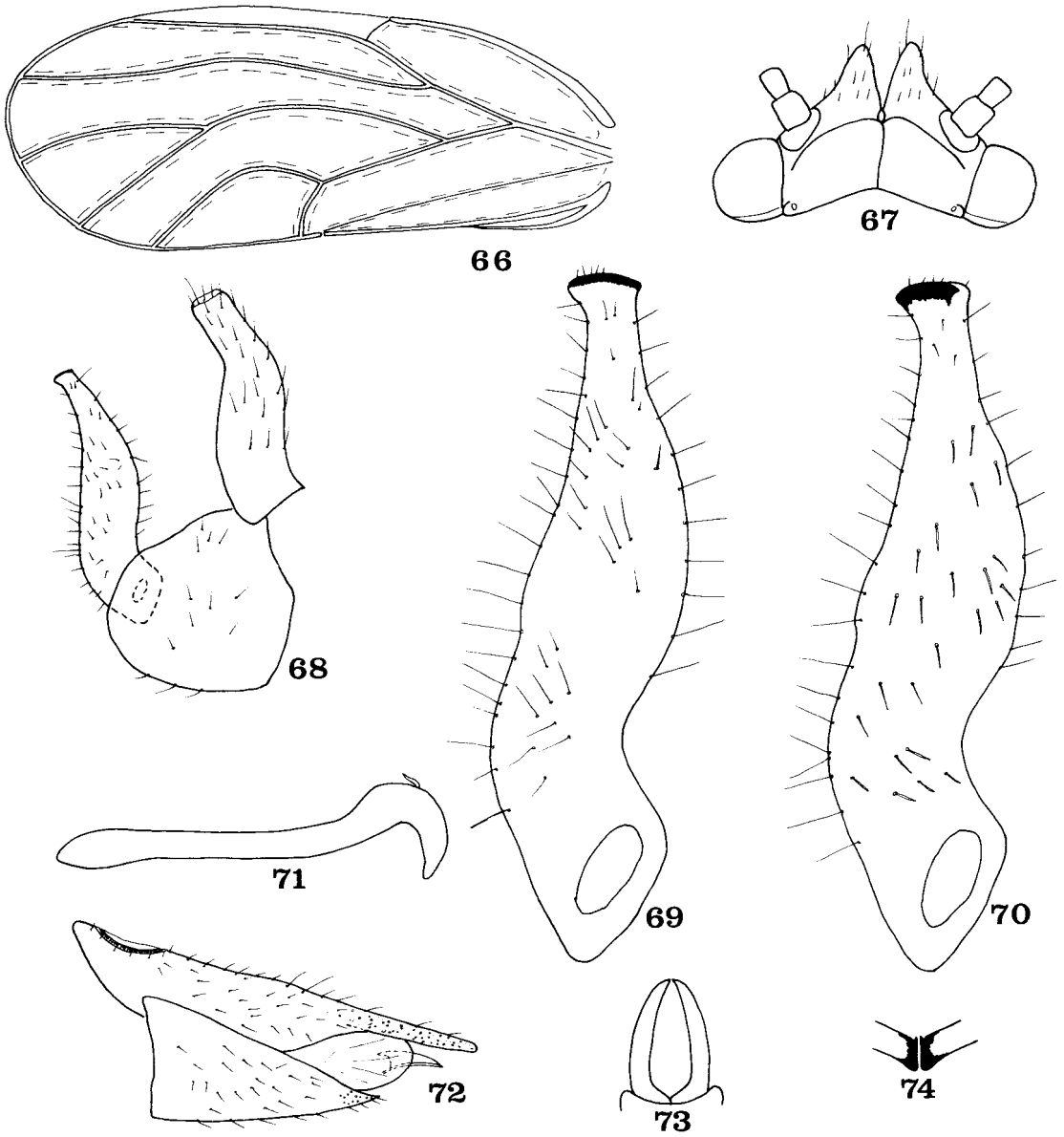
Comment

Psylla rufipennis has no very close North American relatives and is closest to *Psylla intergerina* Loginova and *Psylla sibirica* Loginova, two Russian *Salix*-feeding species (vide Loginova, 1967). These species can be separated on the form of the male genitalia.

Psylla longiforceps sp. nov.

