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AN IDENTIFICATION GUIDE TO THE WHITEFLIES (HEMIPTERA: ALEYRODIDAE) OF THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Whiteflies (Aleyrodidae) are some of the most potentially detrimental pests for agricultural crops and the ornamental plant industry in the southeastern U.S. Generic and species-level identification can be difficult for entomology identifiers that have not received specialized training, but correct identification is essential for (1) the detection of exotic, invasive species and (2) providing proper management recommendations for established pest problems. In order to assist in the identification of commonly occurring specimens in the southeastern U.S. and promote the early detection of exotic species, a generic level key with corresponding distribution records has been developed for thirty four genera and/or whitefly species. Photographs of slide-mounted specimens are provided for each species.

Key Words: Aleyrodidae, Aleyrodinae, Aleurodicinae, whiteflies, key, illustrated key

RESUMEN

Las moscas blancas (Aleyrodidae) son algunas de las plagas potencialmente mas detrimentales para los cultivos y la industria de plantas ornamentales en el sureste de los Estados Unidos. La identificación a nivel de género y de especie puede ser dificil para los identificadores entomológicos que no han recibido un entrenamiento especializado, pero la identificación correcta es esencial para (1) la detección de especies exóticas invasores y (2) proveer recomendaciones apropiadas para el manejo de problemas de plagas establecidas. Para poder asistir en la identificación de las especies comunes que ocurren en el sureste de los Estados Unidos y promover una detección temprana de especies exóticas, una clave al nivel del género con los registros de distribuciones respectivas fue desarrollado para treinte cuatro géneros y/o especies de aleirodidos. Se provee fotos de cada uno de las especies de especimenes montados en laminas de microscopico.

The family Aleyrodidae is composed of tiny insects which obtained the common name "whiteflies" because the wings and bodies of the adults are covered with a fine, powdery or flour-like white wax. There are approximately 1500 (Martin 2004) known species of whiteflies with only about 150 (10%) of these occurring in the United States (Miller et al. 2000). Seventy-six species are known to occur in the southeastern United States (Evans 2003). Of these, 33 species from 20 genera are considered common and economically important. The ability to recognize one of these species with confidence can aid in determining a problematic species for a particular crop or to determine if a specialist is required for further identification.

The adults, which superficially resemble tiny moths, were actually believed to be minute moths by early workers. The eggs almost invariably are attached to the underside of leaves by means of a short or long stalk. Their surfaces may be smooth or sculptured (honeycombed). Many species lay their eggs in one or more semicircular or circular concentric rows, but others scatter their eggs over the leaf. The number of larval stages is four, and the fourth stage is usually termed a puparium. The first stage has well developed legs and antennae and is usually pale to somewhat translucent in color. As the only mobile larval stage, the first stage selects a site for permanent attachment. The puparia, known as pupal cases after emergence of the adults, of many species exhibit varying amounts of wax secretion from papillae or simple or compound pores.

The adults leave the pupal case through an inverted T-slit in the dorsum. Immediately after emergence, the adults of many species begin to feed, even before the wings are unfolded. Both males and females are winged, having 4 membranous wings without cross veins. Sexual dimorphism occurs only to the extent of differences in genitalia, the numbers of ventral abdominal wax plates, antennae, and in the slightly smaller body size of the male. Some species of aleyrodids have more than one generation each year, and in tropical to subtropical climates, continuous genera-

tions may occur with slowed development during short, cool periods. In contrast, several temperate species on non-herbaceous hosts have only one or two generations.

Another interesting aspect of the life history of whiteflies is the occasional tending by ants. Similar to the relationship between ants and aphids and scale insects, in exchange for the honeydew secreted by whiteflies, ants may offer some protection from potential predators or parasitoids. Additionally, at least one species of whiteflies requires ant tending for survival in order to prevent fungus growth due to excess honeydew production.

Economic Importance

Several species of whiteflies are economically important. All species are phytophagous and some transmit viruses (Byrne et al. 1990). The greenhouse whitefly, *Trialeurodes vaporariorum*, occurs over most of the U.S. and is a pest in northern greenhouses, but occurs outside in the southern states. The sweet potato (*Bemisia tabaci*) and silver leaf (*Bemisia argentifolii* or *Bemisia tabaci* biotype *B*) are common pests of various crops and ornamentals throughout the southern region. The citrus whitefly (*Dialeurodes citri*), cloudy-winged whitefly (*Singhiella citrifolii*) (most literature has this species listed as *Dialeurodes citrifolii*), and woolly whitefly, *Aleurothrixus floccosus*, are common on citrus and other ornamental plantings in Florida. In recent times the citrus blackfly, *Aleurocanthus woglumi*, has been found in Florida but is generally not a problem, with natural enemies keeping this species below the economic threshold. Other species that may be a problem in the area are the banded wing whitefly (*Trialeurodes abutiloneus*), and giant whitefly (*Aleurodicus dugesii*). Table 1 and Table 2 list known or reported whiteflies occurring in the southeastern United States. Generally, aleyrodid populations are kept in check by natural parasites and predators, but in agriculture crops or on ornamentals, where humans have upset the natural balance, consistent high and often damaging populations may occur.

Collecting Whiteflies

A fairly large series of specimens should be obtained when collecting whiteflies, including all possible life stages. Sometimes adults can be reared from puparia, depending upon the timing of pupal collection. Most of whitefly taxonomy is based on puparial characters, but exceptions do exist. It sometimes is helpful to have taxonomic records of the other life stages of whiteflies, and currently very little taxonomic data is available on non-puparial life stages.

Aleyrodid Identification

To identify whiteflies to the generic or specific level, one must (1) have the puparial stage present (currently, other forms are usually not identifiable to the species level), (2) be able to detect the pupal cases (sometimes they are hidden, or clear and camouflaged), (3) be able to see the characters that are needed to differentiate it from other genera and species, including having a properly slide-mounted specimen and microscopic equipment, (4) understand the morphology and characters used to distinguish each genus and species (Gill 1990), and (5) have keys and/or other identification aids available to compare and contrast with other species.

Slide Mounting Protocol (modified from Wilkey 1962)

1. Place specimens in 10% potassium hydroxide (KOH), allow to remain in solution for 12-24 h.
2. Remove specimens from KOH and place in distilled water. Allow to sit for 10-15 min.
3. Add two drop of double-stain or triple-stain to distilled water. Allow specimens to soak in this for 15 min.
4. Remove specimens from stain and place in 75% ethyl alcohol (EtOH). Allow to sit for 10-15 min. This should de-stain all non-sclerotized areas.
5. Remove specimens from 75% EtOH and place them in 95% EtOH. Allow to sit for 10-15 min. This should complete the de-staining process.
6. Remove specimens from 95% EtOH and place them in clove oil. Allow them to sit in clove oil for 30 min or longer.
7. Remove specimens from clove oil and place in Canada balsam on slide.
8. Drop cover slip on specimen and label slides.
9. Place slides in dryer oven for three weeks at 35°C.

Key to Puparia of the Whitefly Genera (and some species) of the Southeastern United States

1. Puparia with compound pores (Fig. 1) present (except in *Dialeurodicus*); thoracic legs each with a claw (Fig. 2). Lingula very long, usually extending past the vasiform orifice (Fig. 3) and with 2 pairs of setae at apex . . . . . Aleurodicinae (2)

1'. Puparia without compound pores (Fig. 4), thoracic legs without a claw. Lingula usually not long, not extending past vasiform orifice (Fig. 5) and with only 1 pair of setae at apex . . . . . Aleyrodinae (5)

TABLE 1. WHITEFLIES OF THE SOUTHEASTERN UNITED STATES (ALEYRODINAE)

ALEYRODINAE SPECIES	AL	AR	FL	GA	KY	LA	MS	NC	SC	TN	TX	VA
Aleurocanthus woglumi			X			X	X				X	
Aleurocerus palmae			X									
Aleurochiton forbesii			X	X				X				X
Aleuroclava jasmine			X									
Aleurocybotus graminicolus			X									
Aleurocybotus occiduus			X									
Aleuroglandulus emmae			X								X	
Aleuroglandulus malangae			X					X				
Aleurolobus solitarius			X									X
Aleuroparadoxus ilicicola	X					X						
Aleuroplatus coronatus							X					
Aleuroplatus elemarae			X	X		X						
Aleuroplatus ilicis	X		X	X		X	X	X	X	X	X	X
Aleuroplatus magnoliae			X									
Aleuroplatus myricae			X	X				X				
Aleuroplatus ovatus	X		X								X	
Aleuroplatus plumosus	X		X			X						
Aleuroplatus quercusaquaticae			X				X					X
Aleuroplatus semiplumosus			X	X		X	X	X	X			X
Aleuroplatus vaccinii			X	X				X	X			
Aleuroplatus vinsonioides			X	X			X					
Aleurothrixus floccosus			X			X					X	
Aleurotrachelus atratus			X									
Aleurotrachelus trachoides			X									
Aleurotulus n.sp.			X									
Aleyrodes spiraeoides			X			X					X	
Bemisia berbericola			X								X	
Bemisia tabaci/argentifolii	X	X	X	X	X	X	X	X	X	X	X	X
Crenidorsum commune			X									
Dialeurodes citri	X	X	X	X		X	X	X	X	X	X	X
Dialeurodes kirkaldyi			X								X	
Dialeurodes n. sp. on Schefflera			X									
Massilieurodes alabamensis	X			X								
Massilieurodes americanus	X		X	X		X	X	X	X	X	X	X
Massilieurodes chittendeni										X		X
Massilieurodes curiosa			X									
Massilieurodes myricae			X									
Minutaleyrodes minutus			X									
Parabemisia myricae			X									
Paraleurolobus imbricatus			X									
Pealius azaleae	X		X			X		X	X			X
Pealius rhododendri	X		X			X		X		X	X	
Singhiella citrifolii	X	X	X		X	X	X	X			X	
Singhius hibisci			X								X	
Siphoninus phillyreae				X				X				
Tetraleurodes abnormis			X								X	
Tetraleurodes acaciae			X								X	
Tetraleurodes confuse			X				X					
Tetraleurodes fici			X									
Tetraleurodes mori	X	X	X	X		X		X	X	X	X	X
Tetraleurodes morirariorum			X									
Tetraleurodes perileuca			X			X					X	
Tetraleurodes ursorum	X		X	X		X	X		X		X	X
Tetralicia (Aleuropleurocelus) sp.			X									
Trialeurodes abutiloneus	X	X	X	X	X	X	X	X	X	X	X	X
Trialeurodes fernaldi			X									
Trialeurodes floridensis			X									

