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GENERIC KEY TO CHILEAN JUMPING PLANT-LICE (HOMOPTERA: PSYLLOIDEA) WITH INCLUSION OF POTENTIAL EXOTIC PESTS

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ABSTRACT

An illustrated key is provided for the identification of adult psyllids at generic and, for *Trioza,* at species group level. The key covers taxa presently known to occur in Chile as well as exotic species which may be introduced on cultivated plants.
Two new combinations are proposed: *Katacephala stigmaticalis* (Blanchard, 1852) comb. n. (from *Notophorina*) and *Katacephala longiramis* (Burckhardt, 1987) comb. n. (from *Notophorina*).

RESUMEN

Se entrega una clave ilustrada para la identificación de adultos de los géneros de psílidos presentes en Chile y en el caso de *Trioza*, hasta el nivel de grupos de especies. La clave cubre además aquellos taxa exóticos que afectan plantas cultivadas y que podrían ser susceptibles de introducción en Chile.
Se proponen dos nuevas combinaciones: *Katacephala stigmaticalis* (Blanchard, 1852) comb. n. (de *Notophorina*) y *Katacephala longiramis* (Burckhardt, 1987) comb. n. (de *Notophorina*).

INTRODUCTION

Psyllids (Homoptera, Psylloidea) constitute a small group of sternorrhynchous insects with a high degree of host specificity. Contrary to the related aphids, psyllids are generally of little economic importance. There are, however, some species which are major pests of crop plants. In Europe, Asia and North America psyllids are among the most important pests of cultivated pears (Atger, 1982; Burckhardt & Hodkinson, 1986; Burts, 1970; Burts & Hill, 1987; Hodkinson, 1984; Wildbolz, 1992), and in Asia and Africa they are responsible for big losses in citrus cultures (Anonymous, 1988; Burckhardt & Martinez, 1989; Husain & Nath, 1927; Mead, 1976, 1977; Van den Berg, 1990; Van den Berg & Fletcher, 1988).

In Chile *Cacopsylla bidens* (Šulc) has been reported from three localities (as *Psylla piricola* (sic!), *Psylla simulans* and *Cacopsylla bidens*) but apparently without causing noticeable damage (González, 1981, 1985, 1989; Hodkinson, 1989). *Russelliana solanicola* occurs locally as a minor pest on potatoes (Burckhardt, 1987a; Tuthill, 1959), and *Heteropsylla obscura* Muddiman, Hodkinson & Hollis (recorded as *Heteropsylla texana*) was observed to produce severe damage to *Prosopis chilensis* (Klein Koch & Campos, 1978; Muddiman *et al.*, 1992).

Most of Chile's crop plants are exotic and some of them are parasitised in their native range by psyllids (table 1) (Müller, 1956; Pflugfelder, 1941). These species constitute a potential threat to cultures in Chile.

The identification of psyllids is difficult for the non-specialist as most published keys work only for local faunas or small sub-groups within psyllids. The temperate South American psyllids were revised by Burckhardt

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(1987a, b, 1988) who provided keys to species for the adults. It is, however, not possible to identify potential exotic pests with these keys. The present paper intends to fill this gap. As most of the potential pests belong to exotic genera (or species groups in *Trioza),* the present key is only to genera and, in *Trioza,* to species groups. The larvae are not treated here as they are dealt with on a world base by White & Hodkinson (1985).

MATERIAL AND METHODS

The present key includes the native taxa reported by Burckhardt (1986a, b, 1987a, b, 1988, 1992), Burckhardt & Lauterer (1989), González (1989) and Klein Koch & Campos (1978) and, marked with an asterisk, potential pests listed in table 1; taxa not reported from Chile are indicated with a cross. Literature records are supplemented with data from material represented in the collections of the Muséum d'histoire naturelle, Genève (MHNG), the Natural History Museum, London (BMNH), the Museo Nacional de Historia Natural, Santiago (MNHN), the Universidad de Concepción (UNCO) and the Servicio Agrícola y Ganadero, Santiago (SAGS).