Head (Fig. 67) as broad as thorax, vertex 0.39–0.41 times as long as broad, genal cones long, slender, slightly divergent, 1.00 times as long as vertex at mid line; antennae of typical *Psylla* form, ten segmented, 1.53–1.55 times head width with rhinaria on segments 4, 6, 8 and 9 and two long apical setae on segment 10.

Thorax of typical *Psylla* form, moderately arched, forewing (Fig. 66) membranous, 2.33–2.50 times as long as broad, oblong-oval, with typical *Psylla* venation, 3.81–4.16 times head width; pterostigma long and narrow meeting costal margin beyond the point of bifurcation of vein M, maximum width about one-half that of cell r_1 ; costal break present; vein R_s sinuous, cells m_1 and cu_1 subequal, vein Cu_{1a} moderately arched; basal width to height ratio of cell cu_1 1.72–1.94; forewing membrane covered in dense, dark spinules which are absent from relatively broad bands adjacent to veins. Hind wings membranous, of typical *Psylla* form. Fore and mid legs



FIGS. 66–74. *Psylla longiforceps* sp. nov. 66, forewing, 67, head dorsal view; 68, ♂ genitalia lateral view; 69, ♂ paramere outer view; 70, ♂ paramere inner view; 71, apical portion of ♂ penis; 72, ♀ terminalia lateral view; 73, ♂ parameres posterior view; 74, ♂ parameres dorsal view.

simple; hind legs saltatorial, meracanthi well developed; apex of metatibia with five thick black spines, basal metatarsus with two black spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 68) simple, cylindrical, sparsely hairy basally, densely hairy apically; sub-genital plate

simple, sparsely hairy. Male parameres (Figs. 68–70) very long, simple, in lateral view exceeding the length of proctiger, anterior margin excavate basally then convex to apex; posterior margin sinuous, deflexed posteriorly sub-apically; apex formed by a long slender, sub-parallel, posteriorly bent process bearing an inner broad truncate denticle at apex; in

dorsal view (Fig. 74) apices slender, denticle acute anteriorly, rounded posteriorly; in posterior view (Fig. 73) parameres weakly arched to acute apices; apical portion of male penis (Fig. 71) simple, similar to other *Salix*-feeding forms.

Female terminalia (Fig. 72) long, similar to other *Salix*-feeding *Psylla* spp.; proctiger long and straight, 1.24 times head width; perianal pore ring with two unequal rows of pores, 0.19 times length of proctiger, ventral valve shorter than proctiger, ovipositor and valvulae ventralis barely extending beyond the palps.

Coloration. The specimens to hand are teneral but are beginning to develop the characteristic coloration as in *P. haliaeeti*.

Size. Head width ♂ 0.80 mm, ♀ 0.84 mm; antennal length ♂ 1.20 mm, ♀ 1.29 mm; forewing length ♂ 3.04 mm, ♀ 3.48 mm; female proctiger length 1.03 mm. Male proctiger length 0.51 mm. Male paramere length (including basal portion within subgenital plate) 0.56 mm. Length of apical portion of penis 0.39 mm.

Host plant. Most probably *Salix* spp.

Holotype. ♂, mounted on slide in balsam, on *Salix*, Valdez, Alaska, 5.vii.48 (R. I. Sailer) (USNM).

Paratype. ♀, same data as holotype (USNM).

Comment

Psylla longiforceps belongs to the *Psylla americana* Crawford/*Psylla curta* Crawford complex (vide Jensen, 1951). It can be separated from these species on the length of the male paramere, the form of the paramere apex, and the presence of dense spinules in the basal half of the forewing.

Psylla alaskensis Ashmead

Common on *Salix* species, particularly *S. pulchra*, throughout central and southern Alaska; extends westward to Churchill, Manitoba, and southward down the Rocky Mountains into Colorado.

Psylla betulaenanae Ossiannilsson

Common on *Betula nana* subsp. *exilis* throughout Alaska except the northern part

of the Arctic Slope. A circumpolar species also recorded from Scandinavia, Siberia and Greenland.

Psylla breviata Patch

A single record for Alaska: on *Salix* spp. Teller 11.vii.51 (R. I. Sailer). Previously known from the western and central U.S.A. and Ontario, Canada.

Psylla fibulata Crawford

Abundant on *Salix* spp. in central and southern Alaska, extends southwards down the western mountains through Canada to Colorado.

