

TAXONOMIC GUIDE TO THE ALATE APHIDS¹ OF INLAND-VALLEY
AND COLORADO-DESERT AGRICULTURE OF SOUTHERN CALIFORNIAReed N. Royalty², Charles A. Farrar, and Thomas M. PerringDepartment of Entomology, University of California
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ABSTRACT

A total of 77 species of alate aphids was collected using three trapping methods at five vegetable growing areas in southern California desert and inland valleys. A dichotomous guide to these alate aphids was written with emphasis on identification using a binocular microscope with magnification no greater than 80X.

RESUMEN

Se colectaron setenta y siete especies de áfidos alados con tres métodos de trapeo en cinco regiones productoras de legumbres en el desierto y valles interiores del sur de California. Se describe una clave para la identificación de las especies considerando las características observables con un microscopio cuyo aumento no es mayor de 80X.

INTRODUCTION

Aphids are among the most important economic pests worldwide, with over 250 species feeding on agricultural crops (Blackman and Eastop 1984). There are two primary ways that aphids damage plants: by direct feeding and by transmitting plant pathogens. Despite the wide variety of aphid species that can be found on a particular host plant, often there are only one or two species that colonize the plant and result in economic loss from direct feeding. It is important to differentiate the non-damaging, transient species, which do not colonize, from those that cause economic damage. Inaccurate identification of aphid species can result in the failure to recognize a pest problem, or in implementing costly control measures where none are necessary. The identification of transient alate aphids also is of primary importance when studying the distribution and spread of aphid-vectored plant pathogens. It is critical to determine the overall species complex in order to determine which species serve as primary inoculators and those that are important in the secondary, intrafield spread.

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In our studies of plant virus epidemiology in southern California, we have been faced with the task of identifying numerous species of alate aphids. Several excellent comprehensive aphid keys and host plant listings have been published (Patch 1938; Palmer 1952; Eastop 1966; Medler and Ghosh 1970; Holman 1974; Smith 1974; Kono and Papp 1977; Taylor 1980; Martin 1983; Blackman and Eastop 1984; Stroyan 1984; Nieto Nafria et al. 1987; Remaudière et al. 1989; Pike et al. 1990; Smith et al. 1992), although inconsistencies among these keys exist. In addition, no key specific to the agricultural regions of the southwestern deserts of the United States has been developed. To resolve the inconsistencies among existing keys and repair the omission of species commonly occurring in this region, we supplemented these comprehensive references with more detailed sources dealing with only one or two genera (Knowlton 1928; Richards 1960; Boudreaux and Tissot 1962; Richards 1965; Hille Ris Lambers 1960, 1966, 1968; Smith and Dillery 1968; Eastop 1971; Miyazaki 1971; Corpus-Raroz and Cook 1974; Smith 1974; Bissell 1978; Eastop 1979; Heie 1980, 1986; Moran 1982; Cook 1984; Robinson 1985, 1986; Blackman 1987; Remaudière and Bahamondes 1987; Stoetzel 1987; Voegtlin and Bridges 1988; Remaudière 1989). In addition, we prepared numerous slide mounts and had several identifications verified by aphid taxonomists (Tokuwo Kono, California Department of Food and Agriculture, Sacramento, CA, and David J. Voegtlin, Department of Entomology, Illinois Natural History Survey, Champaign, IL). These efforts enabled us to develop a dichotomous key to the common alate aphids found in our region. Our goal is to provide an identification tool based on easily recognizable characteristics that could be observed with a dissecting microscope with magnification no greater than 80X.

METHODS AND MATERIALS

Aphids were sampled using three methods. The first method utilized a clear water pan trap, which consisted of rectangular pieces of acrylic plastic glued together to form a 16 cm x 16 cm x 4 cm deep dish (Schultz et al. 1985). The liquid trapping medium was selected because of the ease of collection and to minimize damage to the aphid specimens (Irwin and Goodman 1981). The dish was suspended over the host plant by driving an 80-cm steel rod into the ground next to a plant and clamping a 12-cm iron ring to it. The ring was positioned about 5 cm above the plant and painted brown to match more closely the soil background. The clear dish was placed on top of the ring and filled with a 50% mixture of technical grade ethylene glycol in water; the addition of ethylene glycol slowed evaporation of the liquid (Irwin and Goodman 1981). The contents of the traps were collected weekly, and the aphids were rinsed and stored in 70% ethanol until they were identified and counted. With the clear traps we attempted to obtain an estimate of the numbers and types of aphids that were attracted to the particular host plant over which the traps were placed.

A second trap used was the green tile trap. This trap was constructed in a manner similar to the clear water pan trap, but a 16-cm square piece of lime green ceramic tile was placed in the bottom of the pan (Irwin and Goodman 1981). Green tile traps were placed in a wide variety of locations both within and adjacent to commercial plantings. Contents of green tile water pan traps were collected weekly, and aphids were stored in 70% ethanol until they were identified and counted.

Our third method of aphid sampling was with an aerial net (Castle 1989). This trap consisted of two 50-cm diameter sweep nets mounted horizontally on the ends of a 2-m metal boom. The boom was attached at its center to an electric motor powered by a 1000-watt gasoline

generator. Nets were rotated at 50 rpm at a height of approximately 1.5 m for 15 min each hour from dawn to dusk. At the end of the 15-min period, the nets were stopped and the alate aphids inside were aspirated into a vial and stored in 70% ethanol. Aerial net traps were designed to provide an estimate of alates which were in flight above the crop canopy.

Aphid collection was carried out for over three years in a variety of locations and crops (Table 1). In the spring of 1985 traps were located at the USDA Agricultural Experiment Station in Brawley (Imperial Co.), CA., and at the University of California Desert Research and Experiment Center at Holtville (Imperial Co.), CA. Both of these sites are located in a low elevation Colorado desert growing region. Trapping was continued in the spring of 1986 and from September 1986 through June 1987 at the University of California site. In addition, trapping was expanded to ten sites throughout the Imperial Valley from January through June 1987. No collection occurred in July and August in the desert; extremely high temperatures at that time of year preclude significant aphid activity (Castle 1989). In the summer of 1985 and in 1986 traps were located in three inland valley areas: the Citrus Research Station in Riverside, and near the towns of Hemet and Moreno Valley (Riverside Co.), CA.

Based on the species collected, an identification key was devised. Emphasis was placed on characteristics, some of which are illustrated (Fig. 1a-d), which were readily observable under a dissecting microscope. Synonymy of nomenclature was resolved using Kono and Dickson (1977).

RESULTS AND DISCUSSION

The key (Appendix) that we devised to 77 species of alate aphids (Table 2) was used to identify over 99% of the aphids that were encountered. Since vegetables were the predominant crops grown at the majority of the trap sites in this study, there are likely several aphid species in other agroecosystems that have been omitted. However, we are confident that researchers using this guide will be able to identify correctly the majority of alate aphids found in these other agricultural systems.

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TABLE 1. Locations and Dates of Alate Aphid Traps.