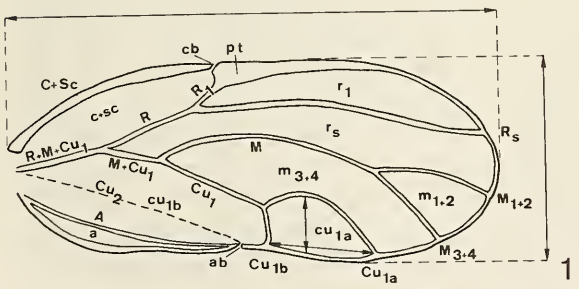
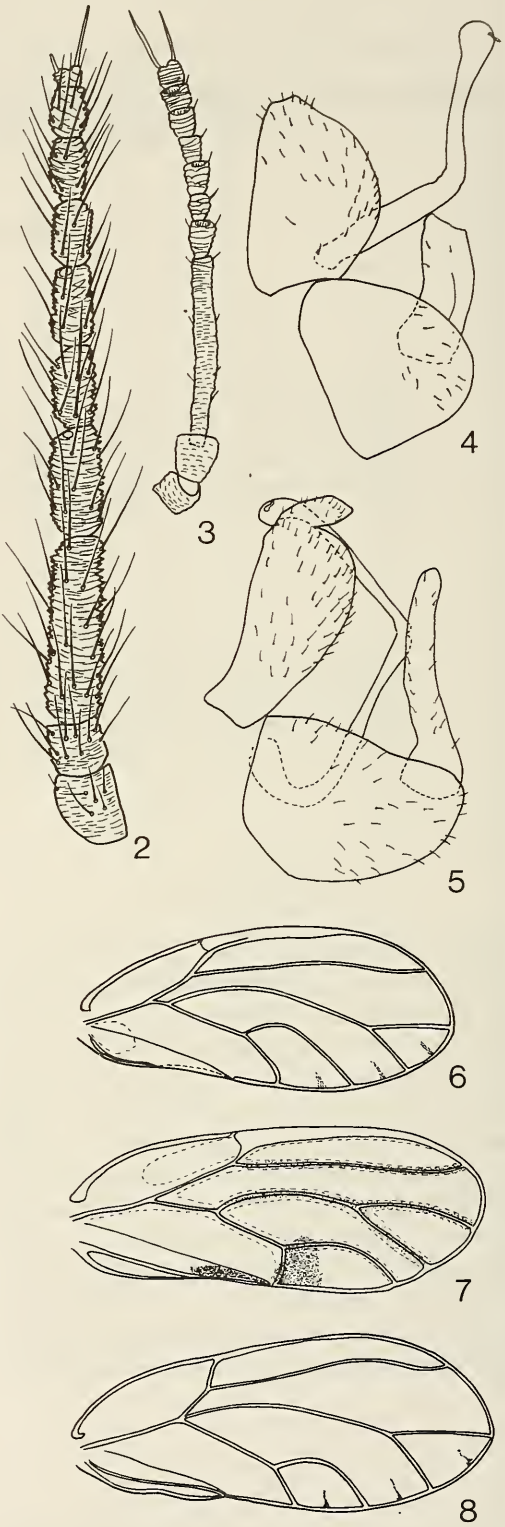


Figure 1. Nomenclature of veins and cells of forewing.

To facilitate the use of the key to non-specialists, most of the characters are illustrated. The terminology of the wing venation is according to Fig. 1. The head width is measured across the complex eyes at the widest distance. Male and female terminalia are illustrated in Figs. 40, 41.



Figures 2-8. 2. *Homotoma ficus* (Linnaeus). 3, 4, 6. *Calophya rubra* (Blanchard). 5. *Notophorina falcata* Burckhardt. 7. *Notophorina lanfrancoae* Burckhardt. 8. *Trioza testacea* (Blanchard). 2, 3. Antenna. 4, 5. Male terminalia, in profile. 6, 7, 8. Forewing.

The classification follows Burckhardt (1987a, b, 1988) with the exception of the *Notophorina stigmaticalis* group which is transferred here to the genus *Katacephala* Crawford (Hodkinson, 1991). The following two new combinations are proposed: *Katacephala stigmaticalis* (Blanchard, 1852) comb. n. (from *Notophorina*) and *Katacephala longiramis* (Burckhardt, 1987) comb. n. (from *Notophorina).*

KEY TO ADULTS

1 Antennal flagellar segments flattened, bearing long black setae (Fig. 2). On *Ficus carica* (Moraceae). . . . . Homotomidae: *Homotoma**†

\- Antennal flagellar segments more or less cylindrical, without long black setae (Fig. 3). 2

2 Basal portion of aedeagus straight (Fig. 4). Forewings with costal break and pterostigma; anal break in distance of apex of vein Cu_{1b} (more than half distance between apices of veins Cu_{1a} and Cu_{1b}); cell cu_{1a} larger than m_{1+2}; vein $M+Cu_1$ shorter than R, and vein Cu_1 less than twice as long as Cu_{1b} (Fig. 6). On *Schinus* spp. (Anacardiaceae). . . . . Calophyidae: *Calophya*

\- Basal portion of aedeagus U-shaped (Fig. 5). Forewings with different combination of characters 3

3 Forewings (Fig. 7) with vein $R+M+Cu_1$ bifurcating into R and $M+Cu_1$; if trifurcating then anal break close to apex of vein Cu_{1b} and metabasitarsus with 1 or 2 black spurs. Costal break and/or pterostigma often developed. . . . . Psyllidae 4