Psylla floccosa Patch

A single record on *Alnus*, Fort Yukon 15.vii.51 (R. I. Sailer). This species is widespread throughout the boreal forest zone of North America and extends southwards down the major mountain chains.

Psylla galeaformis Patch

Common throughout Alaska except the extreme north on *Alnus crispa*. This species has a similar distribution to *P. floccosa*.

Psylla hamata Tuthill

An uncommon species recorded from *Salix* sp. Mount McKinley Park and Atigun River Crossing (AP + 220). Previously known from the Rocky Mountains of southern Alberta, Canada.

Psylla kananaskensis Hodkinson

Common on *Salix* sp. at several scattered localities throughout Alaska. Previously known only from the Kananaskis Valley, southern Alberta, Canada.

Psylla ledi Flor

The female of this species common on *Ledum palustre* at several localities in central Alaska but appears to be absent from this host plant in northern Alaska. A boreo-alpine species ranging from Scandinavia and the mountains of Europe across Siberia to Japan.

Psylla minor Crawford

Taken on *Salix* spp. at several localities in southern Alaska: extends southwards down the western mountains through Canada into the U.S.A.

Psylla myrtilli Wagner ssp. *canadensis*
Hodkinson

The female of this species common on *Vaccinium uliginosum* at several localities in central Alaska. Subspecies *canadensis* was described from the Rocky Mountains, Alberta, Canada. The nominate subspecies is widespread throughout Scandinavia and the mountains of Europe and extends east across the U.S.S.R. to northern China.

Psylla palmeni Low

Common on various *Salix* spp. particularly *S. pulchra*, *S. alaxensis* and *S. lanata* subsp. *richardsonii*. In Alaska it appears to be confined to the Arctic Slope region. A boreal holarctic species found throughout northern Scandinavia and northern Siberia.

Psylla rara Tuthill

The female of this species abundant on *Viburnum edule*, Riley Creek, McKinley Park, 10.viii.76. *Viburnum edule* is now confirmed as the host plant as I have also taken *P. rara* abundantly on the same plant in Canada. Widespread throughout the boreal forest zone of North America, extending down the major mountain chains both in the east and west of the continent.

Psylla sinuata Crawford

Common on *Salix* spp. in southern and central Alaska, extending southwards down the western mountains to Colorado. Also recorded from Minnesota and Manitoba.

Psylla striata Patch

Common on *Betula* sp. in central Alaska. Widespread throughout the boreal forest zone of North America.

Psylla stricklandi Caldwell

Common on *Shepherdia canadensis* in central Alaska. Previously recorded from alpine/sub-alpine localities in Alberta, Canada, and Colorado, U.S.A.

Psylla zaecevi Sulc

Common on *Salix lanata* subsp. *richardsonii* at several localities on the arctic slope of northern Alaska. An holarctic species previously recorded from Scandinavia, northern Siberia and northern India.

Trioza Förster

A difficult genus in which males are usually required for specific determination.

Key to species

- 1 Metatibia with four thick black apical spines arranged 3 + 1 2
- Metatibia with three (2 + 1) apical spines 3
- 2 Forewing with spinules completely covering the membrane. Antennae with segments I–VIII creamy white, remainder black. Ventral valve of female terminalia shorter than proctiger; in lateral view dorsal margin of female proctiger sinuous
Trioza sp. (undescribed)
- Forewing membrane with spinules absent except from radular areas. Antennae with at least segments V–X dark, remainder yellowish. Ventral valve and proctiger subequal; in lateral view dorsal margin of female proctiger almost straight. Male proctiger simple; paramere simple straight, subequal to length of proctiger. On *Urtica* spp.
albifrons Crawf. (Tuthill, 1943)