Location	Crop	Sampling Method ¹	Date
Imperial Valley Desert Research and Experiment Center (IVDREC), Holtville	Cantaloupe	a b c	March - May 1985 February - May 1986 January - June 1987
	Alfalfa	b	September 1985 - May 1986
	Asparagus		
	Cantaloupe		
	Carrot		
	Corn		
	Cotton		
	Weeds Wheat		
USDA Desert Agricultural Experiment Station, Brawley	Cantaloupe	a b c	March - May 1985
	Squash		
	Watermelon		
Imperial Valley, eleven sites	Alfalfa	b	January - June 1987
	Artichoke		
	Asparagus		
	Cantaloupe		
	Carrot		
	Corn		
	Cotton		
	Onion		
	Sudan Grass		
	Sugar Beet		
	Tomato		
	Weeds Native Desert Scrub		
Citrus Experiment Station, UC Riverside	Cantaloupe	a	July - October 1985
	Artichoke	b	December 1985 - December 1986
	Asparagus		
	Cabbage		
	Pea		
	Strawberry		
	Sugar Beet Weeds		
Hemet	Watermelon	a b	July - October 1985
Moreno Valley Field Station, Moreno Valley	Watermelon	a b	July - October 1985

¹ a - Clear Water Pan Trap

b - Green Tile Trap

c - Aerial Net

a)

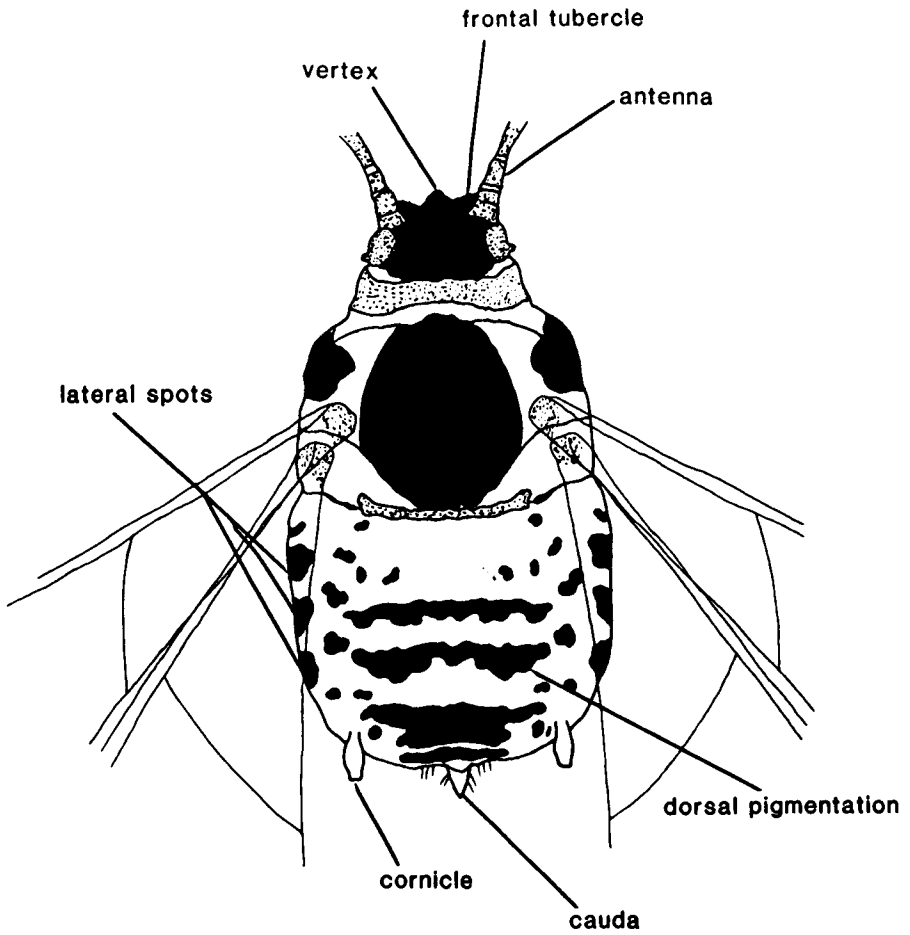


FIG. 1. Morphological characteristics important in alate aphid identification: a) *Brevicoryne brassicae* (Linnaeus) - dorsal view.

b)

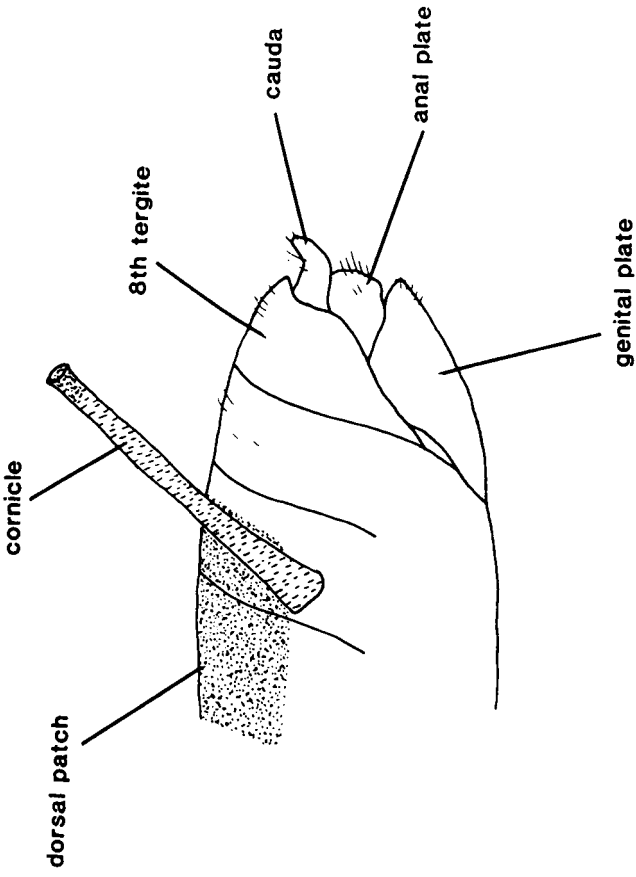


FIG. 1 (cont'd). Morphological characteristics important in alate aphid identification:
b) *Capitophorus eleagni* (del Guercio) - side view of posterior.

c)

antennal segments

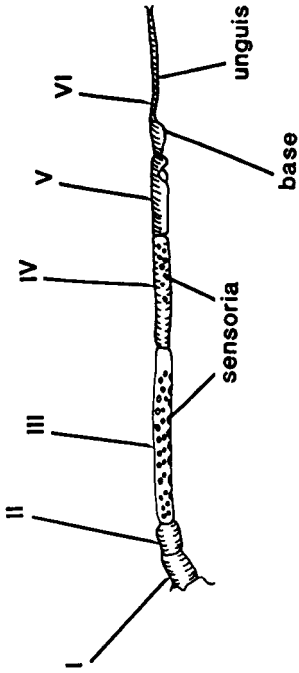


FIG. 1 (cont'd). Morphological characteristics important in alate aphid identification:
c) *Lipaphis erysimi* (Kaltenbach) - antenna.

d)