TABLE 1. (CONTINUED) WHITEFLIES OF THE SOUTHEASTERN UNITED STATES (ALEYRODINAE)

ALEYRODINAE SPECIES	AL	AR	FL	GA	KY	LA	MS	NC	SC	TN	TX	VA
Trialeurodes magnoliae			X								X	
Trialeurodes packardi			X	X				X	X	X	X	X
Trialeurodes pergandei			X	X				X	X	X		X
Trialeurodes ruborum			X			X						X
Trialeurodes similes			X									
Trialeurodes vaporariorum	X		X	X	X	X	X	X	X	X	X	X
Trialeurodes variabilis			X									
Total	15	5	59	18	4	19	14	18	13	11	23	17

2(1). Compound pores absent from puparia (Fig. 6); one species in Florida on Persea; llingula short and enclosed in vasiform orifice . . . . . *Dialeurodicus*

2'. Compound pores present on puparia 3

3(2). Dorsal disc with numerous quinquelocular or quadrilocular pores (Fig. 7); central rod-like processes in compound pores short and not extending dorsally beyond orifice of pores; marginal wax pores present; lingula short, conical usually included in vasiform orifice; submedian, cephalothoracic setae absent; 2 species in Florida, *M. cardini* and *M. griseus* . . *Metaleurodicus*

3'. Dorsal disc with single pores; conical central processes; compound pores and marginal wax pores different; lingula spatulate and longer than vasiform orifice; submedian cephalothoracic setae present 4

4(3). Compound pores with a series of rod-like processes in a ring (Fig. 8A-B); dorsal disc pores simple, occasionally in submedial clusters on abdominal segments III-IV; cephalic and posterior 4 caudal compound pore pairs similar in size, anterior 2-3 pairs smaller; adult without branched radial vein in fore wing and 3 (male) or (female) 4-segmented antennae. . . . . *Paraleyrodes*

4'. Compound pores with single conical central process (Fig. 9A-B); numerous reniform pores on dorsal disc . . . . . *Aleurodicus*

5(1'). Dorsum with elongate glands or siphons (Figs. 10 and 11) 6

5'. Dorsum without elongate glands or siphons. 7

6. Puparium dark brown to black; with many thick dorsal spines that are acute (Fig. 12) . . . . . *Aleurocanthus*

6'. Puparium pale; many siphons located on body (Fig. 13A-B), apices truncate to rounded . . . . . *Siphoninus*

7(5'). Occurring on grasses; body 3-4 times long as wide (Fig 14); outer submargin with row of about 15 setae; antennae elongate, extending to mesothoracic or metathoracic legs; margins crenulate; vasiform orifice and operculum triangular (Fig. 15); caudal ridges present . . . . . *Aleurocybotus*

TABLE 2. WHITEFLIES OF THE SOUTHEASTERN UNITED STATES (ALEURODICINAE).

ALEURODICINAE SPECIES	AL	AR	FL	GA	KY	LA	MS	NC	SC	TN	TX	VA
Aleurodicus coccolobae			X									
Aleurodicus cocois			X									
Aleurodicus dispersus			X			X						
Aleurodicus dugesii			X	X		X					X	
Dialeurodicus frontalis			X									
Metaleurodicus cardini			X									
Metaleurodicus griseus			X									
Paraleyrodes minei			X									
Paraleyrodes perseae			X									
Paraleyrodes pseudonaranjae			X									
Total			10	1		1					1	

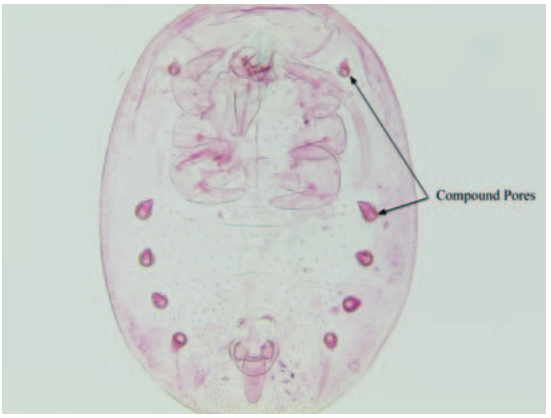

Fig. 1. Compound pores present on puparia.

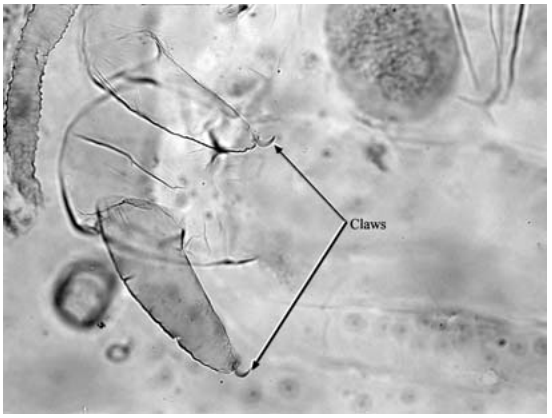

Fig. 2. Thoracic legs with claws.

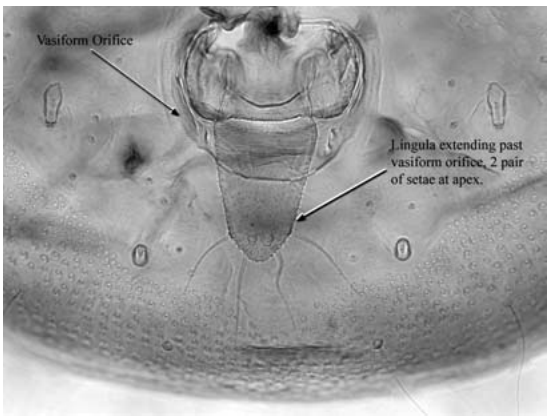

Fig. 3. Vasiform orifice with lingula extending beyond borders of orifice.

Fig. 4. Puparia without compound pores.

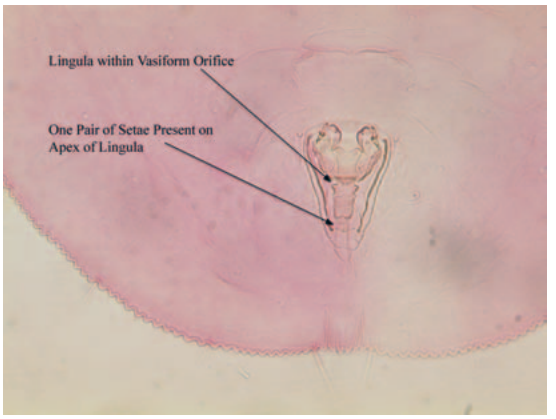

Fig. 5. Vasiform orifice with lingula included.

7'. Not occurring on grasses; body usually oval to round, not elongate; without row of submarginal setae 8

8(7'). Submarginal row of papillae present (Fig. 16A-B) 9

8'. Submarginal row of papillae absent (Fig. 17) 11

Fig. 6. Dorsal disc without any compound pores.

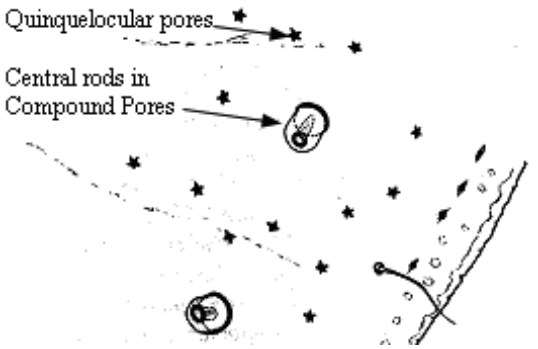

Fig. 7. Quinquelocular pores on dorsal disc and central rod-like processes in compound pores. Illustration from Martin (1987).

