Diagnostics[1]
Diagnostic

Maconellicoccus hirsutus

Specific scope

This standard describes a diagnostic protocol for *Maconellicoccus hirsutus*.

Specific approval and amendment

Approved in 2005-09.

Introduction

Maconellicoccus hirsutus is probably of south-east Asian origin and has spread to Australia, Africa, Middle East, Central America, northern South America, and the USA (Hawaii in 1983, California in 1999 and Florida in 2002). *M. hirsutus* is highly polyphagous and has been recorded feeding on hosts of 73 plant families and over 200 plant genera. Further information on the distribution, list of host plants and biology are available on the CABI Crop Protection Compendium and in OEPP/EPPO (2005a).

Identity

Name: *Maconellicoccus hirsutus* (Green 1908).
Synonyms (including former names): *Phenacoccus hirsutus* Green 1908; *Phenacoccus glomeratus* Green 1922; *Spilococcus perforatus* De Lotto 1954; *Maconellicoccus perforatus* (De lotto), 1964.
Taxonomic position: *Insecta: Hemiptera: Sternorrhyncha: Coccinea: Coccoidea: Pseudococcidae.*
EPPO code: PHENHI.
Phytosanitary categorization: EPPO A1 action list no. 314.

Detection

Plant material, in particular growing tips, should be examined for distorted, stunted, bunchy growths containing white woolly wax, tiny salmon-pink eggs, and sooty mould or sticky honeydew. The honeydew produced may attract attendant ants. The entire mealybug colony tends to become covered by white, sticky, elastic, woolly, wax ovisac material. When the sticky ovisac wax is parted with a needle, clusters of pink eggs and pink to grey females become visible. In heavier infestations, white masses of wax concealing mealybugs may occur in axils and on twigs and stems. Good light conditions are essential for examination. In poor light, a powerful torch is helpful. One of the most favoured hosts of *M. hirsutus* is *Hibiscus rosa-sinensis*. This is a good host to monitor in detection surveys. *M. hirsutus* is frequently detected in the UK, France and the Netherlands on *Annona* fruits imported from India and Pakistan. The mealybugs hide in crevices on the surface of the fruit.

Identification

The taxonomy of the *Coccoidea* is almost entirely based on the adult female and a good slide preparation of a female is required for identification on species level. For details of technical procedures, see Appendix I of OEPP/EPPO (2005b). No keys exist for nymphal stages and males. A key to the families of *Coccoidea* is given by Kosztarab & Kozar (1988). Another key is available at http://www.sel.barc.usda.gov/scalekeys/all_families.htm.

See Appendix 2 of OEPP/EPPO (2005b) for a short glossary of terminology on the morphology of scales.

Diagnosis of the family *Pseudococcidae*

The family may be identified using the following combination of characters: body of the female normally elongate to broadly oval, usually membranous, often with a pair of anal lobes, each terminating in an apical seta. Antennae each normally 6–9-segmented, but sometimes reduced. Legs normally present, each with a single tarsal segment and a single claw. Claw with a pair of digitules at base and often a denticle on plantar surface. Translucent pores frequently present on hind legs. Ostioles

[1]The Figures in this Standard marked 'Web Fig.' are published on the EPPO website www.eppo.org.

normally present. Circulus present or absent. Anal ring present, normally with at least 2 rows of cells and 6 setae. Cerarii present, sometimes absent entirely. Trilocular pores usually present and often abundant on dorsum and venter. Multilocular disc pores often present, at least on venter. Quinquelocular pores present in some genera, usually on venter, rarely on dorsum. Oral collar tubular ducts normally present on venter, less frequently on dorsum. Oral rim tubular ducts sometimes present, at least on dorsum, rarely present on venter only (Williams & Granara de Willink, 1992). The *Pseudococcidae* is the second largest family in the *Coccoidea* and contains some 288 genera with 1947 species and subspecies (Ben-Dov, 1994).

Diagnosis of the genus *Maconellicoccus* Ezzat 1958

The genus *Maconellicoccus* may be identified by the following combination of characters. Each character has to be present (Williams & Watson, 1988; Williams, 2004).