- 3 Forewing with spinules completely covering membrane 4
- Forewing with spinules confined to radular areas 5
- 4 Forewing short, at most 2.2 times as long as broad, cell m_1 smaller than cell cu_1 . Male proctiger (Fig. 95) in lateral view with posterior projection short and rounded; paramere in lateral view (Fig. 95) with basal portion long, curved and narrow, expanded into a broader oval apical portion. Female terminalia long, proctiger in lateral view with dorsal margin sinuous to straight. Forewing membrane yellowish, host plant unknown. *stylifera* Patch (Tuthill, 1943)
- Forewing longer, at least 2.4 times as long as broad, cell m_1 equal in area to cell cu_1 . Male proctiger in lateral view with posterior projection triangular; paramere in lateral view (Fig. 93) straight and parallel sided basally, curving anteriorly to acute apex. Female terminalia short, proctiger in lateral view with dorsal margin strongly convex throughout. Forewing membrane yellowish. On *Salix* spp.
salicivora Reuter (Vondracek, 1957)
- 5 Male paramere in lateral view (Fig. 91) strongly curved anteriorly; apical portion of penis long and slender (Fig. 92). On *Salix* spp.
incerta Tuthill (1943)
- Male paramere in lateral view (Fig. 86) straight basally, curving to acute anteriorly directed apex in apical quarter; apical portion of penis short and massive 6
- 6 Forewing (Fig. 83) short, clear, less than 4.63 times head width. Antennae short, less than 1.63 times head width. Male proctiger in lateral view (Fig. 85) with posterior projection triangular, apical portion of penis as in Fig. 89. Female proctiger (Fig. 88) with a finger-like apical projection. On *Salix* spp.
atkasookensis sp. nov.
- Forewing (Fig. 75) long, yellowish, greater than 4.63 times head width. Antennae longer, greater than 1.63 times head width. Male proctiger (Fig. 77) with posterior projection broadly rounded apically, apical portion of penis as in Fig. 81. Female proctiger (Fig. 80) without an apical projection, dorsal margin convex throughout. On *Salix* spp. *arctica* sp. nov.

Trioza arctica sp. nov.

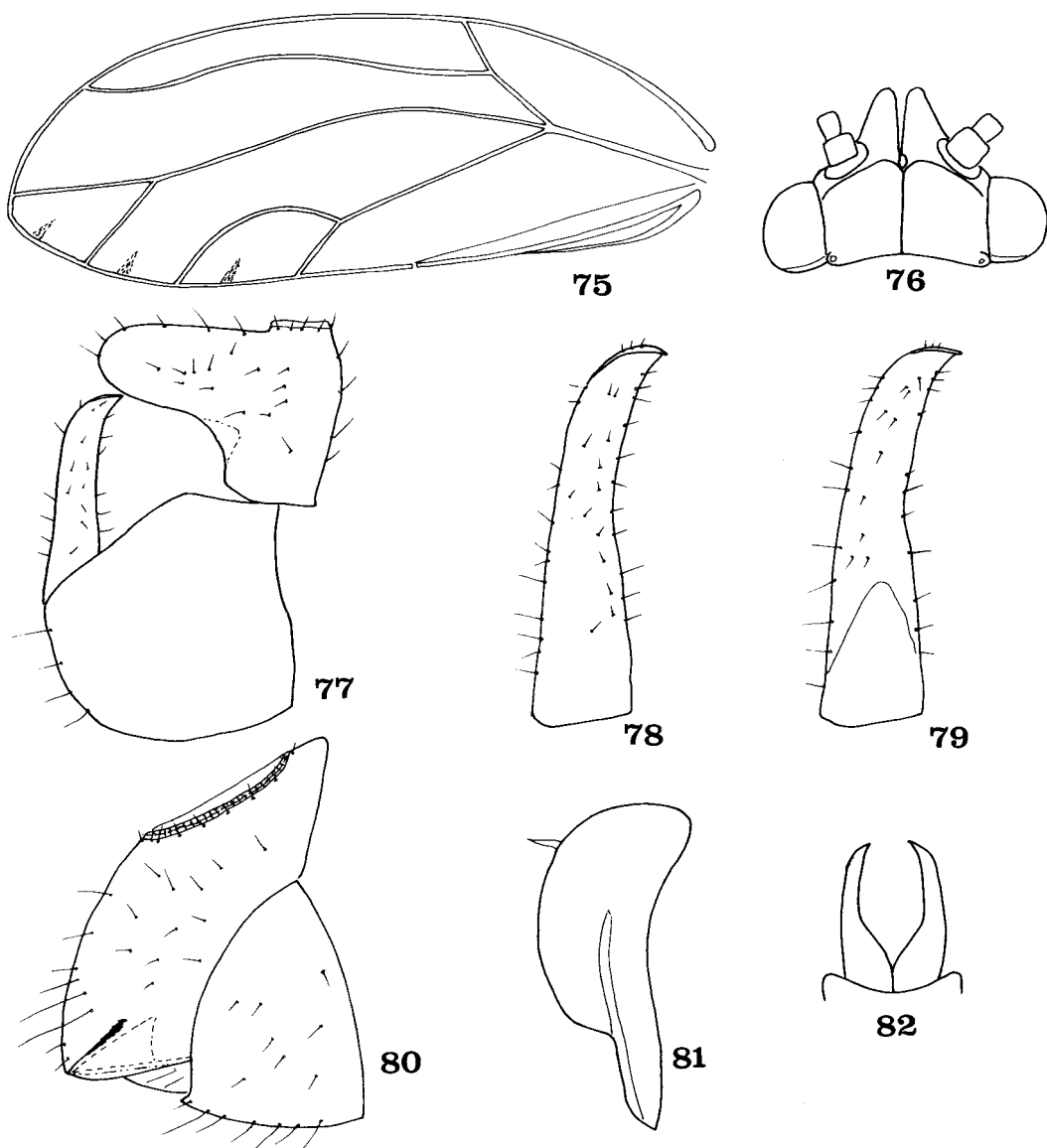
Head (Fig. 76) narrower than thorax, moderately deflexed, vertex 0.53–0.63 times as long as broad; genal cones long, slender proximate, 0.86–1.06 times length of vertex at mid line. Antennae ten segmented, 1.63–2.00 times head width, of typical *Trioza* form, with rhinaria on segments 4, 6, 8 and 9, two long apical setae on segment 10.