9(8). Papillae on dorsal disc reniform-shaped (Fig 18); tracheal pore plate with 1-3 teeth; vasiform orifice subcordate, operculum filling or almost filling orifice; lingual hidden . . . . . *Aleuroparadoxus*

9'. Papillae on dorsal disc simple (usually conical) or absent; tracheal pore area with at most slightly differentiated marginal teeth 10

10. Tracheal notch absent (Fig.20); vasiform orifice usually subtriangular (Fig 19); operculum partially filling orifice; lingula lobed, exposed or hidden . . . . . *Trialeurodes*

10'. Tracheal notch present (Fig. 21); vasiform orifice subcordate; lingula not lobed; with 5 pairs of tubercules . . . . . *Aleuroclava (jasmini)*

11(8'). Tracheal notch or pore present; caudal furrow present 12

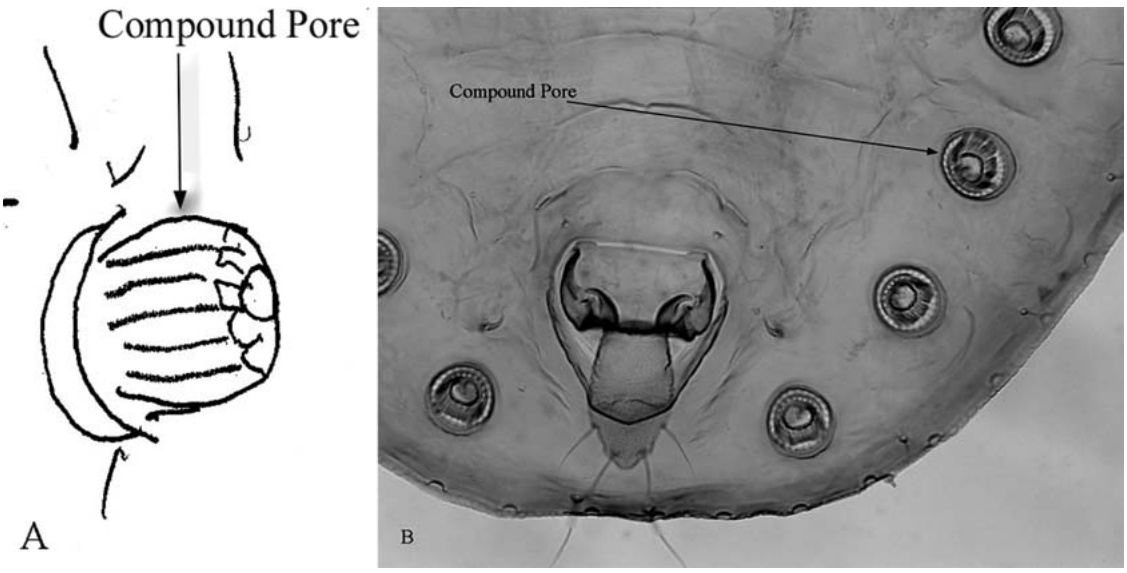

Fig. 8. Illustration (A) and photograph (B) of compound pores with rod-like processes (*Paraleyrodes*).

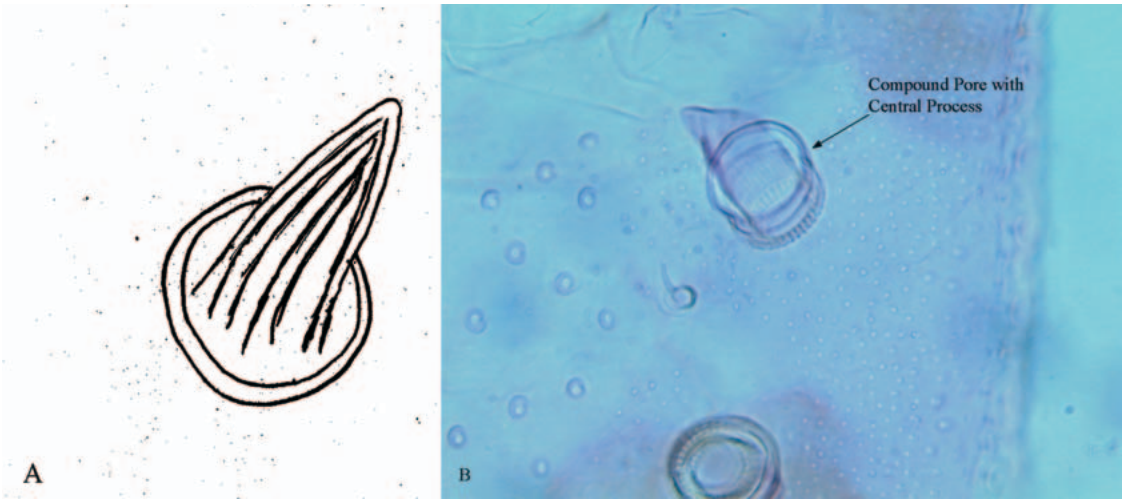

Fig. 9. Illustration (A) and photographd (B) of compound pores with a central process (*Aleurodicus*).

11'. Tracheal notch or pore absent; caudal furrow present or absent 17

12(11). Vasiform orifice subrectangular (Fig. 22A-B), broadly open posteriorly, inner margin with teeth; operculum subcordate; caudal furrow granulated; margin dentate . . . . . *Singhius (hibisci)*

12'. Vasiform orifice subcordate (Fig. 23), enclosed posteriorly by rim, inner margin with or without teeth; operculum subcordate or subcircular; caudal furrow with or without granules; margin other than dentate 13

13(12'). Abdomen emarginated; inner margin of vasiform orifice without teeth; caudal furrow without granules; transverse mouting suture present 14

13'. Abdomen not emarginated, body oval; caudal furrow with or without granules; transverse moulting suture absent 15

14(13). Abdomen shorter than cephalothorax (Fig. 24); submargin defined by a ventral suture only; dorsal disc unsculptured . . . . . *Minutaleyrodes*

14'. Abdomen longer than cephalothorax (Fig. 25); submargin not solely defined by a ventral suture; dorsal disc sculptured . . . . . *Aleuroclava*

15(13'). Ventral parts of caudal and thoracic tracheal areas lined with spinules or nodules (Fig. 26A-B); head region defined by faint suture; 10-12 pairs of submarginal setae present . . . . . *Dialeurodes*

15'. Ventral parts of caudal and thoracic tracheal areas almost always smooth; head region not defined by faint suture; 13-15 pairs of submarginal setae present 16

16(15'). Apical submarginal setae always situated laterad of caudal ridges; midlegs distinctly separated; caudal furrow without transverse rows of nodules . . . . . *Singhiella (citrifolii)*

16'. Apical submarginal setae usually situated on caudal ridges between caudal setae and vasiform orifice; midlegs closely aligned; caudal furrow with transverse rows of nodules . . . . . *Massilieurodes*

17(11'). Submarginal furrow present (Fig. 27A-B) 18

17'. Submarginal furrow absent 24

18(17). Subdorsum with row of papillae (Fig. 28); body color light brown . . . . . *Crenidorsum*

18'. Subdorsum without row of papillae; body usually dark brown to black 19

19(18'). Vasiform orifice (Fig. 29A-B) borne on bifurcate process . . . . . *Aleurocerus*

19'. Vasiform orifice not borne on bifurcate process 20

20(19'). Caudal ridge and furrow developed; area above vasiform orifice trilobed or not 21

20'. Caudal ridge and furrow poorly developed; area above vasiform orifice not trilobed 22

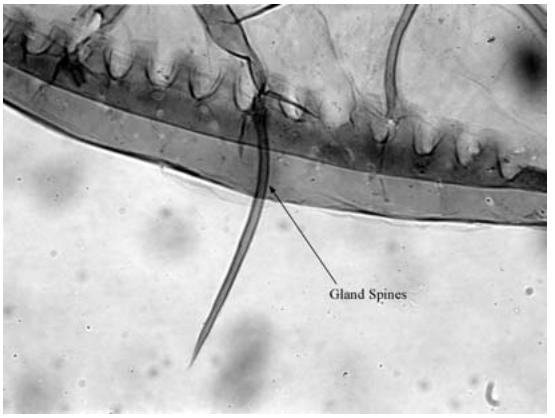

Fig. 10. Gland spines on dorsal disc (*Aleurocanthus*).

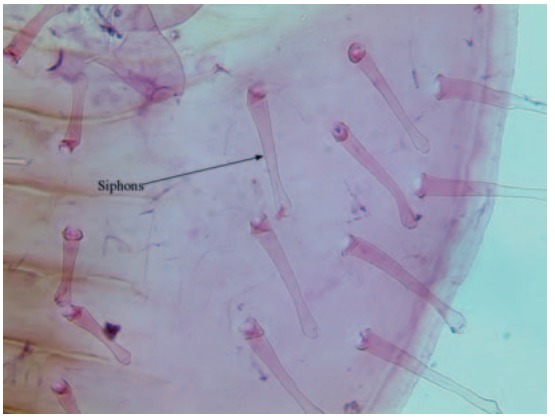

Fig. 11. Siphon tubes on dorsal disc (*Siphoninus*).