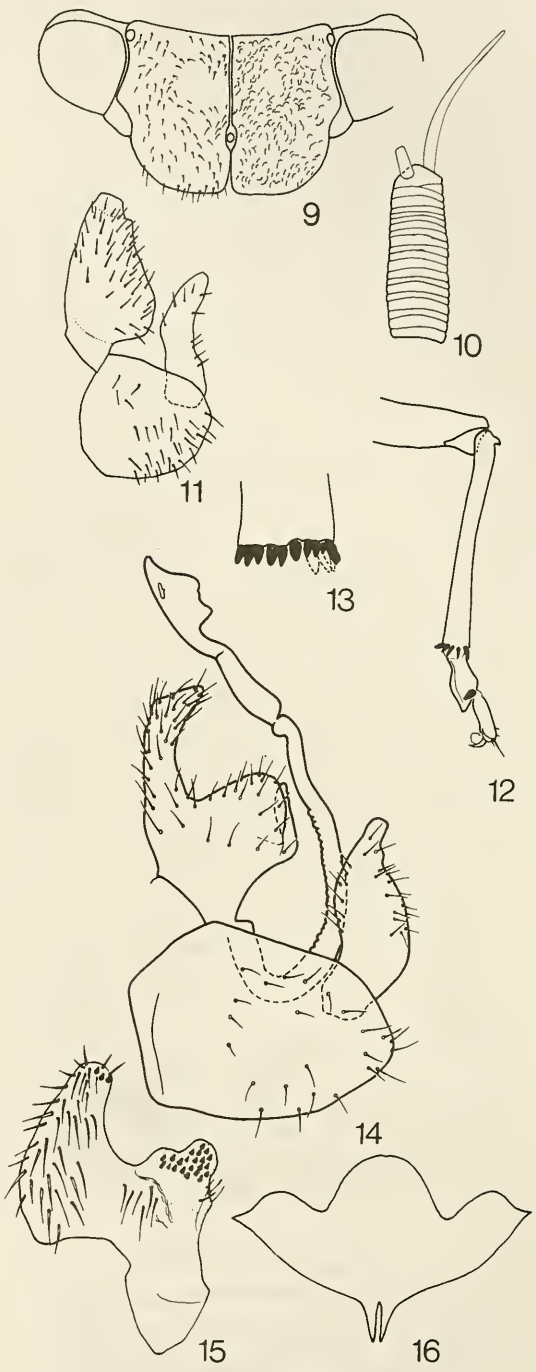
\- Forewings (Fig. 8) with vein $R+M+Cu_1$ trifurcating into R, M and Cu_1 or, rarely, bifurcating into R+M and Cu_1, or R and $M+Cu_1$; anal break distant from apex of vein Cu_{1b} (more than a third distance between apices of veins Cu_{1a} and Cu_{1b}); costal break and pterostigma always absent. Metabasitarsus without black spurs. . . . . Triozidae 23

4 Head (Fig. 9) with large anterior flattened lobes enclosing median ocellus which is, therefore, visible only in dorsal view. On *Olea europaea* (Oleaceae) . . . . . Liviinae: *Euphyllura**†

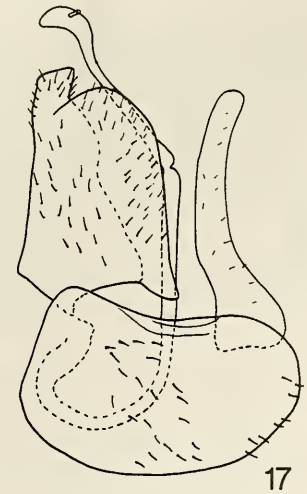
\- Head different, either regularly rounded anteriorly (Fig. 39), or with genal processes (Figs. 37, 38); median ocellus visible in frontal and/or ventral view. . . . 5

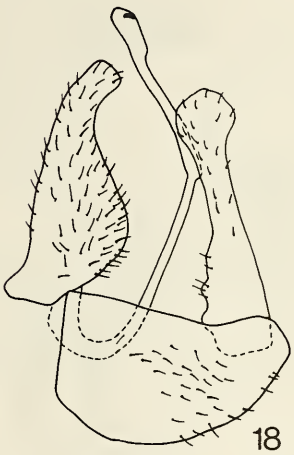
5 Terminal antennal setae strongly unequal in length; one long and curved, the other one very short, shorter than three times its diameter (Figs. 10, 35). Pro and mesobasitarsi short, in profile subglobular. On introduced Myrtaceae, often *Eucalyptus spp* . . . . . Spondyliaspidinae 6

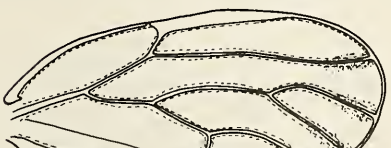
\- Terminal antennal setae subequal or, if unequal, then long seta straight and short seta longer than three times its diameter. Pro and mesobasitarsi elongate, in profile tubular. On indiginous Myrtaceae or other host families 7



Figures 9-16. 9. *Euphyllura olivina* (Costa), head dorsal view. 10. Spondyliaspidini gen. sp., antennal segment 10. 11. *Camarotoscena speciosa* (Flor). 12. *Notophorina vitripennis* Burckhardt, metatibia and metatarsus. 13. *Notophorina fusca* Burckhardt, apex of metatibia. 14. *Acizzia uncatoides* (Ferris & Klyver). 15. *Psyllopsis fraxinicola* (Förster), inner view of male paramere. 16. *Psyllopsis fraxini* (Linnaeus), female subgenital plate in ventral view, sclerite spread. 11, 14. Male terminalia, in profile.

