



## A new species of *Greenisca* and two new species of *Ovaticoccus* from Italy (Hemiptera Coccoidea Eriococcidae), with a key to European genera of Eriococcidae.

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### Abstract

Three new eriococcid species from Italy are described and illustrated, namely *Greenisca oreophila* **sp. n.** off Poaceae, and *Ovaticoccus exoticus* **sp. n.** and *O. agavacearum* **sp. n.**, off Agavaceae. Their morphological relationships are discussed and keys to *Greenisca* and *Ovaticoccus* species are provided, together with a key to the Eriococcidae genera so far known in Europe. A check-list of Italian Eriococcids is added.

**Key words:** Felt scale insects, taxonomy, distribution, Switzerland, Palaeartic and Nearctic Regions, *Greenisca* key, *Ovaticoccus* key, check-list Italian Eriococcidae

### Introduction

There has been very extensive progress in the study of the Eriococcidae throughout the world in the last years (Gullan & Cook, 2007; Erkilic *et al.*, 2011; Foldi & Kozár, 2007; Hardy & Gullan, 2007; Hardy *et al.*, 2008; Henderson, 2007; Hodgson & Trencheva, 2008; Hodgson & Miller (2010); Kaydan & Kozár, 2008; Kozár, 2009; Kozár & Konczné Benedicty, 2008, 2008a; Kozár *et al.*, 2007, 2008, 2009; Miller & Gimpel, 2000; Ouvrard & Kozár, 2009; Pellizzari & Germain, 2010; Szita *et al.*, 2011; Williams, 2007). This has led to many new species in most zoogeographical regions.

The use of ScaleNet (Ben-Dov *et al.*, 2011) is of great utility in obtaining distributional data, but may be the cause of uncertainty when data from published papers differ from those in ScaleNet: i.e. according to Kozár (2009), the known eriococcids in the Palaeartic Region has reached 198 species, whereas ScaleNet lists only 183 species (Ben-Dov *et al.*, 2011). Similar differences can be found by comparison of National lists (Foldi, 2001; Pellizzari & Russo, 2005; Kozár, 2005) and ScaleNet lists. The discrepancies in species lists in the above mentioned references and subsequent complications caused by the many new species, demonstrate that we need more new collecting data, revisions, nomenclatural clarification and updating of National and regional lists to improve our knowledge on this subject.

Three new eriococcid species found in Italy and belonging to *Greenisca* and *Ovaticoccus* are here described; of these, the new *Greenisca* is an autochthonous species, whereas the two new *Ovaticoccus* are introduced alien species.

### Material and methods

In the present paper, we follow the classification and nomenclature of Kozár (2009) and partly of Hodgson and Miller (2010). Terminology used in the descriptions follows mostly that used by Foldi and Kozár (2007), Hodgson and Miller (2010), Kozár *et al.* (2007) and Miller and McKenzie (1967). Measurements of the body are given in

millimeters (mm), all other measurements are in micrometers ( $\mu\text{m}$ ). The measurements of the holotype are given, followed by the size ranges of the paratypes in parenthesis. The illustrations of the adult female shows the venter on the right and the dorsum on the left. Enlargements of important characters are shown around the central drawing, but not drawn to scale.

Specimen depositories: DEAE—The Scientific Museums of the University of Padova (Italy), Department of Environmental Agronomy and Crop Production – Entomology, and PPI—the Plant Protection Institute, Hungarian Academy of Sciences, Budapest, Hungary.

## Taxonomy

### Key to the genera of Eriococcidae in Europe

1. Anal ring not well developed, often without pores; cruciform pores present on midventer of abdomen; mostly on Agavaceae . . . . . *Ovaticoccus* Kloet
- Anal ring well developed, with a row or rows of pores; cruciform pores absent on midventer of abdomen . . . . . 2
2. Dorsum with cruciform pores or with discoidal pores or with both; on grasses. . . . . 3
- Dorsum without cruciform pores or discoidal pores; hosts various including grasses . . . . . 5
3. Dorsum with large sclerotized groups of 5-locular pores . . . . . *Gregoporia* Danzig
- Dorsum without large sclerotized groups of 5-locular pores . . . . . 4
4. Dorsum without cruciform pores . . . . . *Greenisca* Borchsenius
- Dorsum with cruciform pores . . . . . *Kaweckia* Koteja
5. Large spinose setae situated in a row only on body margin, or restricted to anal lobe; mostly on grasses . . . . .
- . . . . . *Anophococcus* Balachowsky
- Large spinose setae situated all over dorsum; hosts various . . . . . 6
6. With 5 setae on posterior tibia; microtubular ducts short; labium with 9 pairs of setae; mostly on herbaceous plants . . . . .
- Rhizococcus* Signoret . . . . . (in sense of Koteja, 1974)
- With 4 setae on posterior tibia; microtubular ducts long; labium with 8 pairs of setae; mostly on woody plants . . . . . 7
7. Dorsal spinose setae much shorter than marginal setae; anal lobe with strong subapical setae; in Europe on such introduced plants as *Araucaria* and *Leptospermum* . . . . . *Uhleria* Cooke
- At least some dorsal spinose setae about as long as marginal setae; anal lobes with hair-like subapical setae; hosts various. . . 8
8. Macrotubular ducts forming a wide band on lateral margins of both surfaces; dorsal enlarged setae of one size; ovisac not covering dorsum; mostly in bark crevices of elm . . . . . *Gossyparia* Signoret
- Macrotubular ducts numerous over dorsum, not forming a wide band on lateral margins of both surfaces; dorsal enlarged setae usually of more than one size; ovisac covering entire body; on woody plants . . . . .
- . . . . . *Acanthococcus* Signoret (in sense of Koteja, 1974)

### Genus *Greenisca* Borchsenius, 1948

Type species: *Eriococcus inermis* Green, 1915 (misidentified) = *Anophococcus gouxi* Balachowsky, 1954.