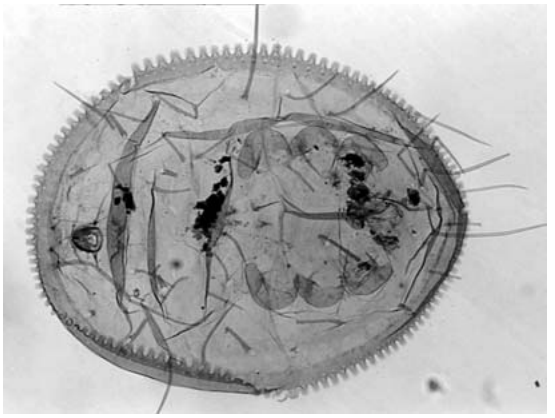

Fig. 12. Dorsal disc of *Aleurocanthus woglumi*.

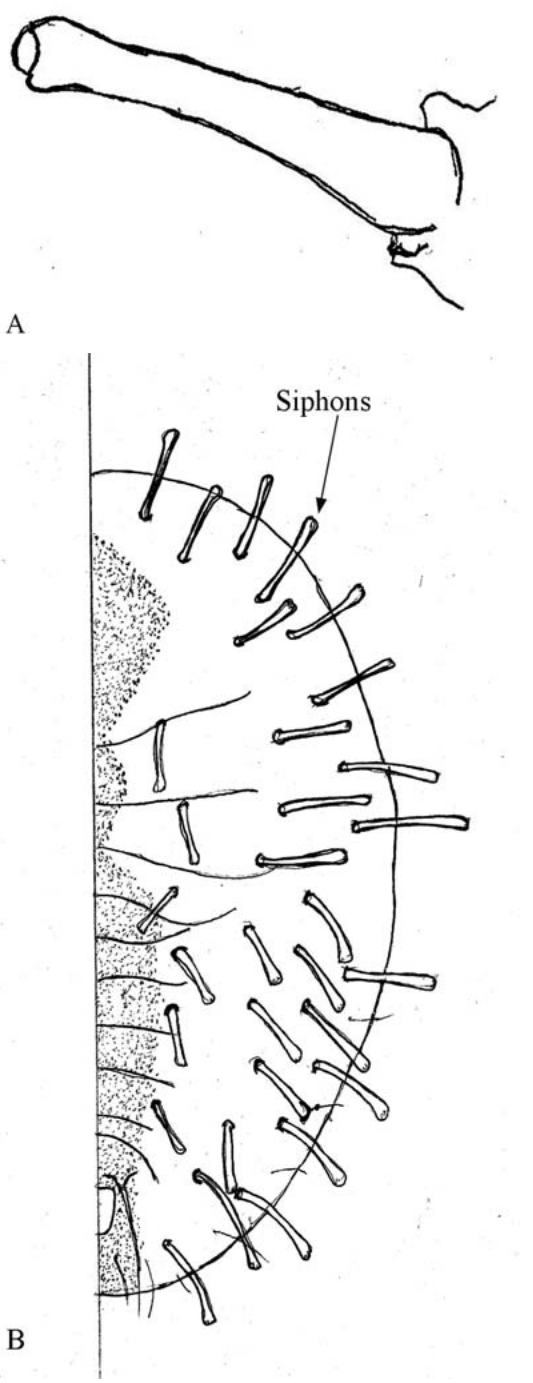

Fig. 13. (A) Enlarged illustration of siphon. (B) Dorsal disc with siphons (*Siphoninus*).

21(20). Area above vasiform orifice trilobed (Fig. 30A-B); body usually dark brown to black; eye usually present; wax secreted as narrow fringe . . . . . *Aleurolobus (solitarius)*

21'. Area above vasiform orifice not trilobed; vasiform orifice and operculum nearly quadrate . . . . . *Paraleurolobus (imbricatus)*

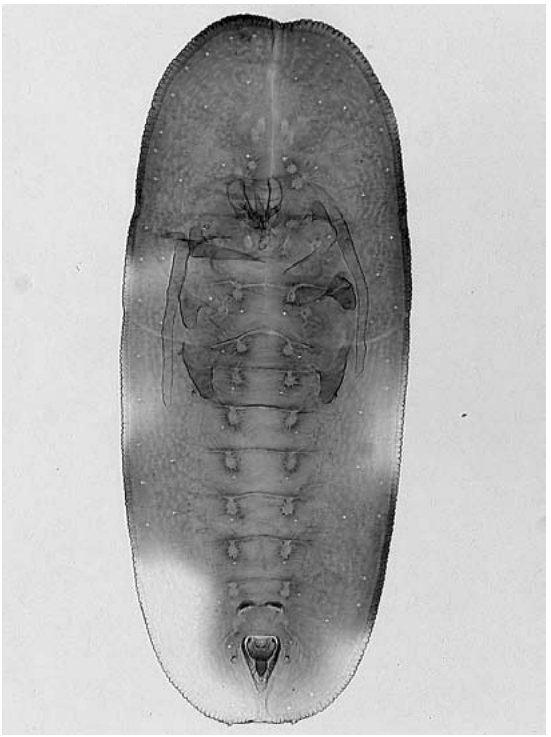

Fig. 14. *Aleurocybotus* sp.

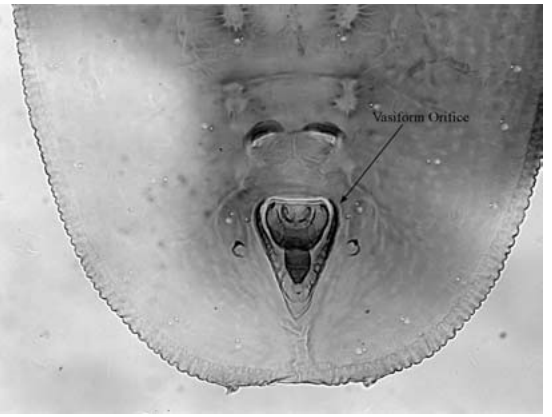

Fig. 15. Vasiform orifice of *Aleurocybotus*.

22(20'). Submargin with a row of small toothlike, conical processes (Fig. 31) . . . . . *Aleurotrachelus*

22'. Submargin without row of small tooth-like, conical processes 23

23(22'). Vasiform orifice small, elliptical; lingula obscured by operculum (Fig. 32) which nearly fills orifice; subdorsal folds often coming to point over head; body usually elliptical . . . . . *Aleurothrixus (floccosus)*

23'. Vasiform orifice subcordate . . . . . *Tetraleurodes*

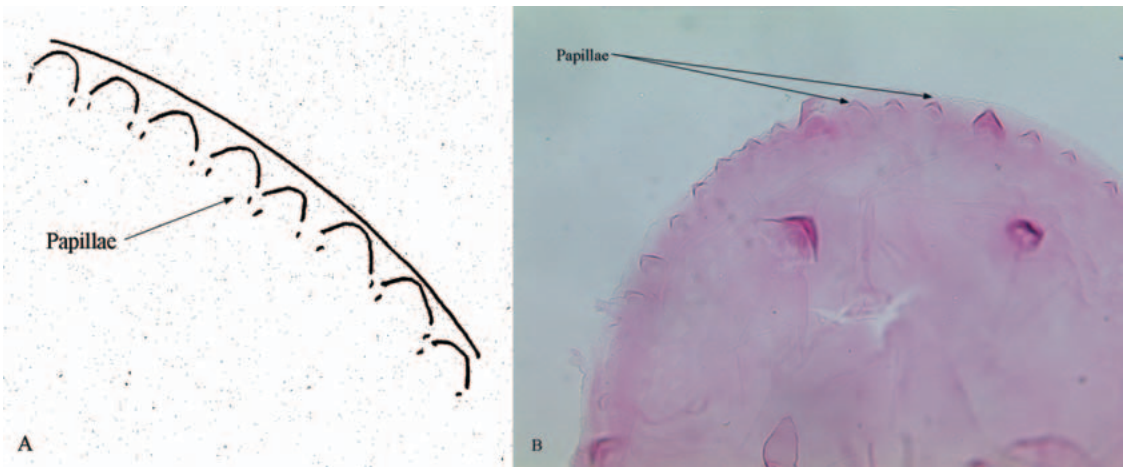

Fig. 16. Illustration (A) and photograph (B) of submarginal row of papillae as seen in Trialeurodinii.

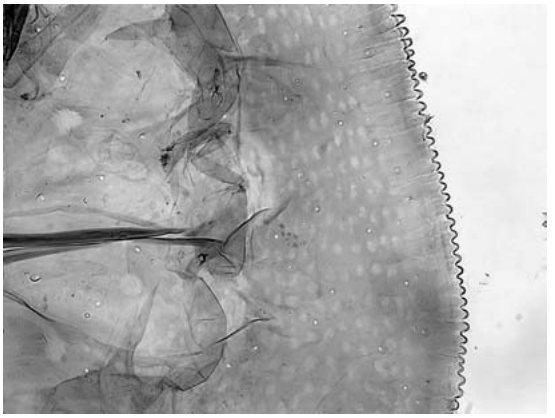

Fig. 17. Submargin without row of papillae (*Aleurotulus* sp.).