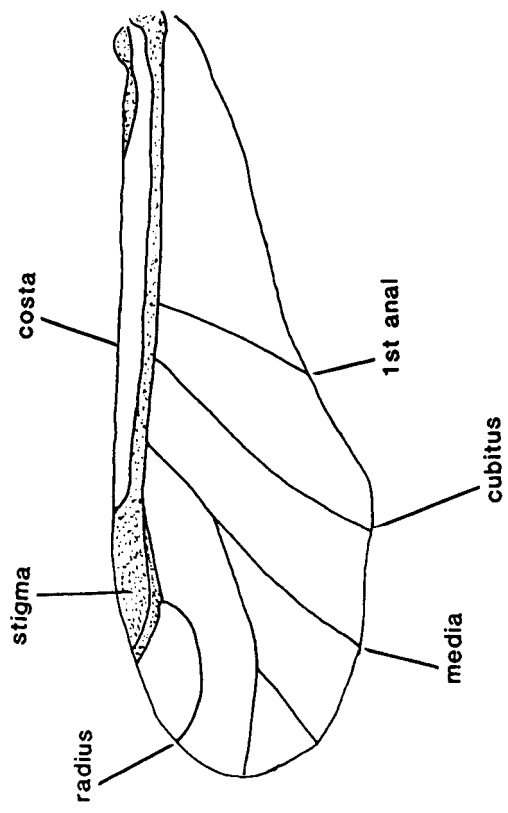


FIG. 1 (cont'd). Morphological characteristics important in alate aphid identification:
d) *Brachycaudus helichrysi* (Kaltenbach) - forewing.

TABLE 2. Alate Aphids Trapped by Water-pan and Aerial-net Traps in the Southern California Agricultural Regions. Names in Bold Print are ESA-approved Common Names (Entomological Society of America 1989).

Species	Common Name
<i>Acyrtosiphon kondoi</i> Shinji	blue alfalfa aphid
<i>Acyrtosiphon pisum</i> (Harris)	pea aphid
<i>Amphorophora agathonica</i> Hottes	large American red-raspberry aphid
<i>Aphis armoraciae</i> Cowen complex	western aster root aphid
<i>Aphis craccivora</i> Koch	cowpea aphid
<i>Aphis fabae</i> Scopoli complex	bean aphid
<i>Aphis forbesi</i> Weed	strawberry root aphid
<i>Aphis helianthi</i> Monell complex	sunflower aphid
<i>Aphis gossypii</i> Glover	melon (cotton) aphid
<i>Aphis lugentis</i> Williams	
<i>Aphis maidiradicis</i> Forbes	corn root aphid
<i>Aphis nasturtii</i> Kaltenbach	buckthorn aphid
<i>Aphis nerii</i> Boyer de Fonscolombe	oleander aphid
<i>Aphis spiraeicola</i> Patch	spirea (green citrus) aphid
<i>Aspidaphis adjuvans</i> (Walker)	armored knotweed aphid
<i>Aulacorthum solani</i> (Kaltenbach)	foxglove aphid
<i>Brachycaudus cardui</i> (Linnaeus)	thistle aphid
<i>Brachycaudus helichrysi</i> (Kaltenbach)	plum leaf-curl aphid
<i>Brachycaudus rumexicolons</i> (Patch)	
<i>Brachycaudus schwartzi</i> (Börner)	peach aphid
<i>Brachycorynella asparagi</i> (Mordvilko)	asparagus aphid
<i>Brachyunguis tetrapteralis</i> (Cockerell)	saltbush aphid
<i>Brevicoryne brassicae</i> (Linnaeus)	cabbage aphid
<i>Capitophorus eleagni</i> (del Guercio)	artichoke aphid
<i>Capitophorus hippophaes</i> (Walker)	polygonum aphid
<i>Cavariella aegopodii</i> (Scopoli)	willow-carrot aphid
<i>Chaitophorus populifolii</i> (Essig)	clear-winged cottonwood leaf aphid
<i>Cinara tujafilina</i> (Del Guercio)	arborvitae aphid
<i>Drepanaphis acerfoliae</i> (Thomas)	painted maple aphid
<i>Drepanaphis parva</i> Smith	
<i>Dysaphis plantaginea</i> (Passerini)	rosy apple aphid
<i>Dysaphis tulipae</i> (Boyer de Fonscolombe)	tulip bulb aphid
<i>Essigella californica</i> (Essig)	Monterey pine aphid
<i>Eucarazzia elegans</i> (Ferrari)	mint aphid
<i>Hayhurstia atriplicis</i> (Linnaeus)	boat gall aphid
<i>Hyadaphis foeniculi</i> (Passerini)	honeysuckle-parsnip aphid
<i>Hyalopterus pruni</i> (Geoffroy)	mealy plum aphid
<i>Hyperomyzus lactucae</i> (Linnaeus)	sowthistle aphid
<i>Hysteroneura setariae</i> (Thomas)	rusty plum aphid
<i>Illinoia liriodendri</i> (Monell)	tuliptree aphid
<i>Lipaphis erysimi</i> (Kaltenbach)	turnip aphid
<i>Macrosiphum euphorbiae</i> (Thomas) complex	potato aphid
<i>Macrosiphum rosae</i> (Linnaeus)	rose aphid
<i>Melanocallis caryaefoliae</i> (Davis)	black pecan aphid
<i>Metopolophium dirhodum</i> (Walker)	rose-grain aphid
<i>Monellia caryella</i> (Fitch)	blackmargined aphid
<i>Myzocallis punctatus</i> (Monell)	dusky-winged oak aphid
<i>Myzus ornatus</i> Laing	ornate aphid

Species	Common Name
<i>Myzus persicae</i> (Sulzer) complex	green peach aphid
<i>Nearctaphis bakeri</i> (Cowen)	clover aphid
<i>Pemphigus</i> sp.	
<i>Periphyllus salicicorticis</i> (Essig)	
<i>Prociphilus fraxinifolii</i> (Riley)	leaf-curl ash aphid
<i>Pterocomma smithiae</i> (Monell)	black willow aphid
<i>Rhopalosiphoninus staphyleae</i> (Koch)	mangold aphid
<i>Rhopalosiphum maidis</i> (Fitch)	corn leaf aphid
<i>Rhopalosiphum musae</i> (Schoudeten)	
<i>Rhopalosiphum nymphaeae</i> (Linnaeus)	waterlily aphid
<i>Rhopalosiphum padi</i> (Linnaeus)	bird cherry-oat aphid
<i>Rhopalosiphum rufiabdominalis</i> (Sasaki)	rice root aphid
<i>Schizaphis graminum</i> (Rondani)	greenbug
<i>Sipha flava</i> (Forbes)	yellow sugarcane aphid
<i>Sipha glyceriae</i> (Kaltenbach)	
<i>Sitobion avenae</i> (Fabricius)	English grain aphid
<i>Sitobion fragariae</i> (Walker)	blackberry-cereal aphid
<i>Tetraneura</i> nr. <i>nigriabdominalis</i> (Sasaki)	
<i>Therioaphis riehmi</i> (Börner)	sweetclover aphid
<i>Therioaphis trifolii</i> (Monell)	yellow clover aphid
<i>Tinocallis kahawaluokalani</i> (Kirkaldy)	crapemyrtle aphid
<i>Tinocallis ulmifolii</i> (Monell)	elm leaf aphid
<i>Toxoptera aurantii</i> (Boyer de Fonscolombe)	black citrus aphid
<i>Tuberculatus californicus</i> (Baker)	
<i>Tuberculatus maureri</i> (Swain)	
<i>Uroleucon ambrosiae</i> (Thomas)	brown ambrosia aphid
<i>Uroleucon erigeronensis</i> (Thomas) complex	Canadian fleabane aphid
<i>Uroleucon taraxaci</i> (Kaltenbach)	dark dandelion aphid
<i>Wahlgreniella nervata</i> (Gillette)	rose-bearberry aphid