**Generic diagnosis: Unmounted adult female.** Ovisac elongate-oval, felt-like, white, or yellowish. Adult female elongate-oval, almost parallel-sided, with convex dorsum.

**Mounted female. Venter.** Antennae 6- or 7-segmented, base at some distance from head margin; frontal tubercle usually present. Labium 3-segmented, basal segment with two pairs of short setae, total number of setae on labium 8 pairs. Stylet loop only slightly longer than labium. Legs well developed, slender, each tibia about as long as tarsus; hind tibia with 5 setae, 3 on inner margin; claws usually with denticle; midcoxae and hindcoxae with spinulae on anterior surfaces; hindcoxae with some translucent pores on posterior surfaces. Quinquelocular pores few, present on both surfaces. Cruciform pores on ventrolateral area only. Macrotubular ducts present, of 2 sizes, larger ducts with flower-shaped terminal gland. Microtubular ducts present, with small filamentous ductule. Enlarged conical setae few, with truncate or sharp-pointed apex, present on anal lobes, rarely on margin of thorax and head; hairlike setae on both surfaces.

**Dorsum.** With small spine-like or setose setae in rows on all segments; anal lobes well developed, each with 3 spine-like setae. Anal ring oval, with 6 or 8 setae, each as long as anal ring diameter and with few pores in a single row. Cauda present. Quinquelocular pores numerous on all segments. Macrotubular ducts and microtubular ducts present.

**Distribution.** The genus *Greenisca* is restricted to the Palaearctic Region and currently includes only three species living on leaves of either Poaceae or Cyperaceae (Kosztarab & Kozár, 1988).

***Greenisca oreophila* sp. n.**

(fig. 1)

**Type data.** **Holotype**, adult female, **Italy**, Lamon, (Belluno district), 600 m asl, on Poaceae leaves, 26.viii.1989, collected by G. Pellizzari, slide n. 199/1. **Paratypes**, 5 adult females, slides n. 199/2-6, same data as holotype; also 5 adult females, **Italy**, Agordo, (Belluno district), 611 m asl, on Poaceae leaves, 2.vii.1993, collected by G. Pellizzari, slides n. 495/1-5. Holotype and most paratypes deposited in DEAE, one paratype deposited in PPI.

**Other material.** 2 additional specimens collected and identified as *G. gouxi* by F. Kozár in Gersau, **Switzerland**, 8.viii.1993 and 15.viii.1993, on *Brachypodium* leaves, slides n. 4221 and 4236, in Kozár collection. These specimens have fewer marginal spines and, because of this, were not included into the paratype series.

**Unmounted female.** Body enclosed in a felted, whitish egg sac.

**Mounted female.** Body elongate-oval, 3.86 (3.0–4.72) mm long, 1.87 (1.55–2.28) mm wide.

**Venter.** Antennae usually 7 segmented; segment length ( $\mu\text{m}$ ) I: 37 (36–48), II: 37 (31–41), III: 40 (40–53), IV: 74 (62–74), V: 30 (19–31), VI: 26 (19–31), VII: 48 (38–48), all segments with few setae, segment II with 1 sensory pore, segment VII with apical setae 38 (38–48)  $\mu\text{m}$  long, and with 3 sensory falcate setae, each 31 (31–36)  $\mu\text{m}$  long; segments V and VI each with single falcate seta 17–36  $\mu\text{m}$  long. Frontal tubercles not seen. Eyes present on ventral margin. Labium 3 segmented, 91 (81–91)  $\mu\text{m}$  long; basal segment well developed, with two pairs of setae. Stylet loop lightly longer than labium. Legs well developed (lengths in  $\mu\text{m}$ ): fore-coxae 75 (65–75), trochanter 46 (46–58), femur 152 (149–154), tibia 128 (123–139), tarsus 130 (127–134), claw 32 (32–36); mid-coxae 80 (72–84), trochanter 46 (46–65), femur 170 (142–170), tibia 125 (125–144), tarsus 130 (127–144), claw 35 (34–36); hind-coxae 102 (82–102), trochanter 58 (58–72), femur 165 (161–171), tibia 160 (160–180), tarsus 148 (138–168), tarsal digitules knobbed, 54 (45–57), claw 32 (32–34), claw digitules 36–40, slightly knobbed. Mid- and hind-coxae with spinulae on anterior (ventral) surfaces (Fig. 1); hindcoxae with translucent pores on posterior (dorsal) surface. Each trochanter with 2 sensory pores on each surface. Claws with denticles. All legs with a few flagellate setae and with sensory pore at base of each tarsus. Mesothoracic spiracles 35 (31–38)  $\mu\text{m}$  in diameter, with some quinquelocular pores at spiracular opening. Quinquelocular pores each 6  $\mu\text{m}$  in diameter, sparse on most of surface; some on last abdominal segments with 10 loculi. Slender setae present, scattered on abdomen. Some longer median flagellate setae present on head, thorax and anterior abdominal segments. Cruciform pores in a very sparse submarginal band. Macrotubular ducts of 2 sizes: larger about 25  $\mu\text{m}$  long, 7–8  $\mu\text{m}$  wide, smaller about 20  $\mu\text{m}$  long and 3–5  $\mu\text{m}$  wide, present on all segments, each duct with a sclerotized rim surrounding orifice, particularly discernible on larger ducts; inner ductule of larger ducts longer than duct, ending in a flower-shaped gland; on abdomen, ducts shorter and narrower. Microtubular ducts few, present around body margin. Oviduct or internal genital organ barely discernible.