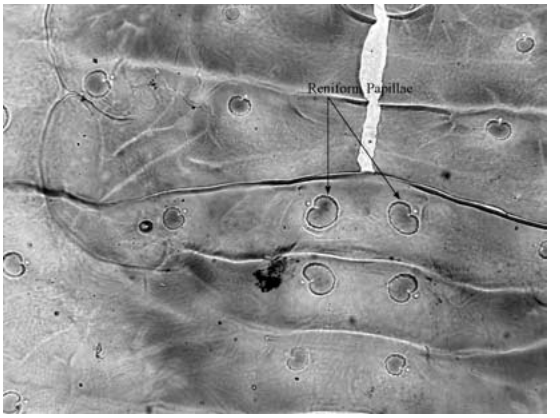

Fig. 18. Reniform shaped papillae on dorsal disc (*Aleuroparadoxus*).

Fig. 19. Vasiform orifice of *Trialeurodes* sp.

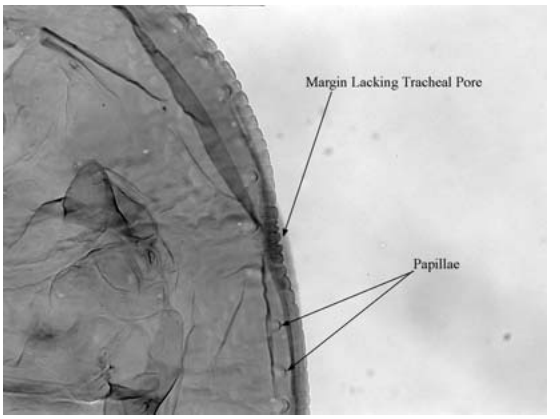

Fig. 20. Tracheal notch absent, tracheal comb present (*Trialeurodes*).

24(17'). Submargin and subdorsum with numerous minute disc pores and speckled with small irregular dark spots (Fig. 33); wide marginal furrow; vasiform orifice subtriangular, enclosed by rather thick posteriorly triangular rim; operculum subcordate, tip of lingula exposed; transverse moulting suture present . . . . . *Aleurochiton (forbesii)*

24'. Submargin and subdorsum without numerous minute disc pores and not speckled with dark spots; vasiform orifice variable 25

25(24'). Prosoma dorsum with a pair of large circular glands (Fig. 34); lingula exposed with 2-3 lobes on each side . . . . . *Aleuroglandulus*

25'. Prosoma dorsum without a pair of very large circular glands; lingula with at most one lobe near base of each side 26

26(25'). Row of submarginal setae extending beyond margin (Fig. 35) 27

26'. Row of submarginal setae not extending beyond margin 28

27(26). Apical knob of lingula distinctly longer than wide (Fig. 36), a lobe near base on each side; vasiform orifice subtriangular . . . . . *Parabemisia (myricae)*

27'. Apical knob of lingula about as wide as long (Fig. 37); lobe absent from base; vasiform orifice subcordate . . . . . *Pealius (rhododendri)*

28(26'). Caudal furrow and ridges present 29

28'. Caudal furrow and ridges absent 31

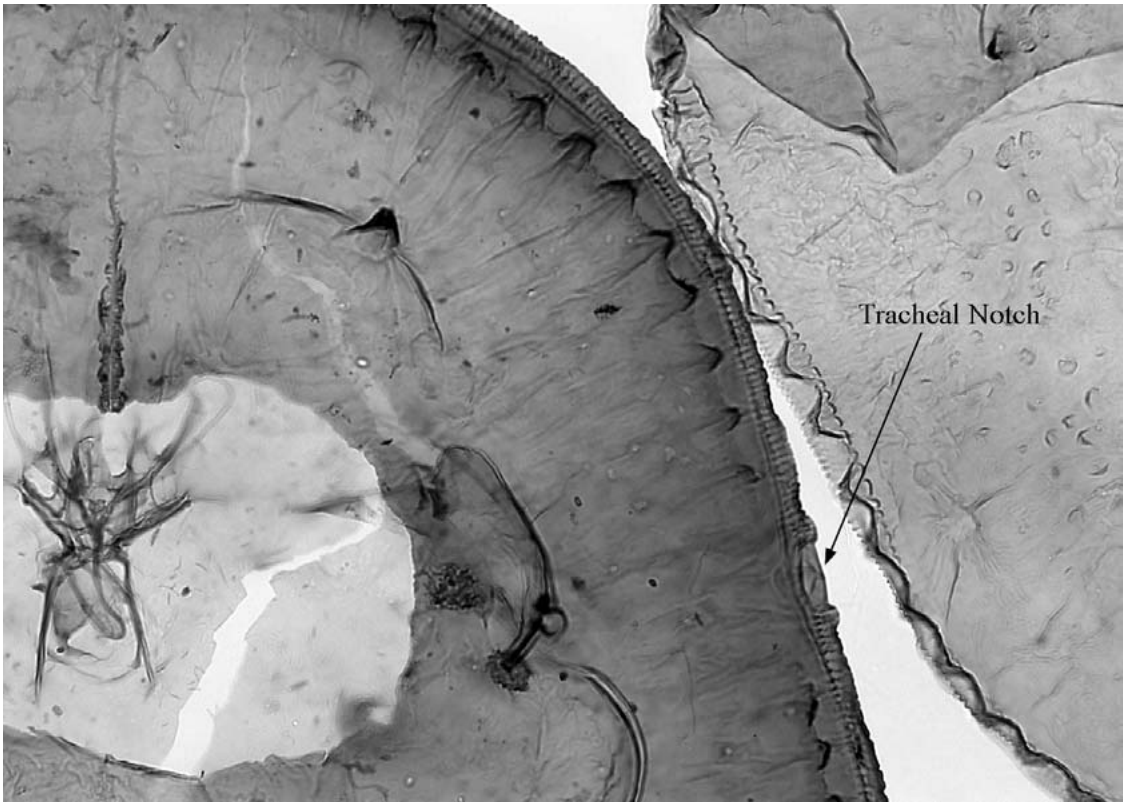

Fig. 21. Tracheal notch present, *Aleuroclava jasmini*.

29(28). Median-submedian part of abdominal segment VI broad throughout, more than half the length of segment VI (Fig. 38A-B); not constricted submedially by segment VIII; tracheal pore area without differentiated marginal teeth . . . . . *Aleyrodes*

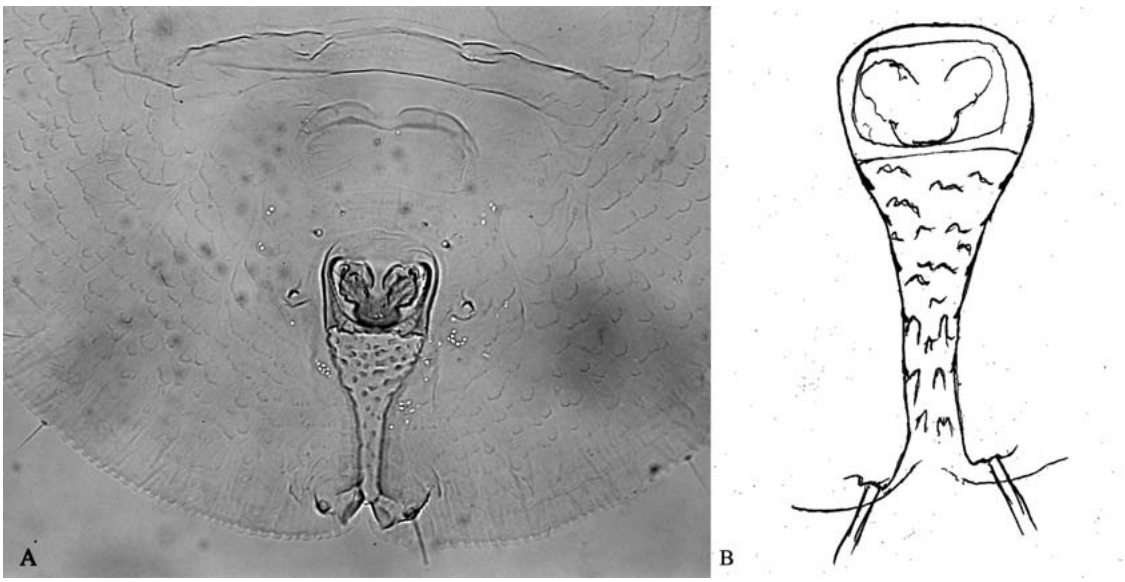

Fig. 22. Vasiform orifice *Singhius* photograph (A) and illustration (B).