- legs present
- anal lobes not projecting, either not developed or at most only moderately produced, rounded, each with a long flagellate apical setae
- trilocular pores present, although sometimes sparse. Antennae much shorter than length of body
- cerarii represented by conical or lanceolate setae, at least on anal lobes
- ceraran setae pointed
- cerarii, and dorsal cerarii if present, not situated on prominences. If cerarii are on sclerotized areas then these are flat
- dorsal oral collar tubular ducts not with the orifice surrounded by a round adjacent, sclerotized area containing 1 or more setae within its borders, or with the setae adjacent to the rim
- oral rim ducts present somewhere on the body
- antennae with 9 segments
- cerarii numbering 4–6 pairs. Antennae and legs normal, not usually long and slender.

Diagnosis of the species M. hirsutus

M. hirsutus (Web Figs 1 and 2) can be distinguished from other species of the genus by a combination of characters given in the Key in Table 1 (Williams, 1996).

Description

Appearance in life orange pink to reddish, sparsely covered with white mealy wax but the insects become completely buried in the white ovisac material (Williams, 1996). A broadly oval species; anal lobe moderately developed, each with an apical seta about 260 µm long and a wide anal lobe bar. Antennae each 9-segmented, 370–450 µm long. Legs well developed, hind leg without translucent pores. Labium about same length as clypeolabral shield. Circulus quadrate, apparently not divided by intersegmental line. Ostioles well developed. Anal ring normal, with 6 setae. Cerarii numbering 5 pairs on posterior abdominal segments as far forward as segment 4, each with a pair of short conical setae with large setal sockets, normally without concentrations of trilocular pores; sometimes a single cerarian seta present on segment 3. Dorsal surface with flagellate setae. Trilocular pores evenly

Table 1 Key to species of *Maconellicoccus* (adult females; after Williams, 1996)

1.	Circulus present	2
	Circulus absent	6
2.	Cerarii numbering 4–7 pairs, present on abdomen only	3
	Cerarii numbering 1 pair, situated on anal lobes	5
3.	Oral rim tubular ducts of two distinct sizes, many of the large type associated with a setal collar. Antennae each about 500–630 µm long (Africa)	*ugandae*
	Oral rim tubular ducts of one size only, not normally associated with setal collars. Antennae no more than 480 µm long	4
4.	Oral collar tubular ducts present on dorsum usually in row across middle of segments. Circulus variable in shape, oval to quadrate, normally 85–140 µm wide, only occasionally divided by intersegmental line. Oral rim tubular ducts 3.7–5.0 µm wide, 7.5–8.5 µm long (pantropical and subtropical)	*hirsutus*
	Oral collar tubular ducts absent from dorsum. Circulus usually 150–195 µm wide, notched at each side and distinctly divided by intersegmental line. Oral rim tubular ducts about 6.25–7.50 µm wide, 12.5 µm long (Nepal)	*ramchensis*
5.	Oral rim tubular ducts each with a conspicuous rim. Oral collar tubular ducts absent from dorsum. Multilocular disc pores absent from venter of thorax (Australia)	*tasmaniae*
	Oral rim tubular ducts each with narrow rim, barely distinguishable from oral collar tubular ducts. Multilocular disc pores present on venter of thorax (Australia)	*lanigerus*
6.	Cerarii numbering 1 pair, situated on anal lobes. Oral rim tubular ducts of two types, each narrower than a trilocular pore, with a narrow rim either sclerotized or membranous (Australia)	*australiensis*
	Cerarii numbering 4 pairs. Oral rim tubular ducts each wider than a trilocular pore, the rim wide and conspicuous	7
7.	Oral collar tubular ducts present on dorsum. Spine-like setae present on femora (Australia)	*leptospermi*
	Oral collar tubular ducts absent from dorsum. Spine-like setae absent from femora, which have only flagellate setae (Southern Asia)	multipori

distributed. Oral rim tubular ducts numerous, fairly evenly distributed across the segments, each duct with a sclerotized rim, the outer edge of rim often obscure. Minute oral collar tubular ducts present in small numbers across the segments. Ventral surface with normal setae present. Multilocular disc pores present at anterior and posterior edge of fourth and posterior segments, not reaching margins. Oral rim tubular ducts, same as on dorsum, present around margins. Oral collar tubular ducts numerous across most abdominal segments, less numerous interiorly; present also around margins to head and median areas of thorax. Trilocular pores fairly evenly distributed, not numerous (Williams & Watson, 1988).