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APPENDIX

Dichotomous Guide to the Alate Aphids of the Inland-valley
and Colorado-desert Agriculture Areas of Southern California

- 1 Cauda semilunar, shorter than broad; cornicle reduced or porelike; medial vein of forewing simple, or infrequently once branched, not extending completely from the wing edge to the costal vein; secondary sensoria on antennae transverse or annular; unguis of ultimate antennal segment reduced, much shorter than the base 2
- Cauda usually elongate, as long as broad or longer; cornicle well developed, sometimes a truncated cone, rarely porelike; medial vein of forewing twice-branched, or infrequently once-branched, extending from the wing edge to the costal vein; secondary sensoria on antennae round or ovoid if present; unguis of ultimate antennal segment usually 0.5 times as long as the base or longer 6
- 2 (1) Body and appendages with long fine setae; radial sector of forewing straight; secondary sensoria on antennae annular; rostrum attaining 3rd coxae 3
- Body and appendages with short setae; radial sector of forewing curved; secondary sensoria on antennae transverse; rostrum not attaining 2nd coxae 4
- 3 (2) Rostrum obtuse; body opaque or pale, flattened dorsoventrally; antennae 5-segmented with sparse setation; medial vein of forewing once-branched; cornicle porelike; dorsum of head with setae only near vertex; hind tibia 1.8-2 times longer than foretibia; antennal segment III with 2-3 secondary sensoria *Essigella californica*
- Rostrum acute; body tan or brown, large and round; six-segmented antennae with numerous long setae and no secondary sensoria; cornicle mammiform, bearing setae; dorsum of head with numerous setae; hind tibia 1.5 times length of foretibia or greater *Cinara tujafilina*
- 4 (2) Antennal segment V longer than IV; anal plate with 4 stout setae, numerous smaller setae; radial sector and cubital and medial veins of hindwing arising from different loci, not pigmented, nearly invisible; antennal segments III-V with numerous secondary sensoria *Tetraneura nr. nigriabdominalis*
- Antennal segment V not longer than IV; radial sector and cubital and medial veins of hindwing arising from same locus, pigmented and apparent 5
- 5 (4) Rostral IV + V obtuse, as broad as long; cornicle ringlike; wax glands not present on thorax; cauda with 2-4 pairs of setae; antennal segment III with 8-10 secondary sensoria; antennal segments IV-V with 2-5 secondary sensoria, occasionally 2-5 on VI *Pemphigus* sp.
- Rostral IV + V longer than broad; cornicle absent; wax glands present on thorax; cauda with 2 pairs of setae; antennal segment III with 7 or fewer secondary sensoria; no secondary sensoria on antennal segments IV-VI *Prociphilus fraxinifolii*
- 6 (1) Cauda semilunar (wider than long) or with a distinct knob; cornicle truncated cone, rarely porelike, if elongate then cauda knobbed; anal plate variable 7

- Cornicle elongate, or if truncated cone then cauda usually much longer than cornicle; cauda never distinctly knobbed, as long as wide or longer; anal plate simple 22
- 7 (6) Body and appendages with long spiny setae; anal plate simple or emarginate; dorsum of abdomen without prominent tubercles 8
- Body and appendages without long setae; anal plate bilobed; dorsum often with prominent tubercles 12
- 8 (7) Cauda semilunar 9
- Cauda knobbed 10
- 9 (8) Cornicle elongate and swollen with a flange, bright yellow; antennal segment III with 15 or more secondary sensoria; rostrum obtuse, surpassing 2nd coxae; setae on the antennae, cauda, and dorsum of abdomen numerous and longer than width of antennal segment III; body blue-brown; unguis of antennal segment VI 1-1.5 times as long as the base *Pterocomma smithiae*
- Cornicle a truncated cone; antennal segment III with 9-12 secondary sensoria; rostrum acute, surpassing 3rd coxae; antennae and cauda with numerous long setae; dorsal abdominal setae prominent but not dense, subequal to diameter of antennal segment III; head and thorax dark brown to black, abdomen and cornicle dusky or yellow; unguis of antennal segment VI subequal in length to the base *Periphylus salicicorticis*
- 10 (8) Antennae six-segmented; rostrum attaining 1st coxae or longer; ocular tubercle present; body not flattened dorsoventrally; frons rounded; setae on appendages long; dorsum of abdomen with dusky dashes; unguis of antennal segment VI more than twice the length of the base; antennal segment III with 8-11 secondary sensoria ..
..... *Chaitophorus populifolii*
- Antennae five-segmented; rostrum very short, not attaining 1st coxae; ocular tubercle absent; body flattened dorsoventrally; frons flat; setae on appendages short; unguis of antennal segment VI twice the length of the base or less; antennal segment III with 4-5 secondary sensoria 11
- 11 (10) Thorax yellow and smooth; unguis of antennal segment V twice as long as the base *Sipha flava*
- Thorax cinnamon or green, denticulate; unguis of antennal segment V subequal to or slightly longer than the base .. *Sipha glyceriae*
- 12 (7) Cornicle porelike; body pale with black abdominal margins; body flattened dorsoventrally; dorsal tubercles on abdomen inconspicuous; stigma and costal margin of forewing black; distal tips of antennal segments dark; antennal segment III with 6-7 secondary sensoria; unguis of antennal segment VI subequal to the base *Monellia caryella*
- Cornicle often truncated cone, if not truncated then stout at base and curved with a distinct flange; body not flattened dorsoventrally; dorsal tubercles on abdomen usually prominent; other characters variable 13
- 13 (12) Dorsal tubercles on abdomen prominent; at least one pair on abdomen subequal to or longer than the cornicle 14
- Dorsal tubercles on abdomen inconspicuous or absent; if present, then much shorter than the cornicle 20
- 14 (13) Dorsal tubercles on thorax prominent 15
- Dorsal tubercles on thorax inconspicuous or absent 17