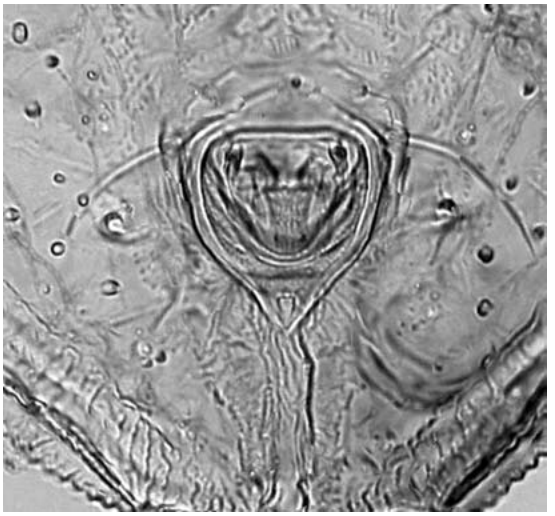

Fig. 23. Subcordate vasiform orifice, *Aleuroclava* sp.

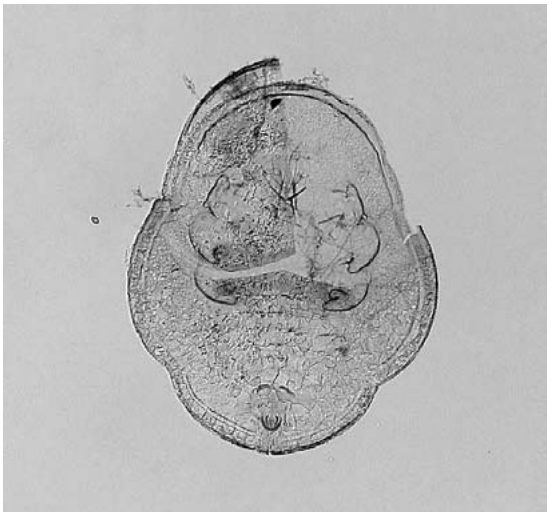

Fig. 24. *Minutaleyrodes* body shape.

29'. Anterior median area of segment VI lobular, less than half the length of VI, usually strongly constricted by segment VIII (Fig. 39A-B); tracheal pore often with series of sclerotized narrow teeth 30

30(29'). Vasiform orifice triangular; divided into two parts; lingula with small D-shaped or oval apical knob (long setae at end of lingula) . . . . . *Pealius (azaleae)*

30'. Vasiform orifice elongate triangular, not divided into two parts; lingula with oval or lanceolate apical part (long apical setae on tubercles) (Fig.40) . . . . . *Bemisia*

31(28'). Margin strongly reflexed beneath body; body usually elliptical, black, often with tubercules or papillae present on dorsum; vasiform orifice subcordate, operculum completely fills orifice, transverse moulting suture present. . . . . *Aleuropleurocelus formerly Tetrilicia)*

31'. Margin not strongly reflexed beneath body 32

32(31'). Disc pores minute (Fig. 41); body oval, usually pale; margin crenulate . . . . . *Aleurotulus (nephrolepidis)*

32'. Disc pores not minute (Fig. 42); pupal case dark brown to black; tracheal pore area with teeth differentiated from marginal teeth; vasiform orifice usually with tooth or tongue (Fig.44A-C) . *Aleuroplatus*

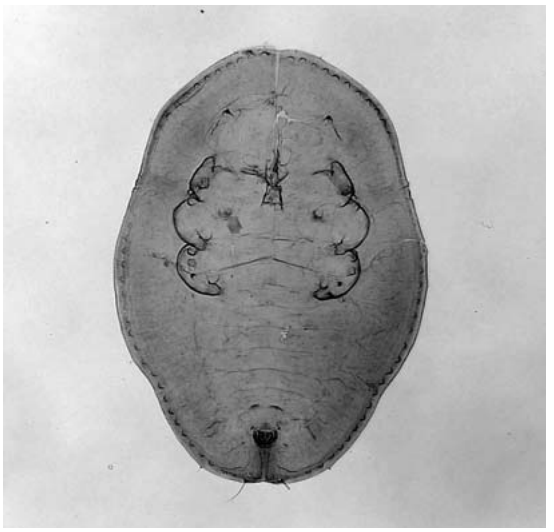

Fig. 25. *Aleuroclava* body shape.

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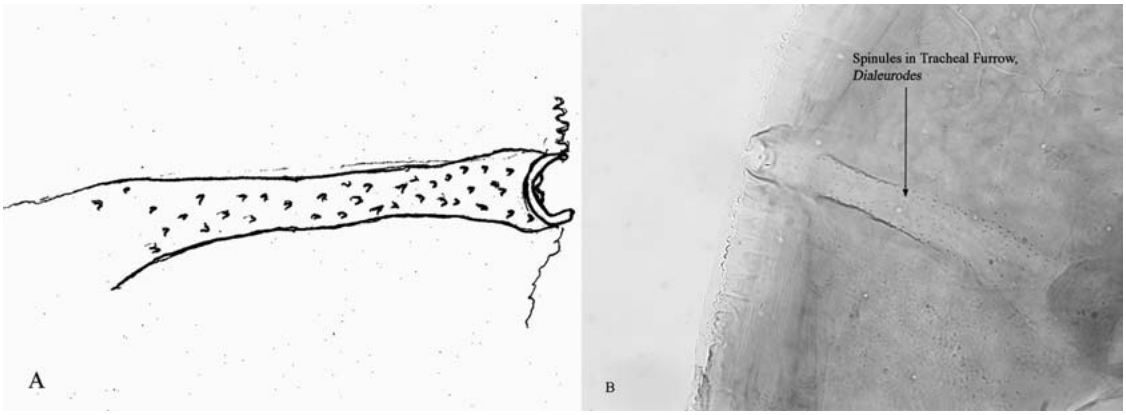

Fig. 26. Illustration (A) and photograph (B) of spinules in tracheal furrow, *Dialeurodes citri*.

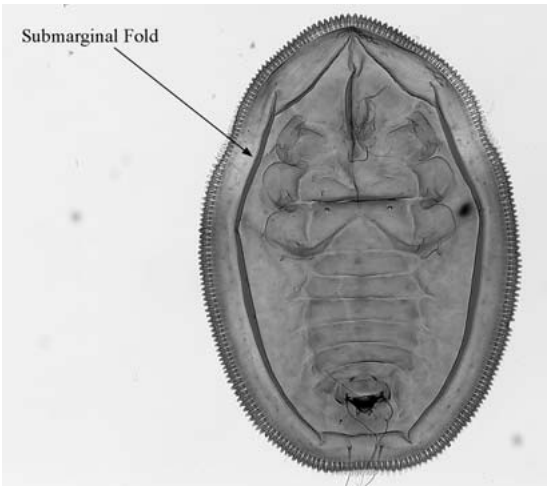

Fig. 27. Submarginal fold on puparia.

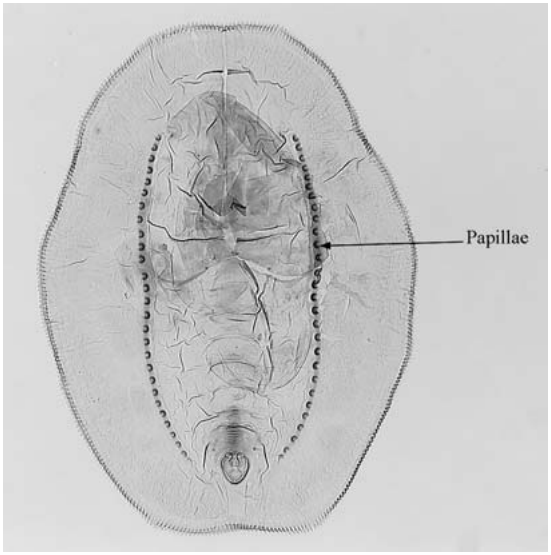

Fig. 28. Submarginal fold with papillae, *Crenidorsum commune*.