**Dorsum.** Spine-like setae 1–3 on margin of each abdominal segment, each 13–20  $\mu\text{m}$  long. Dorsal spinose setae about 9  $\mu\text{m}$  long, and hair-like setae about 14  $\mu\text{m}$  long, scattered all over body. Macrotubular ducts, each 25  $\mu\text{m}$  long, 7–8  $\mu\text{m}$  wide, in very sparse bands on each segment. Microtubular ducts each about 4  $\mu\text{m}$  long and 2  $\mu\text{m}$  wide, with oval orifice, scattered among dorsal setae. Sclerotized quinquelocular (sometimes three locular) pores 7  $\mu\text{m}$  wide, numerous, not forming groups. Anal ring situated on dorsum, well developed, 70 (67–74)  $\mu\text{m}$  wide, and 81 (78–84)  $\mu\text{m}$  long, with single row of pores and 6–8 setae, each 152 (137–170)  $\mu\text{m}$  long. Anal lobes well developed, not sclerotized, with 3 spine-like setae, each 43  $\mu\text{m}$  long. Apical setae 270 (270–326)  $\mu\text{m}$  long. Cauda present.

**Ethymology.** The species epithet *oreophila* is based on the Greek words  $\acute{\omicron}\rho\omicron\varsigma$  (oros) = mountain and  $\phi\acute{\iota}\lambda\omicron\varsigma$  (filos) = “loving, fond of”, and means “mountain-loving” as this species has been collected so far only in mountain localities.

**Affinities.** *G. oreophila* is similar to *G. gouxi* Balachowsky, having sclerotized quinquelocular pores not grouped on dorsum and is similar to *G. placida* (Green) in having spine-like setae on margin of head, but *G. oreophila* differs from both in having marginal spine-like setae on the abdomen and three spine-like setae on each anal lobe.

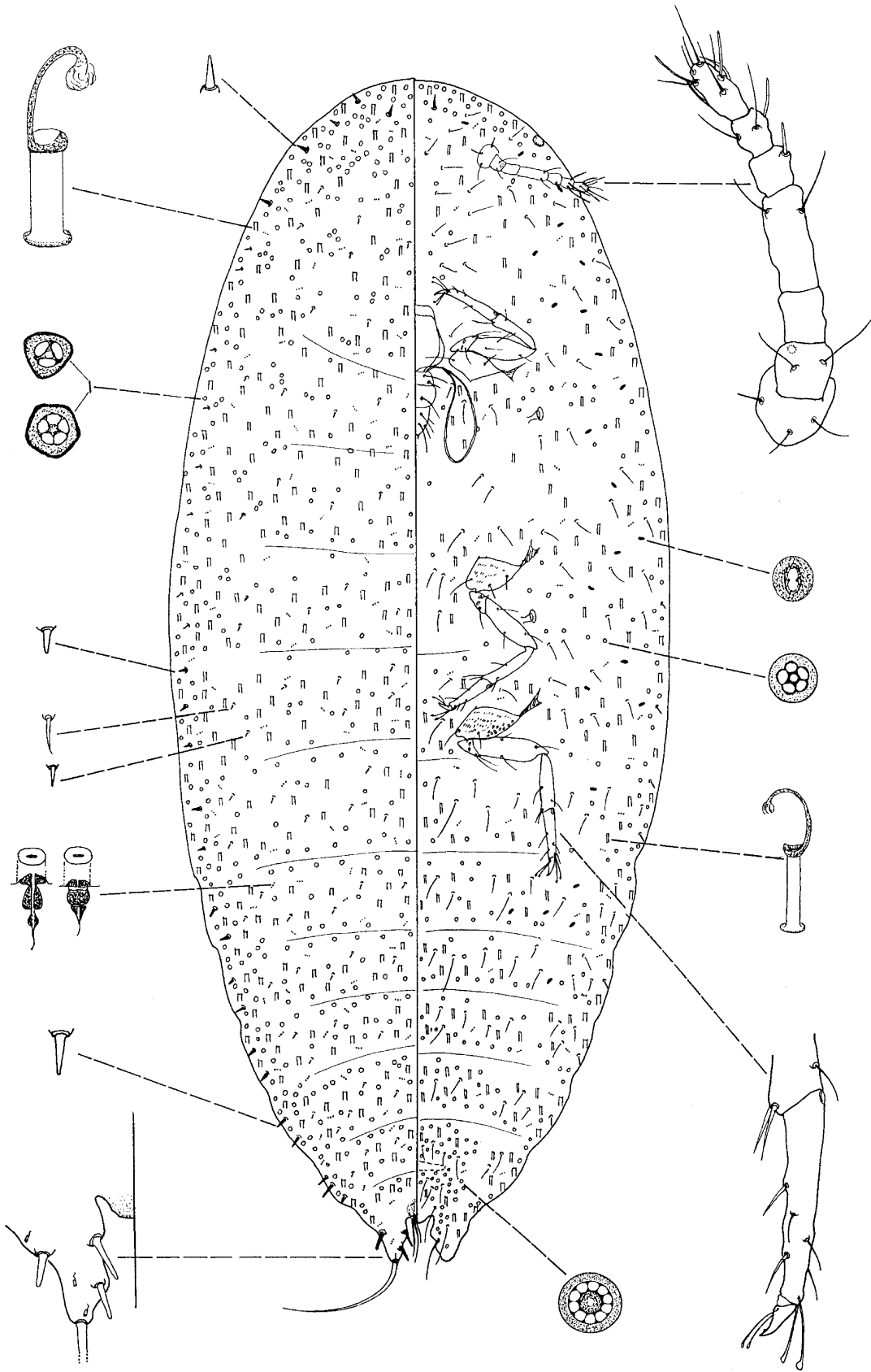


FIGURE 1. *Greenisca oreophila* Pellizzari & Kozár, sp. n., adult female.