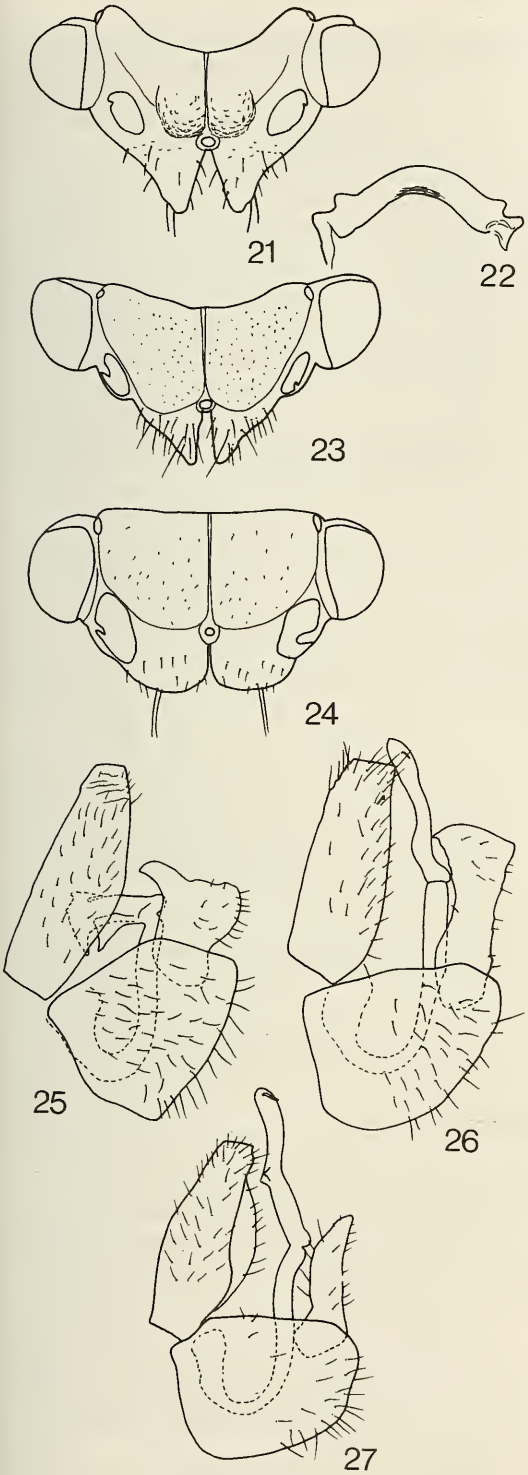






Figures 17-20. 17. *Katacephala stigmaticalis* (Blanchard). 18. *Notophorina atra* Burckhardt. 19. *Connectopelma perelegans* (Blanchard) 20. *Russelliana solanicola* Tuthill. 17, 18. Male terminalia, in profile. 19, 20. Forewing.

6 Metacoxae with tubercular meracanthus (Figs. 42, 43). Mesotibia with an outer apical comb of small bristles (Fig. 36) . . . . . Ctenarytaina*†
- Metacoxae angular, without meracanthus. Mesotibiae without outer apical comb of bristles . . . . . other genera of Spondyliaspidinae*†
7 Head without genal processes (Fig. 39) 8
- Head with genal processes (Fig. 38) 10
8 Metacoxae narrow and elongate, without horn-shaped meracanthus; trochanteral cavity with weakly sclerotised tubercle (Figs. 44, 45). On *Schinus* spp. (Anacardiaceae) . . . . . Rhinocolinae: *Tainarys*
- Metacoxae with horn-shaped meracanthus; trochanteral cavity without tubercle (Figs. 46, 47). 9
9 Antennae shorter than head width. Male parameres simple (Fig. 11). On *Populus* spp. (Salicaceae) . . . . . Paurocephalinae: *Camarotoscena*†
- Antennae longer than head width. Male parameres bifid. On *Prosopis tamarugo* and *chilensis* (Fabaceae) . . . . . Ciriacreminae: *Heteropsylla**
10 Metatibiae with distinctly grouped apical spurs and often with conspicuous basal spine. Metabasitarsi usually with 2 black spurs (in *Acizzia* with 1) 11
- Metatibiae without conspicuous basal spine, or if a conspicuous spine is present (Fig. 12) then apical tibial spurs forming an incomplete crown (Fig. 13), or metabasitarsi without black spurs 13
11 Genal processes shorter than half vertex length. Male proctiger with large posterior lobe and lamellar process (Fig. 14). On Australian *Acacia* spp . . . . . Acizziinae: *Acizzia**
- Genal processes longer than half vertex length. Male proctiger simple. On cultivated Rosaceae and Ericaceae. . . . . .Psyllinae 12
12 Antennae shorter than twice head width . . . . . Cacopsylla*
- Antennae longer than twice head width . . . . . *Psylla*†
13 Metabasitarsi with 2 spurs (rarely only 1). Metatibiae with an incomplete crown of evenly spaced apical spurs (Fig. 13). Fore margin of vertex not strongly bulged . . . . . Diaphorininae 14
- Metabasitarsi usually without spurs; if with two spurs then either metatibiae with grouped apical spurs, or fore margin of vertex strongly bulged (Fig. 38) . . . . . Aphalaroidinae 17
14 Antennae much shorter than head width. Forewings strongly widening towards apex, bearing a dark pattern consisting of well-defined spots. Aedeagus 3-segmented. On *Citrus* spp. (Rutaceae). . . . . *Diaphorina*†
- Antennae usually much longer than head width (slightly shorter in some species of the *Notophorina fusca* group). Forewings oval in outline; pattern not consisting of well-defined spots. Aedeagus 2-segmented 15
15 Male parameres in profile hammer or axe-shaped (Fig. 15). Female subgenital plate in ventral view incised apically (Fig. 16). On *Fraxinus* spp. (Oleaceae). . . . . Psyllopsis*
- Male Parameres in profile lamellar (Figs. 17, 18). Female subgenital plate pointed apically 16