Thorax of typical *Trioza* form, moderately arched. Forewing (Fig. 75) membranous 2.35–2.77 times as long as broad, with typical *Trioza* venation, 4.63–5.25 times as long as head width; vein R_s long and sinuous, cutting costal margin well beyond point of bifurcation of vein M; cells m_1 and cu_1 approximately equal in area; basal width to height ratio of cell cu_1 0.96–1.54; spinules restricted to V-shaped radular areas around margin in cells m_1 , m_2 and cu_1 . Hind wings membranous of typical *Trioza* form. Fore and mid legs simple, hind legs saltatorial, meracanthi well developed, apex of metatibia with three (arranged 2 + 1) apical thick black spines, basal metatarsi without spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 77) with two long conspicuous posterior processes. Apex of each process broadly rounded, ventral margin concave; height of proctiger shorter than height of subgenital plate; subgenital plate simple, of typical form. Male parameres in lateral view (Figs. 77–79) straight and slender in basal three-quarters, margins sub-parallel, curved anteriorly to an acute apex in apical quarter; apex of parameres without denticles, dorsal margin adjacent to apex somewhat thickened. In posterior view (Fig. 82) parameres weakly arched, expanded basally. Apical portion of male penis (Fig. 81) short and massive, somewhat reniform.

Female terminalia (Fig. 80) short; proctiger length 0.57–0.71 times head width, in lateral view dorsal margin convex throughout; peri-anal pore ring simple with a double row of pores, 0.34–0.39 times the length of proctiger; ovipositor and valvula ventralis normally hidden within the proctiger; ventral valve short, with an acute apical projection.

Coloration. Teneral specimens with body coloration reddish orange throughout. Mature specimens with vertex black centrally, bone-white laterally. Genal cones black. Antennal segments 2 and 3 bone-white, remainder dark brown. Pronotum black with pale margin. Dorsum of thorax with multi-coloured orange, plum, brown, black or creamy longitudinal streaks. Forewing membrane clear, slightly yellow, veins yellow. Legs generally brown, tibia and first tarsal segment dirty yellow. Abdominal sclerites



FIGS. 75–82. *Trioza arctica* sp. nov. 75, forewing; 76, head dorsal view; 77, ♂ genitalia lateral view; 78, ♂ paramere outer view; 79, ♂ paramere inner view; 80, ♀ terminalia lateral view; 81, apical portion of ♂ penis; 82, ♂ parameres posterior view.

dark brown, intersegmental membranes orange red, terminalia dark brown to black.