## Key to adult female *Greenisca*

1. Some sclerotized dorsal quinquelocular pores in large groups . . . . . *G. brachypodii* Borchsenius & Danzig
- Sclerotized dorsal quinquelocular pores not forming groups . . . . . 2
2. Outer dorsal spinose seta of anal lobes usually much shorter (less than half) of other two anal lobe setae; spine-like setae absent on margin of abdomen. . . . . 3
- All three dorsal anal lobe spinose setae subequal in length; spine-like setae present on margin of abdomen . *G. oreophila* sp.n.
3. Marginal spine-like setae on head present . . . . . *G. placida* (Green)
- Marginal spine-like setae on head absent . . . . . *G. gouxi* (Balachowsky)

## Genus: *Ovaticoccus* Kloet, 1944

Type species: *Coccus agavium* Douglas, 1888

**Generic diagnosis. Unmounted adult female.** Body oval; body colour varying from pink to purple; with a white, waxy, filamentous eggsac on abdomen.

**Mounted female. Venter.** Antennae 6 or 7 segmented. Labium three segmented, basal segment with two pairs of short setae. Stylet loop slightly longer than labium. Multilocular pores, each with 5 or more loculi, present. Legs short, with tibia shorter than tarsus; hind coxae usually not enlarged. Claw with denticle, claw digitules knobbed, longer than claw. All coxae with spinulae; posterior coxae also with large pores. Microtubular ducts present. Cruciform pores present. Ventral setae short and hair-like.

**Dorsum.** Characteristically dome-shaped spinose setae present or absent. Anal lobes not developed; ventral surface of each lobe with a long apical seta and two shorter subapical setae. Quinquelocular pores numerous on all segments. Macrotubular ducts, if present, heavily sclerotized, each with inner ductule short, terminal gland not observed. Microtubular ducts short. Anal ring usually ventral, not well developed, without pores but with 2–8 setae, all shorter than diameter of anal ring. Cauda absent.

**Distribution.** *Ovaticoccus* species are mainly known from the Nearctic Region, mostly in South-western part of the USA (Miller and McKenzie, 1967), except *O. amplicoxae* Williams & Martin (2003), which was described from the Neotropic Region, and might not belong to *Ovaticoccus*. The species *O. agenjoi* (Gomez-Menor Ortega), known from the Palearctic region (Canary Isl.), was removed from *Ovaticoccus* by Kozár and Konczné Benedicty (2008a), and placed in the new genus *Hispaniococcus*. *O. agavium* is an alien species in Palearctic and Ethiopian regions (United Kingdom, Italian mainland and Sicily, France, Russia, Ukraine, Eritrea, Ethiopia), where it was introduced with ornamental or cultivated Agavaceae (i.e. *Agave sisalana*).

*Ovaticoccus* species live on plants belonging to Agavaceae, Asteraceae, Ephedraceae, Lamiaceae, Liliaceae, Poaceae and Polygonaceae (Miller and McKenzie, 1967; Ben-Dov *et al.*, 2011).

### *Ovaticoccus exoticus* sp. n.

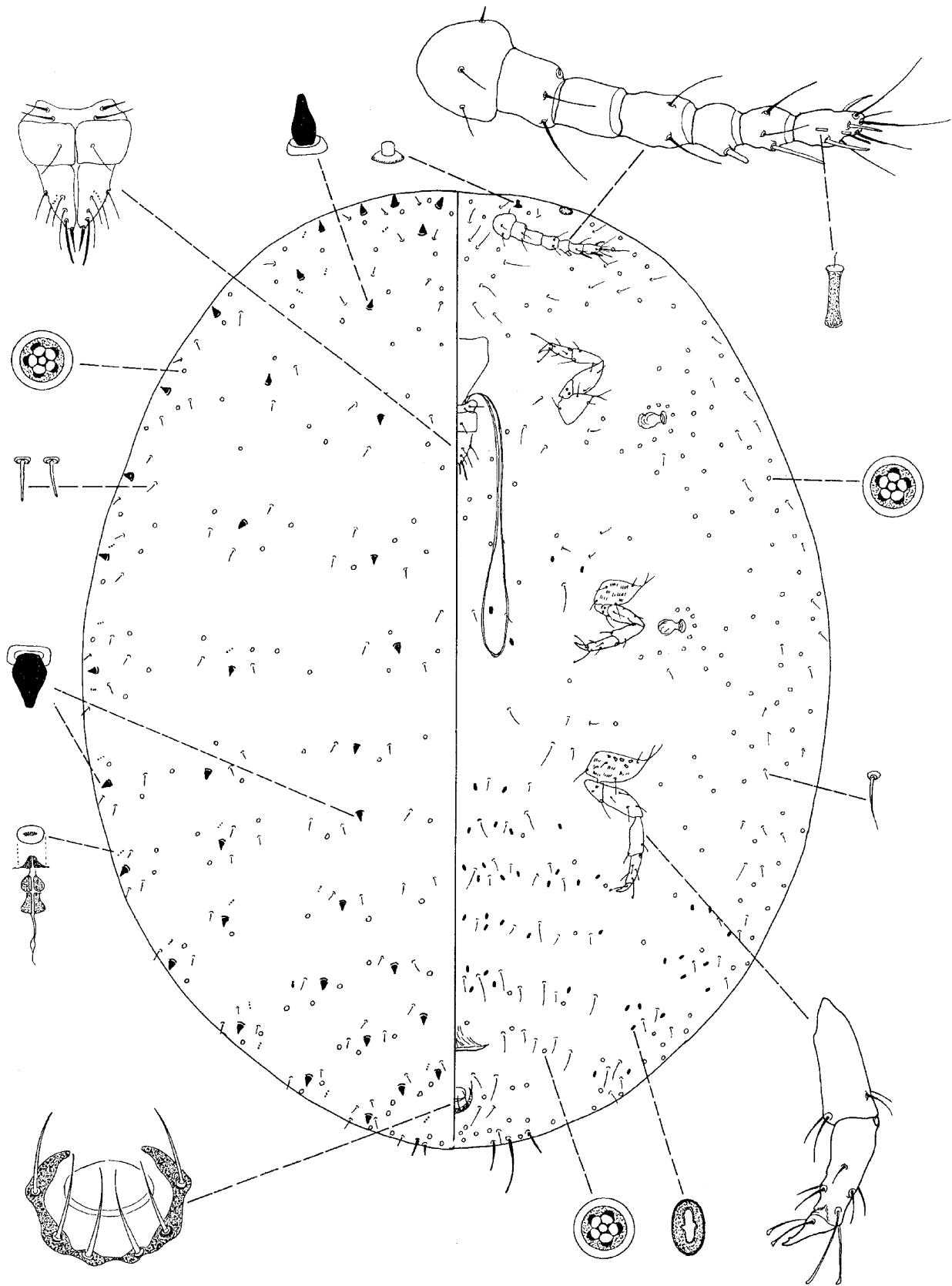
(fig. 2)