Figures 21-27. 21. *Connectopelma perelegans* (Blanchard). 22. *Panisopelma penai* Burckhardt. 23. *Panisopelma fulvescens* (Blanchard). 24. *Prosopidopsylla striata* Burckhardt. 25. *Russelliana solanicola* Tuthill. 26. *Neopelma longiforceps* Burckhardt. 27. *Zonopelma australis* Burckhardt. 21, 23, 24. Head, dorsal view. 22. Pronotum, dorso-frontal view. 25-27. Male terminalia, in profile.

16 Mesoscutum along mid-line more than 1.5 times as long as mesopraescutum. Male proctiger with posterior angular lobes (Fig. 17). On Myrtaceae and Asteraceae ..... *Katacephala**

- Mesoscutum along mid-line less than 1.4 times as long as mesopraescutum. Male proctiger almost straight to rounded or lobed posteriorly, never angular (Fig.18). On Myrtaceae, *Nothofagus* spp. (Fagaceae), *Escallonia* spp. (Escalloniaceae), *Misodendrum* spp. (Misodendraceae), *Laureliopsis philippiana* (Laureliaceae) and *Eucryphia cordifolia* (Eucryphiaceae) ..... *Notophorina*

17 Forewings with cross-vein r-m, or with punctiform or partial fusion of veins Rs and M_{1+2} (Fig. 19)..... 18

- Forewings with veins Rs and M_{1+2} separate (Fig. 20) 19

18 Pronotum flattened laterally. Vertex strongly bulged anteriorly on either side of median suture (Fig. 21). Metabasitarsi usually with black spurs (reduced in *C. topali*) On Rhamnaceae ..... Connectopelma

- Pronotum with two lateral tubercles on either side (Fig. 22). Vertex forming short anterior lobes (Fig. 23). Metabasitarsi without spurs. On Zygophyllaceae ..... *Panisopelma*

19 Vertex flat, subrectangular (Fig. 24). On Fabaceae ..... *Prosopidopsylla*

- Vertex trapezoidal, strongly bulged anteriorly on either side of mid-line (Fig. 38) 20

20 Genal processes as long as (Fig. 38) or longer than vertex along mid-line. On *Colliguaja integerrima* (Euphorbiaceae) and *Kageneckia* spp. (Rosaceae) ..... Sphinia

- Genal processes shorter than vertex along mid-line..... 21

21 Male parameres short and broad; distal segment of aedeagus with short lateral appendages (Fig. 25). On Fabaceae, Asteraceae, Solanaceae, Nolanaceae and Verbenaceae ..... Russelliana*

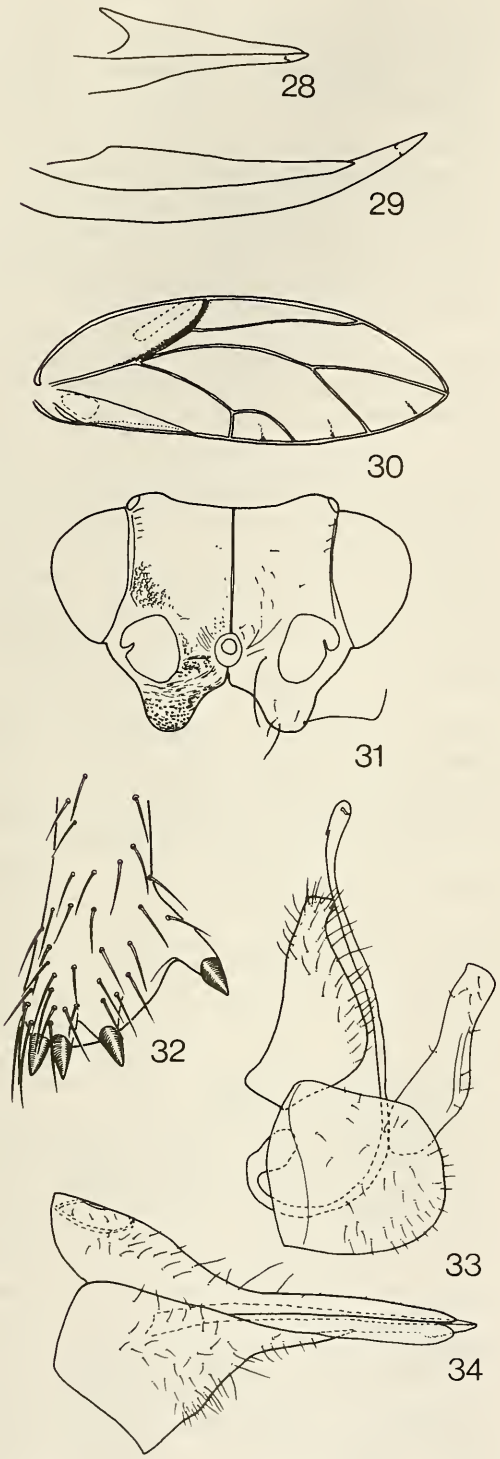
- Male parameres lamellar, slender; distal segment of aedeagus elongate, without or with small appendages in the middle (Figs. 26, 27) 22