- 15 (14) Thorax dark brown; abdomen mottled brown; dorsal tubercles on the 2nd abdominal segment fused medially near the apices to form a saddle-shaped ridge; prominent dark lateral tubercles on abdominal segments II-V; unguis of antennal segment VI subequal to the length of the base; antennal segment III with 3-6 secondary sensoria ***Melanocallis caryaefoliae***
- Thorax and abdomen pale to light brown; dorsal tubercles on 2nd abdominal segment separate or fused near base; lateral tubercles on abdominal segments II-V pale and inconspicuous; antennal segment III with 6-12 secondary sensoria 16
- 16 (15) Body tan or light brown; wing veins dark, especially at vein apices; dorsal tubercles on thorax and 1st and 2nd abdominal segments subequal in length; antennal segment III with 6-7 secondary sensoria; unguis of antennal segment VI subequal to the length of the base ***Tuberculatus californicus***
- Body pale to yellow; wing veins hyaline or slightly darkened at vein apices; dorsal tubercles on 2nd abdominal segment longer than thoracic or 1st abdominal dorsal pairs; antennal segment III with 9-12 secondary sensoria; unguis of antennal segment VI 5 times the length of the base ***Tuberculatus maureri***
- 17 (14) Cornicle a truncated cone, flange indistinct; radial vein of the forewing faint; unguis of antennal segment VI subequal to the base; dorsum of the abdomen spotted; antennal segment III with 7-9 secondary sensoria 18
- Cornicle longer than the width of the base, curved, and base strongly swollen, distinct flange present; radial vein of the forewing distinct; unguis of antennal segment VI much longer than the base; dorsum of the abdomen without spots; antennal segment III with 9 or more secondary sensoria 19
- 18 (17) Head and thorax dark; forewing clouded; dorsal abdominal tubercles on abdominal segment II fused medially near the apices to form a saddle shaped ridge, longer and stouter than those on I; tubercles on abdominal segment I longer than those on III and IV ***Tinocallis kahawaluokalani***
- Head and thorax dusky; forewing lightly pigmented; paired dorsal tubercles on abdominal segment II fused at base or not at all, subequal to those on I in length and width, longer and stouter than those on III and IV; tubercles on abdominal segment III often inconspicuous or absent ***Tinocallis ulmifolii***
- 19 (17) Wing veins heavily pigmented; 1st and 3rd pairs of dorsal abdominal tubercles longer than the 2nd pair; setae on tips of dorsal tubercles blunt; antennal segment III with 9-11 secondary sensoria; unguis of antennal segment VI 6 times as long as the base ***Drepanaphis acerfoliae***
- Wing veins hyaline; 1st and 2nd pair of dorsal tubercles equal in length, shorter than the 3rd pair and equal to or longer than the 4th pair; setae on tips of dorsal tubercles pointed; antennal segment III with 12-15 secondary sensoria; unguis of antennal segment VI 9 times as long as the base ***Drepanaphis parva***
- 20 (13) Body light brown; dorsum of abdomen with dashes or broken bands; wing veins dark with interveinal areas cloudy; radial vein distinct; 3-4 round secondary sensoria on antennal segment III; antennal segments I, II, VI, and distal tips of IV and V dark; dorsum of abdomen without noticeable tubercles; unguis of antennal segment VI longer than the base ... ***Myzocallis punctatus***

- Body dusky; dorsum of abdomen spotted; wing veins darkened but with no cloudiness between veins; radial vein faint; 4-6 ovoid secondary sensoria on antennal segment III; antennal segments dusky at the tips; small dorsal tubercles on abdominal segments 1-4, apices of tubercles with blunt setae; unguis of antennal segment VI subequal in length to the base 21
- 21 (20) Abdomen with medial, pleural, and marginal sclerites; medial sclerites paired (four in all, one pair on either side of the midline) and sometimes coalesced, with blunt, conspicuous setae .
..... ***Therioaphis trifolii***
- Abdomen with medial and marginal but no pleural sclerites; medial sclerites unpaired (one unpaired seta on either side of the midline), with setae pointed and inconspicuous
..... ***Therioaphis riehmi***
- 22 (6) Cornicle 8 times longer than width at base or longer; lateral tubercles not present on abdominal segments I and VII; frontal tubercles usually exceeding vertex 23
- Cornicle 7 times longer than width at base or shorter; lateral tubercles present on abdominal segments I and VII; frontal tubercles inconspicuous, seldom exceeding vertex 46
- 23 (22) Distal half of cornicle strongly swollen, 2 or more times the width of the base 24
- Distal half of cornicle not strongly swollen 29
- 24 (23) Abdomen pale, dorsal patch absent; antennal segment III with 8-15 secondary sensoria a row; 1st anal vein of forewing heavily lined, much darker than other wing veins; cornicle pale proximally, dusky distally; frontal tubercles diverging; unguis of antennal segment VI 7-8 times the length of the base
..... ***Wahlgreniella nervata***
- Abdomen with a dusky to dark dorsal patch; antennal segment III with 15 or more secondary sensoria; 1st anal vein of forewing not darker than the other wing veins; other characters variable .. 25
- 25 (24) VIII abdominal tergite with a small tubercle above cauda; dorsal patch dusky; antennal segment III with 15-20 prominent secondary sensoria; no secondary sensoria on antennal segments IV or V; unguis of antennal segment VI 1-1.5 times as long as the base
..... ***Cavariella aegopodii***
- VIII abdominal tergite without a small tubercle above cauda; dorsal patch dusky or dark brown to black; unguis of antennal segment VI 6-7 times as long as the base 26
- 26 (25) Dorsal patch square, usually dusky; antennal segment III with 20-30 small secondary sensoria; antennal segments IV and V with 12-15 and 3-4 secondary sensoria, respectively
..... ***Capitophorus hippophaes***
- Dorsal patch irregular, dark brown to black; other characters variable 27
- 27 (26) Abdomen dark with large black patch; cauda very short and tapering, nearly triangular; proximal half of cornicle black, distal half dusky to dark; antennal segment III with 11-18 secondary sensoria; frontal tubercles converging
..... ***Rhopalosiphoninus staphyleae***
- Abdominal area surrounding patch dusky to brown, patch dark brown; cauda tongue-shaped; frontal tubercles diverging 28

- 28 (27) Wing veins dark and bordered, tips of veins dusky; cauda short, hardly extending beyond anal plate; antennal segments III and IV with 15-25 and 6-8 secondary sensoria, respectively; no secondary sensoria on antennal segment V; cornicle longer than antennal segment III; hind tibia pale to dusky, noticeably darker at tip ***Eucrazzia elegans***
- Wing veins dark but not heavily bordered; cauda extending well beyond anal plate; antennal segments III, IV, and V with 40-50, 10-20, and 0-8 secondary sensoria, respectively; cornicle shorter than antennal segment III; hind tibia dusky, brown at the tips ***Hyperomyzus lactucae***
- 29 (23) Abdomen with a dorsal patch **30**
- Abdomen without a dorsal patch; pigmentation present as spots, bands, or absent **33**
- 30 (29) Frontal tubercles diverging; antennal segment I swollen medially and distally into knob; cornicle curved inward slightly towards the medial line; cauda tapering, nearly triangular; dorsal patch usually entire; setae distinctly capitate; unguis of antennal segment VI 7 times the length of the base; antennal segment III with 20 or more secondary sensoria; secondary sensoria present on antennal segments IV and V **31**
- Frontal tubercles converging; antennal segment I not swollen distally; cornicle usually curved outward, slightly away from medial line; cauda elongate; dorsal patch usually broken; setae blunt but not distinctly capitate; unguis of antennal segment VI 3-5 times the length of the base; antennal segment III with 10-16 secondary sensoria; no secondary sensoria on antennal segments IV and V **32**
- 31 (30) Cornicle swollen, distal half slightly dusky; cauda with 4 pairs of setae; antennal segments III, IV, and V with 20-30, 12-15, and 3-4 secondary sensoria, respectively; cornicle subequal in length to antennal segment III ***Capitophorus hippophaes***
- Cornicle cylindrical or only slightly swollen, dusky only at tips; cauda with 2-3 pairs of setae; antennal segments III, IV, and V with 35-40, 19-30, and 9-12 secondary sensoria, respectively; cornicle longer than antennal segment III ***Capitophorus eleagni***
- 32 (30) Cornicle noticeably shorter than antennal segment III, nearly cylindrical; dorsal pigmentation extending over entire abdomen, often forming segmental bands; tibia I dusky to dark brown; unguis of antennal segment VI less than 3 times the length of the base ***Myzus ornatus***
- Cornicle subequal to or longer than antennal segment III, slightly swollen; dorsal pigmentation restricted to posterior of abdomen, usually as a dark patch; tibia I dusky to light brown; unguis of antennal segment VI at least 3 times as long as the base ***Myzus persicae* complex**
- 33 (29) Cornicle reticulated, stout and cylindrical in appearance, distal half dark brown to black; body reddish brown to brown **34**
- Cornicle not reticulated, slender or mildly clavate in appearance, black only at tips or not at all; body and legs pale to light brown **40**
- 34 (33) Tibiae dusky to dark; rostrum reaching or surpassing 2nd coxae; segment IV + V of rostrum 2.5 times as long as wide or longer; reticulation on distal portion of the cornicle exceeds one third the entire length; diameter of the distal portion of the cornicle spanning 7-11 reticulated hexes; setae on the dorsum of the abdomen apparent, often arising from dark sclerites **35**