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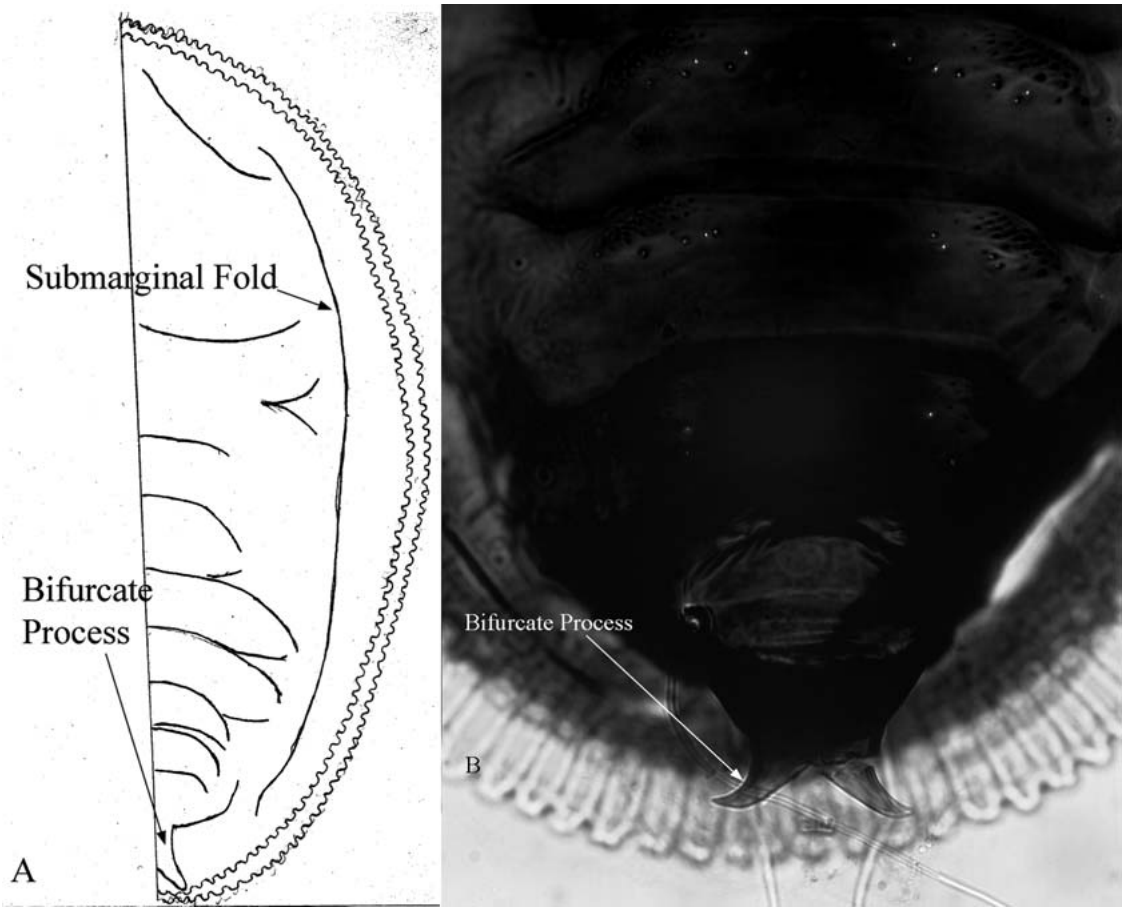

Fig. 29. Illustration (A) and photograph (B) of *Aleurocerus* sp., with bifurcate process covering vasiform orifice.

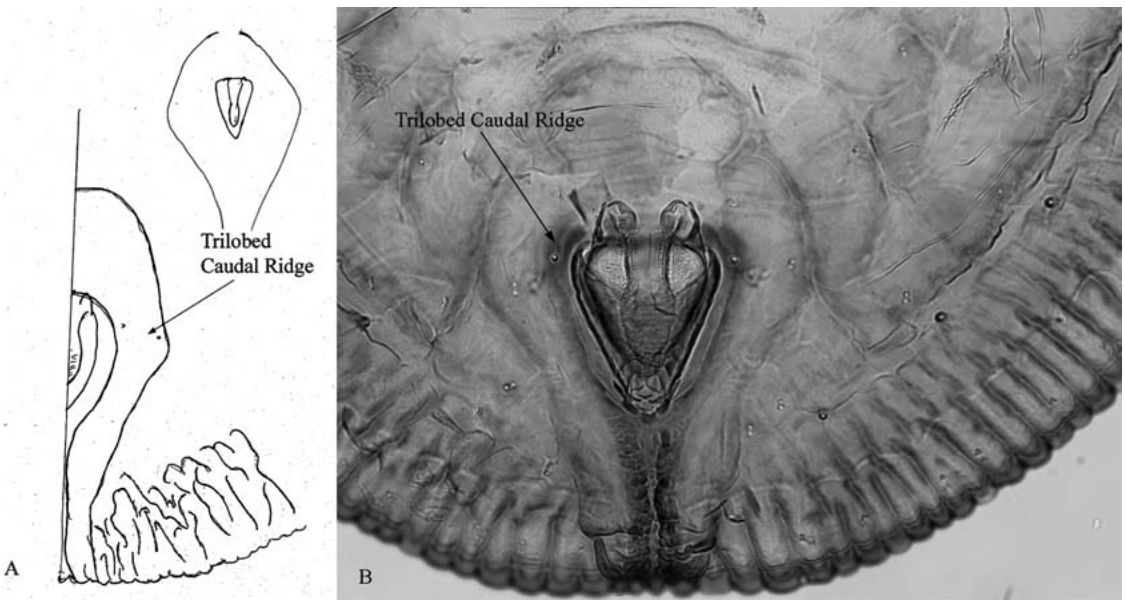

Fig. 30. Illustration (A) and photograph (B) of *Aleurolobulus solitarius*, trilobed area above vasiform orifice.

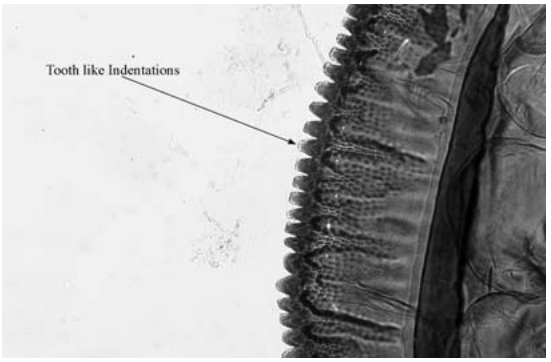

Fig. 31. Margin of *Aleurotrachelus trachoides*.

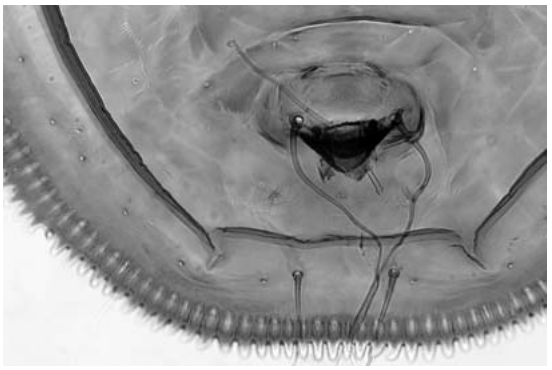

Fig. 32. Vasiform orifice (obscured) *Aleurothrixus floccosus*.

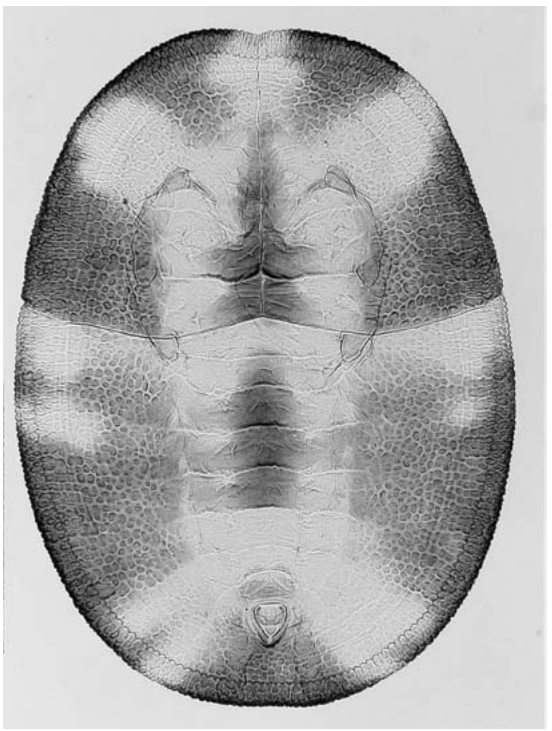

Fig. 33. *Aleurochiton forbesii*, body.

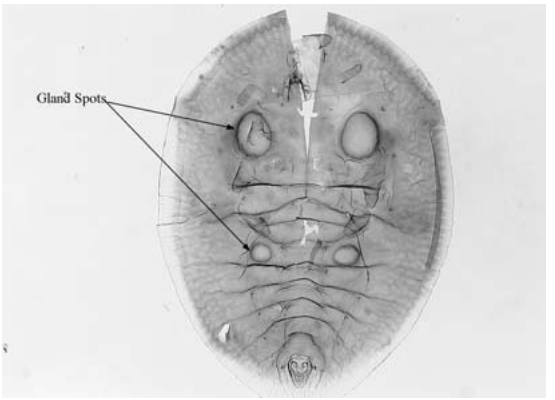

Fig. 34. *Aleuroglandulus* species.

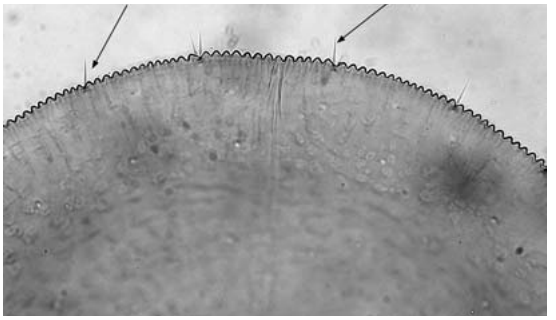

Fig. 35. Marginal setae extending beyond margin of body.

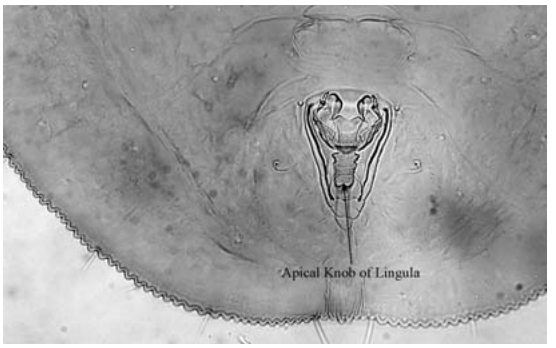

Fig. 36. *Parabemisia myricae* vasiform orifice.