22 Male parameres in profile widened in apical half; distal segment of aedeagus without humps in the middle (Fig. 26). Valvulae 2 in female straight (Fig. 28). On *Baccharis* spp. (Asteraceae) ..... Neopelma

- Male parameres in profile tapering towards apex; distal segment of aedeagus with small humps in the middle (Fig. 27). Valvulae 2 in female weakly upturned (Fig. 29)..... *Zonopelma*

23 Forewings with subacute apex and often with characteristic brown or black streak along veins $R+M+Cu_1$, R and R_1; vein $R+M+Cu_1$ not strictly trifurcating (Fig. 30). Head with globular eyes and broadly separated, blunt genal processes (Fig. 31). Metatibiae often with more than 1 outer apical spur. On *Psidium guajava* (Myrtaceae) ..... *Triozoida**

- Forewings usually with strict trifurcation. Head either with strongly adpressed eyes or with subacute conical genal processes. Metatibiae with only 1 outer apical spur 24



Figures 28-34. 28. *Neopelma longiforceps* Burckhardt. 29. *Zonopelma australis* Burckhardt. 30, 31. *Triozoida limbata* (Enderlein). 32. *Egeirotrioza ceardi* (Bergevin), metatibial apex. 33, 34. *Trioza testacea* (Blanchard). 28, 29. Valvulae 2 and 3. 30. Forewing. 31. Head, dorsal view. 33. Male terminalia, in profile. 34. Female terminalia, in profile.

24 Outer apical metatibial spur on a large claw-like tubercle (Fig. 32). On *Populus* spp. (Salicaceae) . . . . . Egeirotrioza*†
- Outer apical metatibial spur not on large claw-like tubercle 25
25 Genal processes shorter than half vertex length 26
- Genal processes longer than half vertex length . . . *Trioza* p.p. 29
26 Metatibiae with 1+3 black apical spurs. Aedeagus long and very slender; apex of distal segment very long and narrow, often with ventral, subapical teeth (Fig. 33). Female terminalia often long and styliform (Fig. 34). On *Baccharis* spp. and other Asteraceae . . . . . *Trioza baccharidis* group
- Metatibiae with 1+2 black apical spurs. Aedeagus not extremely long and slender; apex of distal segment short and broad. Female terminalia never styliform. 27
27 Antennae completely black or, at most, with light segment 3. Polyphagous on herbaceaous plants . . . . . *Trioza nigricornis* group*†
- Antennal segments 3 to 6 light 28
28 Forewings shorter than 2.9 mm. On *Solanum tuberosum, Lycopersicon esculentum* and *Lycium andersoni* (Solanaceae) . . . . . Paratrioza*†
- Forewings longer than 2.9 mm. On Asteraceae . . . . . Trioza *hastata* group
29 Metatibiae with 1+3 black apical spurs; if with only 2 inner spurs then they are separated by more than 1 spur length 30
- Metatibiae with 1+2 black apical spurs, the inner ones separated by less than 1 spur length 31
30 Vein Rs of forewings concavely arched towards fore margin, ending distinctly proximal to line joining apices of vein Rs and Cu_{1a}. On *Citrus* spp. (Rutaceae) . . . . . *T. erytreae* group*†.
- Vein Rs of forewings straight or long, sinuous, ending on or distal to line joining the apices of veins Rs and Cu_{1a}. On *Berberis* spp. (Berberidaceae), Asteraceae and Myrtaceae. . . . . *T. berberidis* group
31 Forewings unevenly rounded apically. On *Ficus carica* (Moraceae) . . . . . *T. buxtoni group*†
- Forewings acute or subacute apically 32
32 Vein M_{1+2} of forewings more than twice the length of vein M_{3+4}; fore margin of forewings strongly arched, hind margin only weakly curved. Male proctiger with large posterior lobes. Female proctiger long. On *Rubus* spp. (Rosaceae) . . . . . *T. trisignata group*†
- Vein M_{1+2} of forewings less than twice as long as M_{3+4}; fore margin of forewings only slightly stronger curved than hind margin. Hind margin of male proctiger weakly produced or straight. Female terminalia short 33
33 Distal segment of aedeagus with two bent tubular processes in the middle. Oligophagous on Chenopodiaceae . . . . . *T. chenopodii* group*
- Distal segment without processes in the middle . . . 34
34 Surface spinules present in all cells of forewings, forming large fields. Oligophagous on Apiaceae . . . . . *T. apicalis* group*†