**Type data. Holotype**, adult female, **Italy**, Sicily, island of Mozia (Trapani district), off *Agave americana*, 26.viii.2008, collected by G. Pellizzari, slide n. 1546/1. **Paratypes**: 16 adult females, on slides 1546/2–9, same data as holotype; 1<sup>st</sup> and 2<sup>nd</sup> instar nymphs, on slides 1546/10–13, same data as holotype. Holotype and most paratypes deposited in DEAE, two paratypes deposited in PPI.

**Unmounted female.** Body of adult female oval, pinkish, derm membranous, covered with powdery wax and with wax filaments on abdomen.

**Mounted female.** Body oval, 2.64 (1.6–3.2) mm long, 1.5 (0.97–1.8) mm wide.

**Venter.** Antennae 7 segmented; segment lengths (in  $\mu\text{m}$ ) I: 30 (24–30), II: 26 (22–30), III: 26 (20–26), IV: 24 (20–24), V: 16 (16–22), VI: 16 (16–20), VII: 26 (24–26); segment II with 1 sensory pore, segments V and VI each with one sensory falcate seta; segment VII with 3 sensory falcate setae. Preantennal pore present, 3  $\mu\text{m}$  in diameter. Eyes present on margin. Labium 3 segmented, 84 (80–90)  $\mu\text{m}$  long, basal segment not well developed, with two pairs of setae, total number of setae 9 pairs. Stylet loop reaching line behind middle legs. Legs well developed, all about the same very constant lengths (in  $\mu\text{m}$ ), forecoxae 30, trochanter + femur 80, tibia 40, tarsus 50, claw 16–18; midcoxae 30, trochanter



**FIGURE 2.** *Ovatococcus exoticus* Pellizzari & Kozár, sp. n., adult female.

+ femur 80 (70–80), tibia 40, tarsus 50, claw 16–20; hindcoxae 30, trochanter + femur 80, tibia 40, tarsus 50, tarsal digitules knobbed 34–36, claw 18–20, claw digitules knobbed, longer than claw, 24–26. Mid- and hindcoxae with spinulae on anterior (ventral) surfaces. Each trochanter with 2 sensory pores on each surface. Claws without denticles. All legs with a few flagellate setae and with a sensory pore at base of each tarsus. Spiracles 20 µm in diameter, with 4–8 quinquelocular pores situated very near each spiracular opening. Quinquelocular pores each 5 µm in diameter, distributed mostly on body margin and submargin, around labium and on last abdominal segments. Ventral setae of variable lengths, each 8 to 40 µm long, scattered on abdomen; also some short flagellate setae present on head and thorax. Oval cruciform pores, each 6 µm long, present in small clusters on submargin of abdominal segments V–VIII and in sparse bands across medial abdominal segments; rare on mesothorax. Macrotubular ducts absent.

Anal ring incomplete, sclerotised, 34 (30–34) µm wide and 20 µm long, without pores, but with three pairs of setae, one pair 16–20 µm long, longer than other two pairs. Anal lobe not developed, with an apical seta 90 (90–110) µm long and two spine-like setae, each 28–30 and 20 µm long

**Dorsum.** Dorsal setae dome shaped, about 6–8 µm long, present mostly in single rows of 6 setae across each thoracic and abdominal, segment, plus 3 or 4 on margin of head and 3 or 4 on frons. Small hair-like setae, each about 8 µm long, scattered on abdominal segments. Microducts oval, short, sclerotized, each about 4 µm long, with normal orifice, sparse along submargin of thorax and abdomen. Quinquelocular pores, similar to those on venter, sparse over entire surface. Macrotubular ducts absent. Anal lobes not developed. Cauda absent.