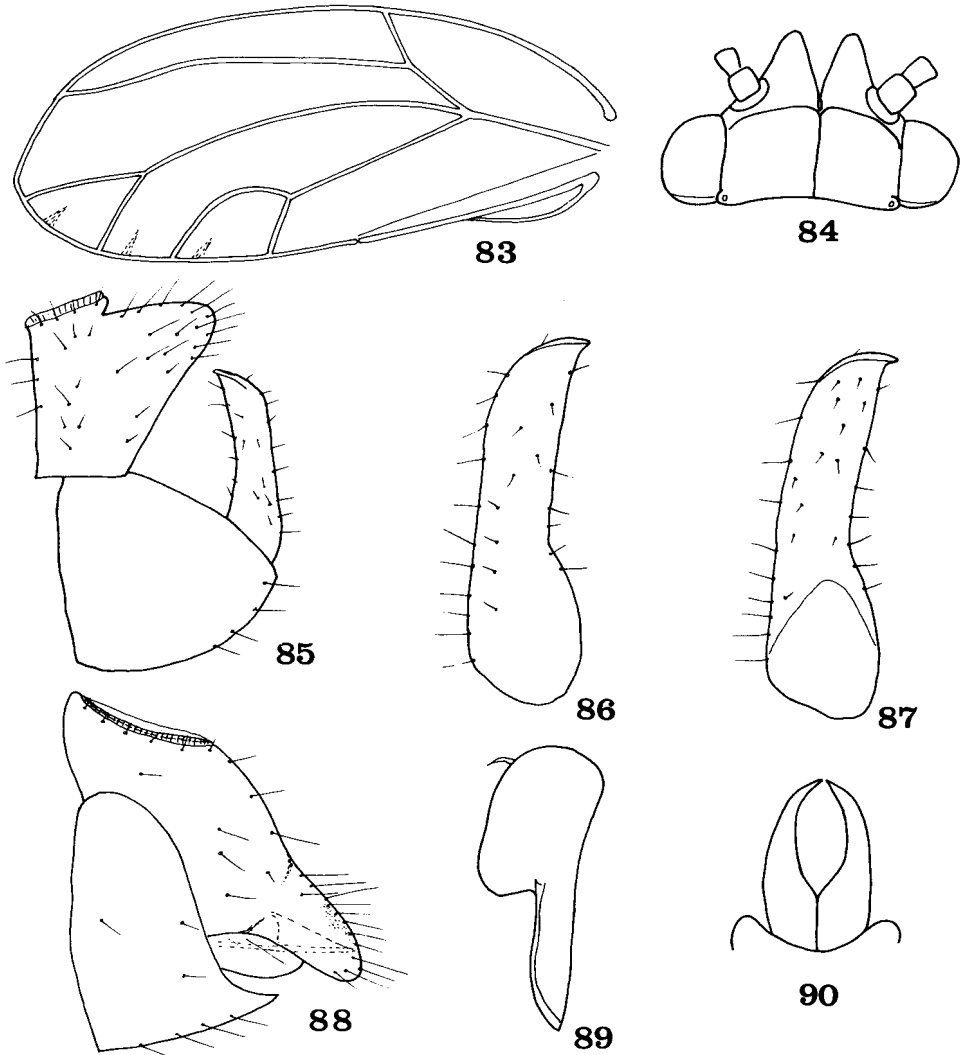
Size. Head width ♂ 0.56–0.62 mm, ♀ 0.56–0.66 mm. Antennal length ♂ 1.06–1.22 mm, ♀ 1.07–1.13 mm. Forewing length ♂ 2.78–3.00 mm, ♀ 2.86–3.17 mm. Female proctiger length 0.35–0.42 mm. Male proctiger length 0.18–0.24 mm. Male paramere length (including basal portion within sub-

genital plate) 0.20–0.26 mm. Length of apical portion of penis 0.16–0.19 mm.

Host plant. *Salix* spp.

Holotype. ♂, mounted on slide in balsam, from *Salix* sp., Grayling Lake (AP + 100), Alaska, 14.viii.76.

Paratypes. 11 ♂, 8 ♀ with data as holotype; 2 ♂, 1 ♀ Old Man Camp (AP + 52), Alaska, 14.viii.76; 1 ♀ (teneral), Sagwon (AP), 6.viii.77.



FIGS. 83–90. *Trioza atkasookensis* sp. nov. 83, forewing; 84, head dorsal view; 85, ♂ genitalia lateral view; 86, ♂ paramere outer view; 87, ♂ paramere inner view; 88, ♀ terminalia lateral view; 89, apical portion of ♂ penis; 90, ♂ parameres posterior view.