For a positive identification of *M. hirsutus* a good microscopic slide preparation should be made and the combination of 9-segmented antennae, anal lobe bars, numerous dorsal oral rim ducts and long, flagellate dorsal setae have to be present. Examination of slide-mounted material is necessary because some other species of mealybug are similar to *M. hirsutus* in appearance and cause similar damage. Appearance in life of *Paracoccus marginatus* is blue-black to black, covered in white secretion (Williams & Granara de Willink, 1992), or yellow (Watson & Chandler, 1999), not pink. When preserved in 80% alcohol, specimens of *P. marginatus* turn black in a matter of days, whereas *M. hirsutus* remain brown.

Reference material

Phenacoccus hirsutus Green 1908a: 25. Type data: India: on undetermined shrub, attended by ants (*Crematogaster rogenhoferi*). Lectotype female, by subsequent designation Williams 1985: 194. Type depository: London: The Natural History Museum, London, UK. Described: female. Illust.

Reporting and documentation

Guidelines on reporting and documentation are given in EPPO Standard PM7/– (in preparation).

Further information

Further information on this organism can be obtained from:
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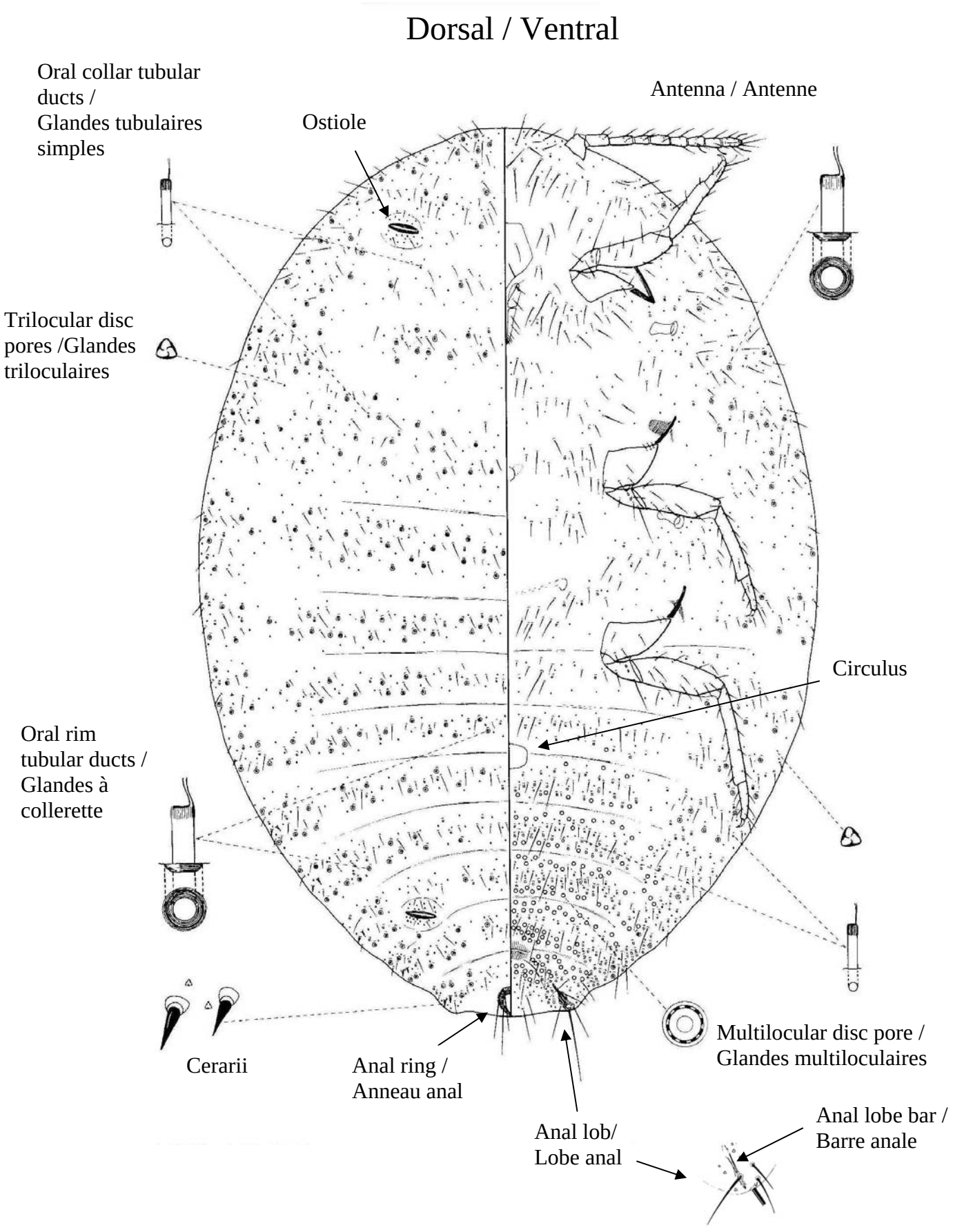
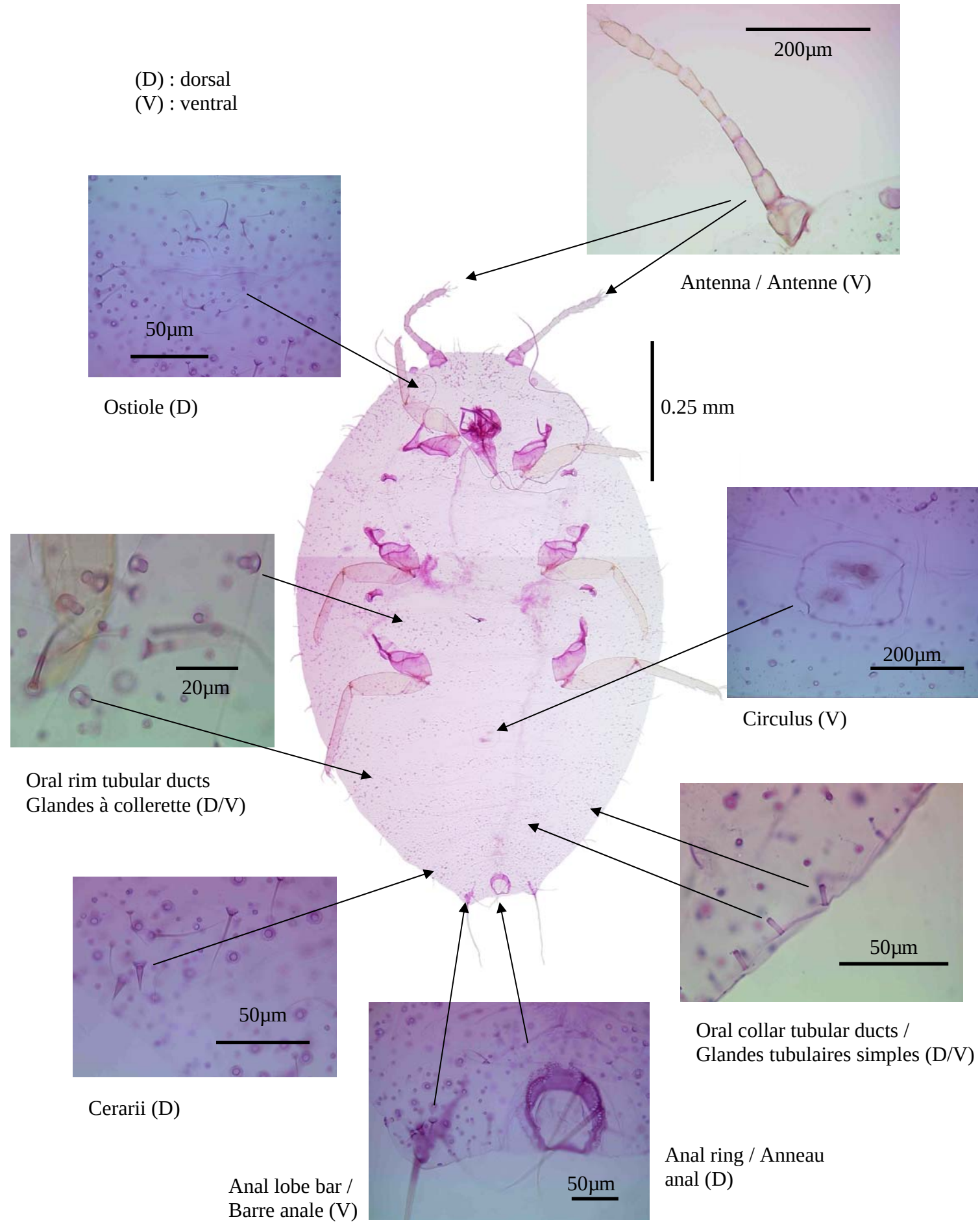


Web Fig. 1: Morphological description *Maconellicoccus hirsutus*
(after Williams & Watson, 1988)



Web Fig. 2 : *Maconellicoccus hirsutus*, slide mounted observations