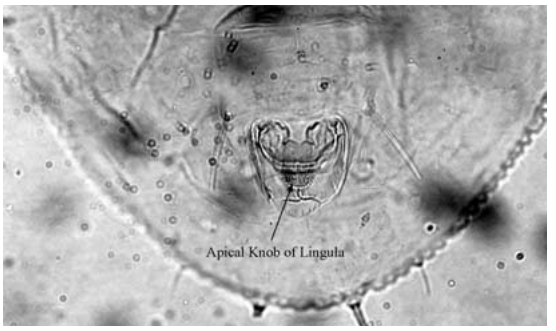

Fig. 37. *Pealius rhododendri*, Vasiform orifice.

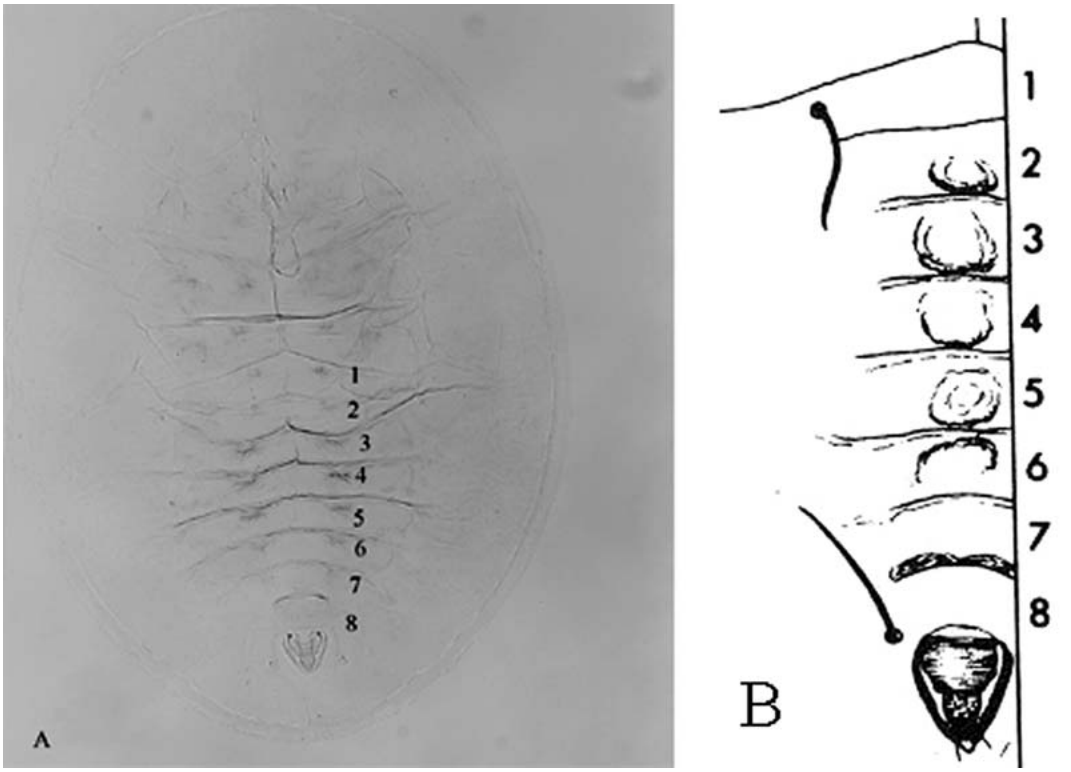

Fig. 38. Photograph (A) and illustration (B) from Martin (1987) of *Aleyrodes* segmentation (abdominal segments 1-8).

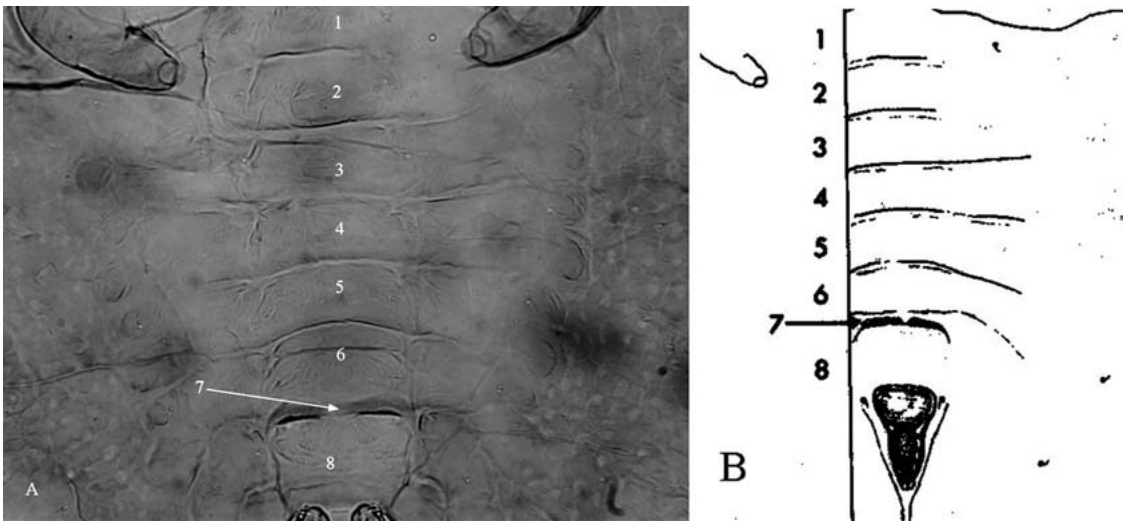

Fig. 39. Photograph (A) and illustration (B) from Martin (1987) of *Bemisia* segmentation (abdominal segments 1-8).

Fig. 40. *Bemisia* species, vasiform orifice and caudal furrow.

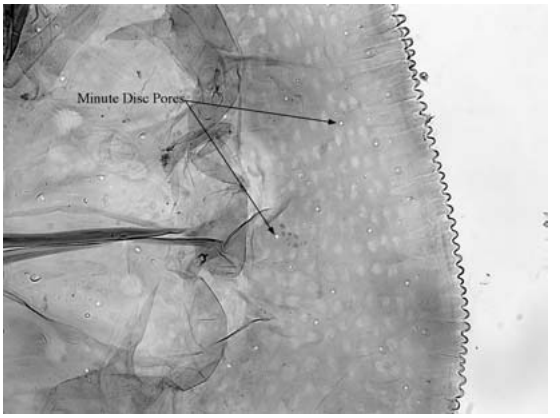

Fig. 41. *Aleurotulus*, minute disc pores.

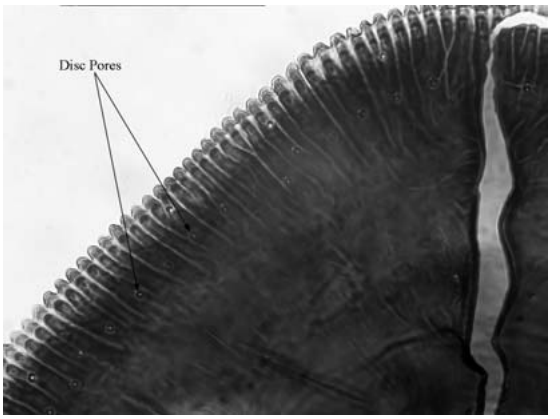

Fig. 42. *Aleuroplatus* species, disc pores on dorsal disc.

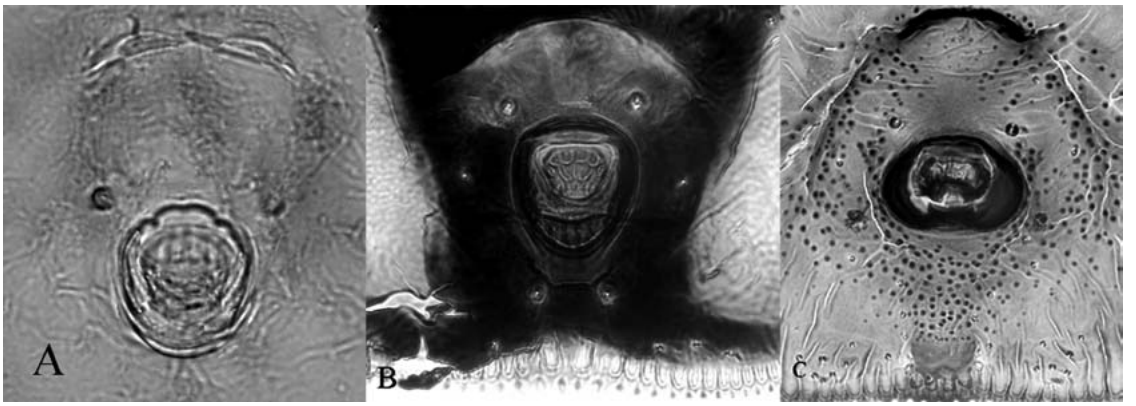

Fig. 43A-C. *Aleuroplatus* species, illustrating vasiform orifice.