Holotype and six paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Trioza arctica is closest to the next species, *T. atkasookensis*, and the systematic position of the two is discussed together.

Trioza atkasookensis sp. nov.

Head (Fig. 84) narrower than thorax, vertex 0.50–0.61 times as long as broad; genal

cones long, proximate, 0.76–0.94 times length of vertex at mid line. Antennae ten segmented, 1.33–1.78 times head width, of typical *Trioza* form, with rhinaria on segments 4, 6, 8 and 9, and two long apical setae on segment 10.

Thorax of typical *Trioza* form, moderately arched. Forewing (Fig. 83) broad and membranous, 2.31–2.50 times as long as broad, with typical *Trioza* venation. Forewing very short, 3.88–4.62 times as long as head width; vein R_s long and sinuous, cutting costal margin well beyond point of bifurcation of

vein M; cells m_1 and cu_1 approximately equal in area; basal width to height ratio of cell cu_1 1.06–1.60; spinules restricted to V-shaped radular areas around margin in cells m_1 , m_2 and cu_1 . Hind wings membranous of typical *Trioza* form. Fore and mid legs simple, hind legs saltatorial, meracanthi well developed, metatibia with three (arranged 2 + 1) apical thick black spines, basal metatarsi without spines.

Abdomen lacking diagnostic features except for terminalia. Male proctiger (Fig. 85) with posterior processes short and triangular, ventral margin straight; height of proctiger equal to height of subgenital plate; subgenital plate simple, of typical form. Male paramere in lateral view (Figs. 85–87) similar to *T. arctica*, straight and slender in basal three-quarters, margins sub-parallel, curved anteriorly to an acute apex in apical quarter; apex of parameres without denticles, dorsal margin adjacent to apex somewhat thickened. In posterior view (Fig. 90) parameres strongly arched, expanded basally. Apical portion of male penis (Fig. 89) short and massive, oblong-oval.

Female terminalia (Fig. 88) short; proctiger length 0.68–0.77 times head width, in lateral view dorsal margin sinuous, apex with a finger-like projection; peri-anal pore ring simple with a double row of pores, 0.32–0.42 times the length of proctiger, ovipositor and valvula ventralis normally hidden within the proctiger; ventral valve short with an acute apex.

Coloration. Vertex bone-white with dark brown markings centrally. Antennae with segments 2 and 3 bone-white, remainder dark brown. Genal cones black. Pronotum white, darkened at margins. Mesothoracic prescutum brown or plum with white streaks along mid line and posterior margin. Mesothoracic scutum multicoloured orange, plum, brown with four distinct and two indistinct longitudinal pale streaks. Forewings clear, veins brown. Legs generally brown, tibia and first tarsal segment dirty yellow. Abdominal sclerites reddish brown to black, intersegmental membranes orange-red, terminalia brown to black, female terminalia with white markings.

Size. Head width ♂ 0.51–0.60 mm, ♀ 0.55–0.60 mm. Antennal length ♂ 0.75–

1.02 mm, ♀ 0.82–0.99 mm. Forewing length ♂ 2.13–2.52 mm, ♀ 2.21–2.74 mm. Female proctiger length 0.36–0.43 mm. Male proctiger length 0.17–0.20 mm. Male paramere length (including basal portion within subgenital plate) 0.16–0.21 mm. Length of apical portion of penis 0.15–0.18 mm.

Host plants. *Salix lanata* subsp. *richardsonii* and *Salix niphoclada*.

Holotype. ♂, mounted on slide in balsam from *Salix lanata*, Atkasook, Meade River, 90 km south of Point Barrow, Alaska.

Paratypes. Several hundred specimens from the following localities: Meade R. 17.vi.76, 24.vi.76, 29.vii.76, 2.viii.76, on *S. lanata* and *S. niphoclada*. Atigun River Crossing (AP + 220), 18.viii.76, Toolik Lake (AP + 236), 15.viii.76, Slope Mountain (AP + 260), 15.viii.76, Happy Valley Cut (AP + 280), 15.viii.76, Sagwon (AP + 300), 15.viii.76, Pump Station 2 (AP + 305), 15.viii.76, Franklin Bluffs (AP + 329), 16.viii.76, 9.viii.77, all on *Salix* spp.