- Tibiae pale, except at the tips; rostrum rarely surpassing 2nd coxae; segment IV + V of the rostrum less than 2.5 times as long as wide; reticulation on the cornicle restricted to the distal fourth; diameter of the distal portion of the cornicle less than 7 reticulated hexes; setae on the dorsum of the abdomen not apparent 37
- 35 (34) Proximal fifth of cornicle dusky instead of black; cauda with 4 pairs of lateral setae and 2 short capitate setae at the tip; rostrum pale except at tip; unguis of antennal segment VI shorter than III; antennal segment III usually with less than 30 secondary sensoria *Uroleucon erigeronensis* complex
- Entire cornicle black; cauda with no capitate setae at the tip; rostrum IV + V black; unguis of antennal segment VI longer than III; antennal segment III with more than 30 secondary sensoria ..
..... 36
- 36 (35) Cornicle 2-2.5 times the length of the cauda; cauda dark with a slight neck and with 3-5 pairs of setae; dorsum of the abdomen with distinct black spots and setae; antennal segment III with more than 45 secondary sensoria *Uroleucon taraxaci*
- Cornicle 1.5-2 times as long as the cauda; cauda tapering with 6-7 pairs of setae; spots and setae on the dorsum of the abdomen faint or lacking; antennal segment III with less than 40 secondary sensoria *Uroleucon ambrosiae*
- 37 (34) Cornicle subequal to or shorter than antennal segment III, slightly swollen and with 5-12 secondary sensoria in a row; frontal tubercles not exceeding or barely attaining vertex ... 38
- Cornicle equal in length or longer than antennal segment III, cylindrical, and with more than 11 secondary sensoria; frontal tubercles exceeding vertex 39
- 38 (37) Cornicle less than twice as long as the cauda ... *Sitobion avenae*
- Cornicle 2-2.5 times as long as the cauda ... *Sitobion fragariae*
- 39 (37) Cornicle entirely black, longer than antennal segment III; body reddish; distal third of femora dark; antennal segment III with 40 or more secondary sensoria, not in a row ... *Macrosiphum rosae*
- Cornicle pale proximally and black distally, as long as antennal segment III; body dusky; femora dark only at tips; antennal segment III pale proximally and with 11-18 secondary sensoria in a row *Macrosiphum euphorbiae* complex
- 40 (33) Dorsum of the abdomen with dusky bands; frontal tubercles parallel-sided; cornicle with a broad flange, pale with the tip black; antennal segment III with 9-12 secondary sensoria in a line; unguis of antennal segment VI 5-6 times the length of the base *Aulacorthum solani*
- Dorsum of the abdomen pale or with spots; frontal tubercles diverging; other characters variable 41
- 41 (40) Cornicle distinctly swollen proximally to medially, narrowing distally; dorsum of the abdomen with 2 rows of dark lateral spots; antennal segment I dark medially; antennal segment III pale proximally and dusky to dark distally, with 10-13 secondary sensoria; unguis of antennal segment VI 8 times the length of the base *Illinoia liriiodendri*
- Cornicle slightly swollen distally to cylindrical; dorsum of the abdomen without spots; other characters variable 42

- 42 (41) Tibia III distinctly longer than body; distal half of cornicle swollen; unguis of antennal segment VI 7-8 times the length of the base 43
- Tibia III not distinctly longer than body; cornicle nearly cylindrical; unguis of antennal segment VI 3-5 times the length of the base 44
- 43 (42) Antennal segment III with 8-15 secondary sensoria in a row; distal half of the cornicle slightly to moderately swollen; 1st anal vein of forewing darker than other veins; mesosternal furca absent *Wahlgreniella nervata*
- Antennal segment III with more than 40 secondary sensoria, not in a row; cornicles slightly swollen or cylindrical; 1st anal vein of the forewing only slightly darker than the other veins; mesosternal furca present *Amphorophora agathonica*
- 44 (42) Cauda with 4 pairs of lateral setae; antennal segment II with 18-25 secondary sensoria; cauda nearly parallel-sided, sometimes blunt at tip; hind tarsi longer than the base of antennal segment VI; body light brown; unguis of antennal segment VI 3-4 times the length of the base *Metopolophium dirhodum*
- Cauda with 3-5 pairs of lateral setae; antennal segment III with 6-11 secondary sensoria; cauda tapering; hind tarsi shorter than the base of antennal segment VI; body pale to light brown; unguis of antennal segment VI 4-5 times the length of the base 45
- 45 (44) Thorax pale to light brown, antennal segment III and sometimes IV and V with a black band at the tip (dark at joints); unguis of antennal segment VI twice the length of the base; very large body; cauda with 3-5 pairs of lateral setae; distal half of cornicle gradually darkening *Acyrtosiphon pisum*
- Thorax brown, antennal segment III pale proximally, gradually shading to brown distally; unguis of antennal segment VI 1.5 times the length of the base; cauda with 3 pairs of lateral setae; cornicle dark at tips only *Acyrtosiphon kondoi*
- 46 (22) Cornicle reduced to a truncated cone, nearly as broad as long ... 47
- Cornicle at least 2 times as long as broad 49
- 47 (46) Dorsum of the abdomen with a square sclerotic black patch; body dark; cauda short, rounded; antennal segment III with 5-8 secondary sensoria in a line; unguis of antennal segment VI 2.5-3 times the length of the base *Brachycaudus rumexicolens*
- Dorsum of the abdomen without a sclerotic black patch; body tan to dusky; cauda elongate, parallel-sided or tapering; unguis of antennal segment VI less than twice the length of the base ... 48
- 48 (47) Unguis of antennal segment VI 1.5-2 times the length of the base; cauda 3 times as long as wide and tapering; antennal segment III with 5-7 secondary sensoria *Brachycorynella asparagi*
- Unguis of antennal segment VI one half the length of the base or less; cauda than 2 times as long as wide; antennal segment III with 3-6 secondary sensoria *Brachyunguis tetrapteraleis*
- 49 (46) Cornicle slightly or moderately swollen; cauda with 2-3 pairs of lateral setae 50
- Cornicle nearly cylindrical or tapering; setae on cauda variable 62