**Ethymology.** The species name is based on the Latin adjective *exoticus* meaning “foreign, alien”, because this species, even though collected in Sicily (Italy), surely does not belong to European fauna.

**Affinities.** *O. exoticus* is related to *O. agavium* but differs mostly in the absence of dorsal macrotubular ducts. Moreover, it has fewer dome-shaped dorsal setae, all about the same size, and fewer oval cruciform pores on the ventral abdominal segments. *O. parkerorum* Miller shares with *O. exoticus* the absence of dorsal macrotubular ducts, but the former has a distinctly dorsal anal ring, which is circular and complete (incomplete on *O. exoticus*) and quinquelocular pores on the venter only (present on both surfaces on *O. exoticus*).

### ***Ovaticoccus agavacearum* sp. n.**

(fig. 3)

**Type data. Holotype:** adult female, **Italy**, Valenzano, (Bari district), 19.v.2008, off potted *Yucca* sp., growing indoors, collected by G. Pellizzari, slide n. 1498/1 in Pellizzari collection. **Paratypes:** 23 adult females on 9 slides n.1498/2–11; 1<sup>st</sup> instar nymphs, 2<sup>nd</sup> instar nymphs male and female, on slides 1498/12–19, same data as holotype. Holotype and most paratypes deposited in DEAE, 2 paratypes slides with seven adult females deposited in PPI.

**Unmounted adult female.** Body oval; cuticle membranous.

**Mounted female.** Body of slide-mounted specimens, oval, 2 (1.76–2.1) mm long, 1.6 (1.4–1.6) mm wide.

**Venter.** Antennae 7 segmented, segment lengths (in µm) I: 28 (26–36), II: 26 (26–33), III: 26 (26–30), IV: 23 (23–40), V: 23 (21–26), VI: 20 (20–23), VII: 31 (29–32); all segments with few setae, each about 17 µm long; segment II with 1 sensory pore, segment VII with apical seta 45 µm long, and with 3 sensory falcate setae, each 18 µm long, segments V and VI with single falcate seta, 11 and 18 µm long respectively, plus two 4 µm long coeloconic sensilla on apical segment. Preantennal pore present. Eyes present on margin. Labium 3-segmented, 67 (67–72) µm long, basal segment not well developed, with two pairs of setae; total number of setae 9 pairs; apical median setae half length of longest lateral setae. Stylet loop reaching line behind middle legs. Legs well developed (lengths µm), forecoxae 26 (26–30), trochanter 22 (22–32) femur 65 (65–68), tibia 50 (48–56) tarsus 55 (55–61), claw 21; mid-coxae 32 (26–35), trochanter 27 (26–30), femur 68 (62–72), tibia 50 (49–56), tarsus 57 (52–58), claw 21; hind-coxae 30 (28–36), trochanter 28 (28–32), femur 72 (70–75), tibia 56 (52–60), tarsus 65 (59–65), tarsal digitules knobbed, 33–36, claw 23, claw digitules 24–26, knobbed. Coxae with spinulae on anterior (ventral) surfaces; hind-coxae with translucent pores and spinulae on posterior (dorsal) surface. Each trochanter with 2 sensory pores on each surface. Claws with a denticle. All legs with a few flagellate setae and with a sensory pore at base of each tarsus. Spiracles 22 µm in diameter, with a group of quinquelocular pores in a sclerotized depression near spiracular opening. Quinquelocular pores sometimes with 3 or 7 loculi, each 6 µm in diameter, scattered in medium numbers on most of surface. Short slender setae, each 9–16 µm long, scattered on abdomen. Some longer flagellate setae

present on head, mid abdomen and thorax. Cruciform pores, each 5  $\mu\text{m}$  long, present in rows on posterior abdominal segments, absent on mid-thorax; with some scattered on submargin of posterior abdominal segments. Macrotubular ducts absent. Microtubular ducts present on margin. Oviduct or internal genital organ barely discernible.