- Surface spinules largely reduced in apical half of forewings. On Lauraceae ..... *T. ocoteae group*

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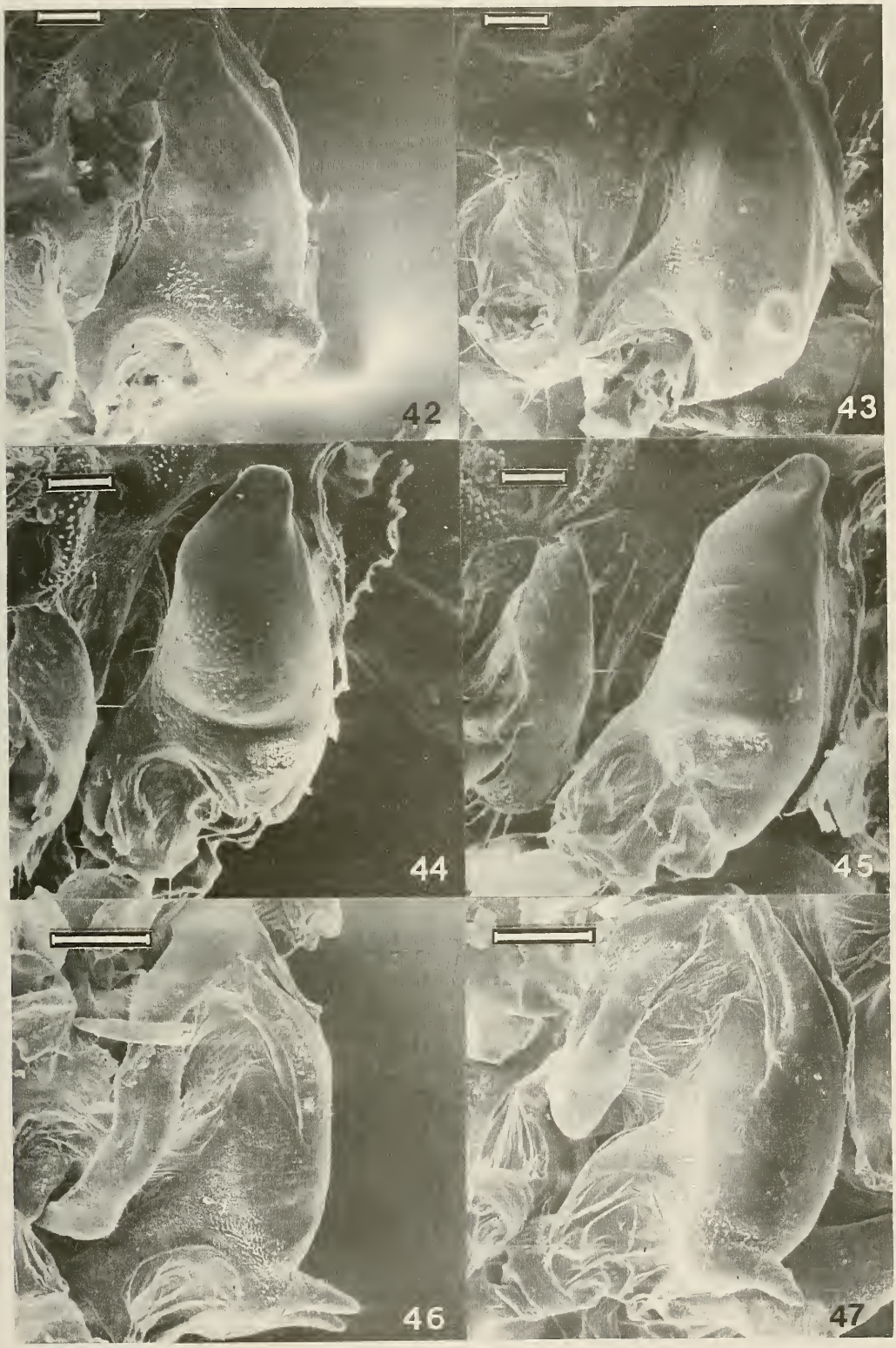
Figures 35-41. 35-37, 41. *Ctenarytaina eucalypti* (Maskell). 38. *Sphinia* sp. 39, 40. *Tainarys sordida* Burckhardt. 35. Antennal segment 10. 36. Mesotibia. 37-39. Head, dorsal view. 40. Male terminalia, in profile. 41. Female terminalia, in profile. Scales in μm: 35: 10; 36: 20; 37-39, 41: 100; 40: 50.