- 50 (49) Antenna five-segmented; VIII abdominal tergite forming an armored spine above the cauda; cornicle tiny, lying along side the abdomen; ocular tubercle absent; antennal segment III with 3-5 secondary sensoria; unguis of antennal segment VI 1.5-2 times the length of the base *Aspidaphis adjuvans*
- Antenna six-segmented; no spine above the cauda; ocular tubercle present 51
- 51 (50) Cornicle distinctly swollen; cauda triangular; bands on abdominal tergites VII and VIII dusky to brown 52
- Cornicle not strongly swollen; cauda usually tongue-shaped or rounded, if triangular, then cornicle nearly cylindrical and the dorsum of the abdomen with a black patch; bands on abdominal tergites VII and VIII brown to dark brown 53
- 52 (51) Cornicle fusiform, without a distinct flange; cauda and cornicle pale to dusky; thorax dusky to brown; antennal segment III with numerous secondary sensoria; no secondary sensoria on antennal segment IV; unguis 4-5 times the length of the base *Brevicoryne brassicae*
- Cauda and cornicle dark brown to black; thorax brown to black; antennal segments III and IV with numerous secondary sensoria; unguis of antennal segment VI 3-4 times the length of the base ..
..... *Hyadaphis foeniculi*
- 53 (51) Cornicle shorter than the cauda 54
- Cornicle longer than the cauda 55
- 54 (53) Body orange-yellow; rostrum short, barely surpassing the 1st coxae, segments IV + V as long as wide; antennal segments III, IV, and V with 25-30, 5-10, and 0-4 secondary sensoria, respectively; cauda with 3 pairs of setae; unguis of antennal segment VI 4 times the length of the base *Hyalopterus pruni*
- Head and thorax dark brown; rostrum attaining 2nd coxae, ultimate segment 1.5-2 times as long as wide; no secondary sensoria on antennal segments IV and V; antennal segment III with 12-15 secondary sensoria; cauda with 2 pairs of setae, unguis of antennal segment VI 3 times the length of base *Hayhurstia atriplicis*
- 55 (53) Cornicle dusky to light brown; 2nd branch of the medial vein of the forewing forming an equilateral triangle at the wing tip; antennal segments III and IV with 20-25 and 5-7 secondary sensoria, respectively; unguis of antennal segment VI 2 times as long as the base *Lipaphis erysimi*
- Cornicle dark brown or black; 2nd branch of the medial vein of the forewing variable, sometimes missing; unguis of antennal segment VI 2.5 times the length of the base or longer 56
- 56 (55) 2nd branch of the medial vein of the forewing often near tip of wing or absent, if normal than rostrum never attaining 2nd coxae; dorsum of the abdomen with black bands or lateral spots but never with a dark dorsal patch; abdominal segments VII and VIII without dorsal tubercles; cauda tongue-shaped; antennal segment III with less than 25 secondary sensoria 57
- 2nd branch of the medial vein of the forewing normal, never near tip of wing or absent; dorsum of the abdomen with a dark dorsal patch; abdominal segments VII and VIII with small dorsal tubercles; cauda triangular, partially covered by the anal and genital plates; antennal segment III with more than 25 secondary sensoria 61

- 57 (56) Unguis of antennal segment VI 3 times as long as the base of VI or longer; 2nd branch of the medial vein of the forewing near tip of wing or absent; rostrum nearly attaining 2nd coxae or longer; maculation usually horseshoe-shaped, rarely completely encircling the cornicle anteriorly 58
- Unguis of antennal segment VI less than 3 times the length of the base; 2nd branch of the medial vein of the forewing normal; antennal segment III with 12-15 secondary sensoria; rostrum very short, barely exceeding 1st coxae; maculation usually encircling the cornicle; cauda with 2 pairs of lateral setae *Rhopalosiphum maidis*
- 58 (57) Setae on legs and antennae 2 times as long as the diameters of their respective appendages or longer; rostrum attaining the 3rd coxae; antennal segments III and IV often coalesced, with 12-15 and 7-8 secondary sensoria, respectively; antennal segment V with 2-4 secondary sensoria; unguis of antennal segment VI 6 times the length of the base *Rhopalosiphum rufiabdominalis*
- Setae on legs and antennae subequal in length to the diameters of their respective appendages; rostrum attaining only the 2nd coxae; antennal segments III and IV never coalesced; no secondary sensoria on antennal segment V; unguis of antennal segment VI 3-5 times the length of the base 59
- 59 (58) Unguis of antennal segment VI 5 times as long as the base; 2nd branch of the medial vein of the forewing near wing tip or absent; antennal segments III and IV with 16-20 and 2-6 secondary sensoria, respectively *Rhopalosiphum padi*
- Unguis of antennal segment VI 3-4 times as long as the base; 2nd branch of the medial vein of the forewing 0.25 times the distance from the wing margin to the first branch of the vein; antennal segment III with 10-25 secondary sensoria 60
- 60 (59) Imbrications on the cornicle faint; cornicle appearing smooth, twice the length of the cauda and with the swelling on the distal half pronounced, proximal half thin, not swollen; 0-2 secondary sensoria on antennal segment IV; unguis of antennal segment VI 3-3.5 times the length of the base; maculation reduced, restricted to area posterior to the cornicle; pigmentation dusky to light brown *Rhopalosiphum nymphaeae*
- Imbrications on the cornicle apparent; cornicle 1.5 times the length of the cauda and slightly swollen; 5-6 secondary sensoria on antennal segment IV; unguis of antennal segment VI 3.5-4 times the length of the base; maculation horseshoe-shaped; pigmentation usually dark brown *Rhopalosiphum musae*
- 61 (56) Cornicle twice as long or longer than hind tarsi, flange distinct; antennae subequal to or longer than body; antennal segments III, IV, and V with 40-60, 20-30, and 4-6 secondary sensoria, respectively; unguis of antennal segment VI 4 times as long or longer than base; tibiae dusky to tan, distinctly lighter in color than distal halves of femora; rostrum not attaining 2nd coxae *Dysaphis plantaginea*
- Cornicle slightly longer than hind tarsi, flange indistinct; antennae distinctly shorter than body; antennal segments III, IV, and V with 35-50, 5-10, and 2-4 secondary sensoria, respectively; unguis of antennal segment VI 3 times as long as base; tibiae tan to light brown, slightly lighter in color than distal halves of femora; rostrum attaining 2nd coxae *Dysaphis tulipae*
- 62 (49) Cornicle short, 3 times as long as wide or shorter; dorsum of the abdomen with a distinct dark patch; cauda with 3 pairs of lateral setae 63

Cornicle greater than 3 times as long as wide; pigmentation on the dorsum of the abdomen varied; setae on cauda variable 67

- 63 (62) Cornicle distinctly imbricated, 2.5-3 times as long as wide; rostrum not attaining 2nd coxae; antennal segments III and IV with 22-30 and 2-9 secondary sensoria, respectively; unguis of antennal segment VI 2.5 times the length of the base; cauda triangular; rostral segments IV + V subequal in length to hind tarsi ***Nearctaphis bakeri***