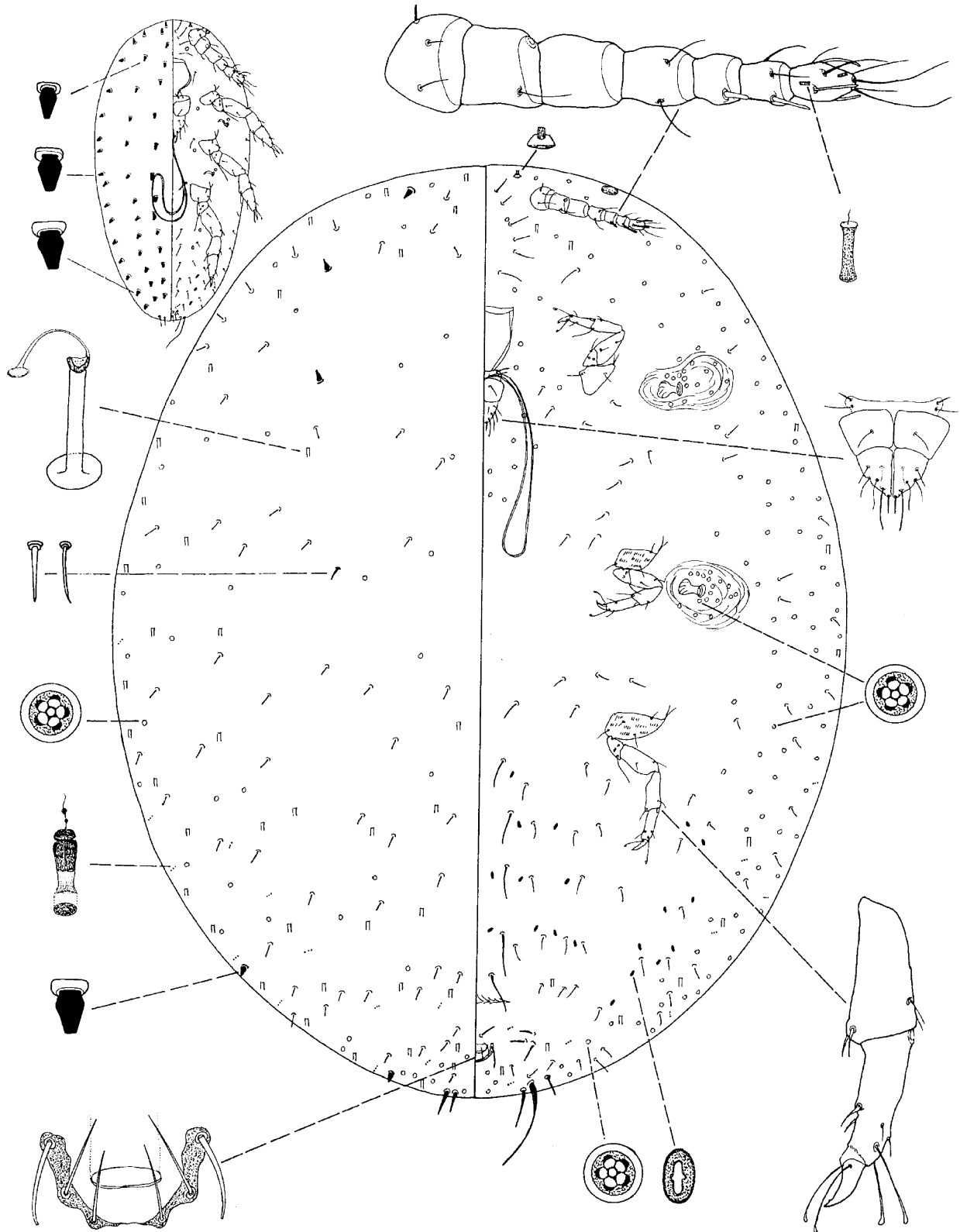


FIGURE 3. *Ovaticoccus agavacearum* Pellizzari & Kozár, sp. n., adult female; top left = first-instar nymph.



**Dorsum.** Dorsal setae dome shaped, of one size, each 6–7  $\mu\text{m}$  long, some present on margin of last abdominal segments and on head and thorax, usually with a total of 2–9 on whole of dorsum (one specimen with 14). Small hair-like setae, each 5–8  $\mu\text{m}$  long, scattered on abdominal segments. Macrotubular ducts scattered all over dorsum, each 12  $\mu\text{m}$  long and 3  $\mu\text{m}$  wide. Microtubular ducts short, sclerotized, each about 4  $\mu\text{m}$  long, with oval orifice, scattered around margin. Quinquelocular pores as on venter, few, scattered on all segments. Anal ring on venter, weakly developed, sclerotized, 35 (33–36)  $\mu\text{m}$  wide, 20 (20–24)  $\mu\text{m}$  long, without pores, but with 6 setae, each 16  $\mu\text{m}$  long, two of them stronger. Anal lobes not developed, unsclerotized, with 2 spine-like setae. Apical setae each 86  $\mu\text{m}$  long. Cauda absent.

**Mounted first instar nymph** (fig.3, top left). Body of slide-mounted specimens oval, 540–550  $\mu\text{m}$  long, 225–235  $\mu\text{m}$  wide. Antennae six segmented, apical three segments with strong sensory setae as on adult female. Dorsum with dome-shaped spines of three sizes, largest on posterior abdominal segments. Usually with six spinose setae on each segment. Tubular ducts absent. Venter with transverse rows of six small hair-like setae on each abdominal segment; median setae longer than others. Cruciform pores present on posterior 3 or 4 abdominal segments, usually with one pore on each side of segments. With 1 pair of quinquelocular pores on each thoracic segment, 1 near each spiracle, plus 1 pair on frons. Stylet loop reaching the 3<sup>rd</sup> abdominal segment, stylet length 840–860  $\mu\text{m}$ . Anal ring with three sclerotized plates and with 6 spine-like setae.

**Ethymology.** The species name *agavacearum* means “of the Agavaceae” after the family of the host plant on which this species was collected.

**Affinities.** Adult female *O. agavacearum* are similar to those of *O. agavium*, but have macrotubular ducts also on head and thorax (only on the abdomen in *O. agavium*) and few cruciform pores, these restricted to the abdominal segments (numerous, and also on thorax in *O. agavium*). Moreover, the dome-shaped spines are very few and of one size (numerous, and of different size on *O. agavium*). The first-instar nymph of *O. agavacearum* is similar to that of *O. agavium* but the latter sometimes has two cruciform pores on each side of the last abdominal segments, the anal ring has only two sclerotized lateral plates and the setae are hair-like.

#### Key to adult female *Ovaticoccus*

(after Miller and McKenzie (1967) and Williams and Martin (2003), with additions and changes).

*O. nativus* (Parrott, 1900) is not included in the key; according to Miller and McKenzie (1967), it is inadequately characterized because specimens were not available for examination. Moreover, because of some morphological characters (i.e. pores in the spiracular atrium), it should belong to the genus *Spiroporococcus* Miller.