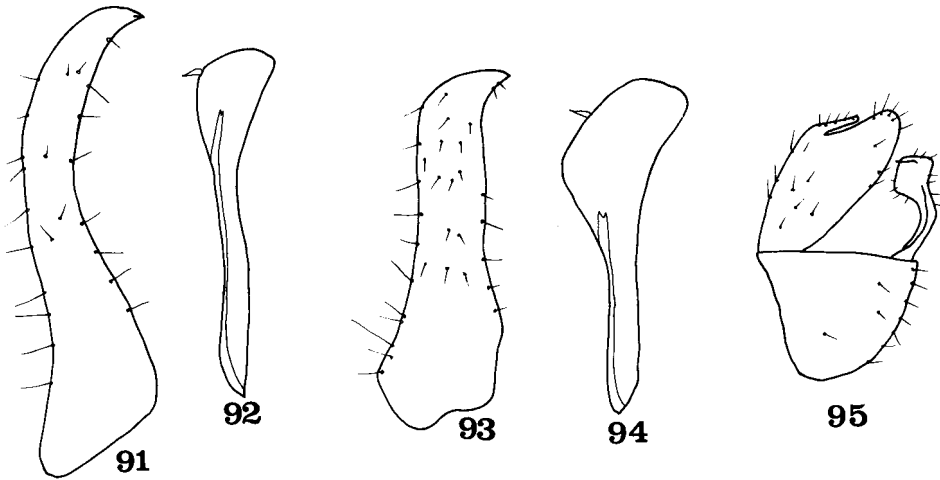
Holotype and paratypes in BMNH, remaining paratypes in USNM and author's collection.

Comment

Trioza atkasookensis is closest to *T. arctica* Hod. The two species can be separated by the shorter wings and antennae in *T. atkasookensis*, the shape of the male proctiger, paramere and penis, and the shape of the female proctiger. The two species appear closest to *Trioza versicolor* Löw sensu Dobreanu & Manolache 1962, a *Salix*-feeding species from Romania, but can be separated on the male genitalia. Among North American species *T. arctica* and *T. atkasookensis* are closest to *T. incerta* Tuthill, *T. varians* Crawford and *T. salicivora* Reut. The species can be separated on the shape of the male parameres and by the presence of wing spinules in *T. salicivora*. The male genitalia of *T. incerta* and *T. salicivora* which occur in Alaska are illustrated for comparison (Figs. 91–94).

Trioza albifrons Crawford

Previously recorded for Alaska by Tuthill (1943). This widespread nearctic species was



FIGS. 91–95. 91, *Trioza incerta* ♂ paramere outer view; 92, *T. incerta* apical portion of ♂ penis; 93, *Trioza salicivora* ♂ paramere outer view; 94, *T. salicivora* apical portion of ♂ penis; 95, *Trioza stylifera* ♂ genitalia lateral view.

not found during the present study. Host plant is *Urtica* spp.

Trioza incerta Tuthill

Frequently encountered on *Salix* spp. especially *S. depressa* subsp. *rostrata* at several localities in southern and central Alaska; extends southwards down the western mountains through Canada to Colorado.

Trioza salicivora Reuter

This species has previously been recorded from North America under the name *Trioza maura* Förster. Crawford introduced this species into the North American list without examining specimens of *maura* and using Sulc's illustrations for comparison. I have now compared a long series of North American material from Alaska, Canada, Utah and New Mexico with European material of *T. salicivora* from England and Scandinavia, including a female Reuter type deposited in the British Museum. These North American specimens, identified as *maura*, are the same species as *salicivora*, the only difference being that the female proctiger is fractionally longer in North American material. This species is widespread on *Salix* spp., particularly *S.*

depressa subsp. *rostrata*, throughout southern and central Alaska. Widely distributed across Canada and the northern U.S.A.

Trioza stylifera Patch

A rare and little-known species. 1 ♂ Eagle River Flats, Anchorage, 9.iv.48 (*K. Sommerman*), 1 ♀ Otter Lake Marsh Anchorage, 18.v.48 (*R. I. Sailer*). Previously recorded from New Hampshire, U.S.A., and Manitoba and Ontario, Canada. Host plant unknown. The male genitalia of this species which are inadequately illustrated by Tuthill (1943) are shown in Fig. 95.

Trioza sp. nov.

One female of an undoubtedly new species collected at Toolik Lake (AP+236), 15.viii.76, is not being described owing to the lack of a male specimen.

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