Cornicle smooth, imbrications faint if present; rostrum nearly attaining or exceeding 2nd coxae; cauda short but not triangular; rostral segments IV + V longer than the hind tarsi 64

- 64 (63) Cornicle 1-2 times as long as wide, flange indistinct; antennal segment III with 5-8 secondary sensoria in a line; unguis of antennal segment VI 2-2.5 times the length of the base ***Brachycaudus rumexicolens***

Cornicle 2-3 times as long as wide, flange distinct; antennal segment III with 12 or more secondary sensoria; unguis of antennal segment VI 3-4 times the length of the base 65

- 65 (64) Cornicle and rostral segment IV + V distinctly attaining 3rd coxae; antennal segment III with 16-20 secondary sensoria; no secondary sensoria on antennal segment IV; cornicle 2.5-3 times as long as the cauda ***Brachycaudus cardui***

Cornicle and rostral segment IV + V not distinctly longer than the base of antennal segment VI; rostrum attaining 2nd coxae; antennal segments III and IV with 15-20 and 3-6 secondary sensoria, respectively 66

- 66 (65) Setae on dorsal abdominal segment VI apparent, nearly 0.1 mm in length; cornicle 2.5-3 times the length of the cauda ***Brachycaudus schwartzi***

Setae on dorsal abdominal segment VI not apparent, 0.02 mm in length; cornicle 2-2.5 times the length of the cauda ***Brachycaudus helichrysi***

- 67 (62) Forewing with the medial vein once-branched; cauda with 2-3 pairs of setae 68

Forewing with the medial vein twice-branched; setae on cauda variable 69

- 68 (67) Body black; stigma of the forewing black; cornicle and cauda black; sensory pegs present on hind tibiae; antennal segments I, II, VI, and distal half of III-V black; antennal segment III with 4-7 secondary sensoria; unguis of antennal segment VI 3-4 times the length of the base ***Toxoptera aurantii***

Body pale to tan; antennae dark; stigma of the forewing brown; cornicle and cauda pale; no pegs present on hind tibiae; antennae dark beyond base of segment III; antennal segment III with 5-7 secondary sensoria; unguis of antennal segment VI 3-4 times the length of the base ***Schizaphis graminum***

- 69 (67) Hindwing with the cubital vein absent; cauda pale, parallel-sided with 2 pairs of setae; antennal segment III with 5-8 secondary sensoria; unguis of antennal segment VI 5 times the length of the base ***Hysteronera setariae***

Hindwing with cubital vein present; other characters variable 70

- 70 (69) Cauda not bushy, bearing 2-3 pairs of lateral setae 71

- Cauda bushy, bearing 4 or more pairs of lateral setae 74
- 71 (70) Rostrum attaining 3rd coxae; no secondary sensoria on antennal segment III (rarely 1 to 3); unguis of antennal segment VI 3-4 times as long as the base or longer; head and thorax dark *Aphis forbesi*
- Rostrum barely attaining 2nd coxae; antennal segment III with 4-16 secondary sensoria; unguis of antennal segment VI 1-3 times as long as the base 72
- 72 (71) Cornicle only slightly longer than the cauda, with the maculation faint and restricted to the area posterior of the base of the cornicle; antennal segment III with 12-16 secondary sensoria, usually not in a line; unguis of antennal segment VI slightly longer than the base; hind tarsi subequal in length to rostral segments IV + V *Aphis nasturtii*
- Cornicle nearly twice as long as the cauda, with a large sclerotic maculation near the base; antennal segment III with 5-10 secondary sensoria in a line; unguis of antennal segment VI 2-3 times as long as the base; rostral segments IV + V usually distinctly longer than the hind tarsi 73
- 73 (72) Cauda dark brown to black, nearly as dark as the cornicle; dorsum of the abdomen with black bands; maculation nearly encircling cornicle; unguis of antennal segment VI 2-3 times as long as the base *Aphis craccivora*
- Cauda pale to brown, lighter than cornicle; maculation horseshoe-shaped, opening anteriorly around the base of the cornicle; unguis of antennal segment VI nearly 3 times as long as the base; antennal segments often pale proximally, tan to brown distally ..
..... *Aphis gossypii*
- 74 (70) Unguis of antennal segment VI 5 times as the base or longer; rostrum attaining 3rd coxae; cornicle longer than antennal segment III; maculation restricted to area posterior of cornicle *Aphis nerii*
- Unguis of antennal segment VI less than 4 times as long as the base; rostrum usually attaining the 2nd coxae; cornicle shorter than antennal segment III; maculation variable 75
- 75 (74) Secondary sensoria on antennal segment III 4-8 and in a line
..... 76
- Secondary sensoria on antennal segment III more than 8 and usually not in a line 77
- 76 (75) Body green to orange-yellow; maculation on the dorsum of the abdomen restricted to the area posterior to the cornicle; cauda and cornicles dusky to tan; wings clear; unguis of antennal segment VI 2.5-3 times the length of the base; setae on hind tibiae subequal to or longer than basal diameter of appendage; rostrum nearly attaining 2nd coxae *Aphis spiraeicola*
- Body with dusky to dark brown lateral markings on abdomen; bands on VII and VIII abdominal tergites; maculation on the dorsum of the abdomen not restricted to the area posterior to the cornicle; cauda and cornicle dark brown to black; wings slightly dusky; unguis of antennal segment VI 1.5-2 times the length of the base; setae on hind tibiae shorter than basal diameter of appendage; rostrum nearly attaining 3rd coxae *Aphis maidiradicis*

- 77 (75) Cauda with a bushy appearance (6 pairs of lateral setae on a short cauda); abdomen pale with brown lateral spots; maculation posterior to cornicle; antennae shorter than the body, secondary sensoria fewer than 20 and not tuberculate on antennal segment III; unguis of antennal segment VI 2 times as long as the base; cornicle 1-1.5 times as long as rostral segment IV + V **Aphis armoraciae** complex
- Cauda without a bushy appearance (4 or 5 pairs of lateral setae on a long cauda); abdomen dusky to light brown; maculation extending anteriorly around cornicle; secondary sensoria on antennal segment III tuberculate; unguis of antennal segment VI variable; cornicle at least 1.5 times as long as rostral segments IV + V **78**
- 78 (77) Dorsum of the abdomen with usually with distinct dark bands anterior to cornicles; hind tibiae and antennal segment III with numerous long erect setae, nearly as long as width of the appendage or longer; unguis of antennal segment VI 3 times as long as the base or longer; rostral segment IV + V usually longer than the base of antennal segment VI **Aphis fabae** complex
- Dorsum of the abdomen without distinct dark bands anterior to cornicles; setae on the hind tibiae and antennal segment III short and sparse; unguis of antennal segment III never longer than 3 times the base; rostral segments IV + V shorter than the base of antennal segment VI **79**
- 79 (78) Antennal segment IV with more than 5 secondary sensoria; unguis of antennal segment VI 1.5-2 times as long as the base **Aphis lugentis**
- Antennal segment IV usually without secondary sensoria; unguis of antennal segment VI 2-2.5 times the length of the base **Aphis helianthi** complex