Figures 42-47. Metacoxae. 42, 43. *Ctenarytaina eucalypti* (Maskell). 44, 45. *Tainarys sordida* Burckhardt. 46, 47. *Sphinia* sp. 42, 44, 46. Lateral view. 43, 45, 47. Postero-lateral view. Scales in µm: 42-45: 50; 46, 47: 100.

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TABLE 1
PSYLLID SPECIES DEVELOPING ON SUBTROPICAL AND TEMPERATE CROP PLANTS

Rutaceae: *Citrus* spp.	*Diaphorina* citri Kuwayama	Oriental, Saudi Arabia, Brazil, Honduras
	Trioza erytreae (del Guercio) (*T. erytreae* group)	Afrotropical
Rosaceae: *Pyrus* spp.	*Cacopsylla pyri* (Linnaeus)	Palaearctic
	Cacopsylla pyricola (Förster)	Holarctic, ?Argentina
	Cacopsylla bidens (Šulc)	Europe, Chile
	Cacopsylla permixta Burckhardt & Hodkinson	Middle East
	Cacopsylla fera (Baeva)	Central Asia
	Cacopsylla pyrisuga (Förster)	Palaearctic
Rosaceae: *Malus* spp.	*Cacopsylla mali* (Schmidberger)	Holarctic
	Cacopsylla costalis (Flor)	Europe
Rosaceae: *Prunus* spp.	*Cacopsylla pruni* (Scopoli)	Europe, Middle East
	Psylla trimaculata Crawford	Nearctic
Rosaceae: *Rubus* spp.	*Trioza tripunctata* Fitch (*T. trisignata* group)	Nearctic
	Trioza trisignata Löw (*T. trisignata* group)	Europe
Ericaceae: *Vaccinium* spp.	*Cacopsylla myrtilli* (Wagner)	Holarctic
Moraceae: *Ficus carica*	*Homotoma ficus* (Linnaeus)	Palaearctic
	Trioza buxtoni Laing (*T.buxtoni* group)	Middle East
Oleaceae: *Olea europaea*	*Euphyllura olivina* (Costa)	West Palaearctic
	Euphyllura straminea Loginova	West Palaearctic
	Euphyllura phillyreae Förster	West Palaearctic
Oleaceae: *Fraxinus excelsior*	*Psyllopsis fraxinicola* (Förster)	West Palaearctic, introduced into North America, Australia, Chile (UNCO data)
Lauraceae: *Persea* spp.	*Trioza perseae* Tuthill (*T.ocoteae* group)	Peru
	Trioza anceps Tuthill (*T. ocoteae* group)	Mexico
Lauraceae: *Laurus nobilis*	*Trioza alacris* Flor	originally Palaearctic, now cosmopolitan, Argentina, Brazil, Chile

Myrtaceae: *Psidium guajava*	*Katacephala psidii* (Tuthill)	Peru, Chile (SAGS; MHNG data)
	Triozoida limbata (Enderlein)	Panama, Mexico, Trinidad, Ecuador, Colombia, Brazil, Bolivia, Peru, Chile, Argentina
Myrtaceae: *Eucalyptus* spp	*Ctenarytaina eucalypti* (Maskell)	Australia, Europe, North America, Africa
	Spondyliaspidini gen. spp.	Australia, North America
Fabaceae: *Prosopis* spp.	*Heteropsylla obscura* Muddiman, Hodkinson & Hollis	Peru, Chile
Fabaceae: *Cercis siliquastrum*	*Cacopsylla pulchella* (Löw)	West Palaearctic
Fabaceae: *Acacia* spp.	*Acizzia uncatoides* (Ferris & Klyver)	Australia, New Zealand, Mediterranean, USA, Chile
	Acizzia acaciaebaileyanae (Froggatt)	Australia, New Zealand, Mediterranean
Anacardiaceae: *Schinus molle*	*Calophya schini* Tuthill	Peru, Chile, California, New Zealand
Salicaceae: *Populus* spp.	*Camarotoscena speciosa* (Flor)	Palaearctic
	Egeirotrioza ceardi (Bergevin)	North Africa, Middle East
Solanaceae: *Solanum* spp.	*Paratrioza cockerelli* (Šulc)	North America
	Russelliana solanicola Tuthill	Peru, Bolivia, Chile, Argentina
Solanaceae: *Capsicum* spp.	*Paratrioza cockerelli* (Šulc)	North America
	Russelliana capsici Burckhardt	Argentina, Brazil
Apiaceae: *Daucus carota*	*Trioza apicalis* Förster (*T. apicalis* group)	Palaearctic
oligophagous on Chenopodiaceae	*Trioza chenopodii* Reuter (*T. chenopodii* group)	Palaearctic, Eastern USA (MHNG data), Chile (MHNG data)
polyphagous on herbaceous plants	Trioza nigricornis Förster (T. *nigricornis* group)	Palaearctic
	Trioza tremblayi Wagner (*T. nigricornis* group)	Palaearctic
	Triosa trigonica Hodkinson (*T. nigricornis* group)	Palaearctic