1. Coxae greatly enlarged, with large number of pores. . . . . *O. amplicoxae* Williams & Martin
- Coxae not greatly enlarged; if enlarged, with few pores. . . . . 2
2. Macrotubular ducts absent . . . . . 3
- Macrotubular ducts present . . . . . 4
3. Cruciform pores arranged in a marginal band of single elements from prothorax to abdominal segment IX . . . . .
- . . . . . *O. parkerorum* Miller
- Cruciform pores arranged in sparse transverse bands across all abdominal segments. . . . . *O. exoticus* sp. n.
4. With at least 2–10 dome-shaped spinose setae on dorsum . . . . . 5
- Without dome-shaped spinose setae on dorsum (except for perhaps 1 or 2) . . . . . 8
5. Dorsal quinquelocular pores present. . . . . 6
- Dorsal quinquelocular pores absent (except for perhaps 1 or 2 on thorax). . . . . *O. variabilis* Miller
6. Antennae 6 segmented; ventral cruciform pores restricted to lateral margins; microcruciform pores numerous in region of hind coxae . . . . . *O. salviae* Miller
- Antennae 7 segmented; ventral cruciform pores present across most abdominal segments; microcruciform pores absent. . . . . 7
7. Ventral cruciform pores numerous across most abdominal segments and present in middle of thoracic segments; dome-shaped spinose setae numerous over dorsum . . . . . *O. agavium* (Douglas)
- With few ventral cruciform pores across most abdominal segments, these absent in middle of thoracic segments; dorsal dome-shaped spinose setae very few. . . . . *O. agavacearum* sp. n.
8. Microtubular ducts absent. . . . . *O. californicus* McKenzie
- Microtubular ducts present . . . . . 9
9. Cruciform pores present on dorsum, clustered on 9<sup>th</sup>-abdominal segment; on grass . . . . . *O. adoxus* (Ferris)
- Cruciform pores absent from dorsum; on Ephedraceae and Compositae . . . . . 10
10. Quinquelocular pores present on dorsum; antennae 7 segmented; anal ring thinly sclerotized and incomplete . . . . .
- . . . . . *O. mackenziei* Miller
- Quinquelocular pores absent on dorsum; antennae 6 segmented; anal ring circular, complete . . . . . *O. senarius* McKenzie

## Conclusions

Until present days the Italian scale insects included 32 eriococcids species (Lindinger, 1931; Tranfaglia and Esposito, 1985; Pellizzari and Russo, 2005; Pellizzari and Germain, 2010). The addition of the above new species has increased the Italian Eriococcid fauna by three species. Moreover, two other species, *Rhizococcus tavnigani* (Goux) and *Acanthococcus heteroacanthos* (Balachowsky), have been recently collected respectively in Central Italy (Caramanico, Pescara district, Abruzzo region, off unidentified plant, 28.viii.2006; Firenze Galluzzo, Tuscany region, off *Cistus* sp., 12.vi.2011) and in South Italy (Gargano, Apulia region, 23.v.2006). With these further additions, the Italian eriococcids fauna presently stands at 37 species (Table 1).

**TABLE 1.** Check list of Italian Eriococcidae and their distribution respectively in North Italy (N), Central and South Italy (S), Sicily (Si) and Sardinia (Sa). An asterisk marks alien introduced species.

Species	N	S	Si	Sa	Validation source
* <i>Acanthococcus mariannae</i> Pellizzari <sup>1</sup>	+				Pellizzari & Germain, 2010
<i>Acanthococcus aceris</i> (Signoret)	+	+			Pellizzari & Russo, 2005
<i>Acanthococcus acutus</i> (Goux)				+	Pellizzari & Russo, 2005
* <i>Acanthococcus araucariae</i> (Maskell) <sup>2</sup>	+	+	+	+	Pellizzari & Russo, 2005
<i>Acanthococcus bezzii</i> (Leonardi)	+				Tranfaglia & Esposito, 1985
<i>Acanthococcus devoniensis</i> (Green)	+		+		Pellizzari & Russo, 2005
<i>Acanthococcus ericae</i> (Signoret)				+	Tranfaglia & Esposito, 1985
<i>Acanthococcus greeni</i> (Newstead)	+	+			Pellizzari & Russo, 2005
<i>Acanthococcus heteroacanthos</i> (Balachowsky)			+		Present paper
<i>Acanthococcus latialis</i> (Leonardi)			+		Pellizzari & Russo, 2005
<i>Acanthococcus micracanthus</i> Dansig	+	+			Pellizzari & Russo, 2005
<i>Acanthococcus munroi</i> Boratynski	+	+			Pellizzari & Russo, 2005
<i>Acanthococcus roboris</i> (Goux)	+	+			Pellizzari & Russo, 2005
<i>Acanthococcus rosannae</i> (Tranfaglia & Esposito)		+	+		Pellizzari & Russo, 2005
<i>Acanthococcus thymi</i> (Schrank)	+				Lindinger, 1931; Hoy, 1963
<i>Acanthococcus uvaeursi</i> (Linneus)	+				Pellizzari & Russo, 2005
<i>Cryptococcus fagisuga</i> Lindinger	+	+	+		Pellizzari & Russo, 2005
<i>Eriococcus buxi</i> (Fonscolombe)			+		Tranfaglia & Esposito, 1985
<i>Greenisca brachypodii</i> Borchsenius & Dansig			+		Pellizzari & Russo, 2005
<i>Greenisca gouxii</i> (Balachowsky)	+	+			Pellizzari & Russo, 2005
<i>Greenisca placida</i> (Green)	+				Pellizzari & Russo, 2005
<i>Greenisca oreophila</i> Pellizzari & Kozár	+				Present paper
<i>Gossyparia spuria</i> (Modeer)	+	+		+	Pellizzari & Russo, 2005
<i>Gregoporia rosacea</i> (Balachowsky)	+	+			Pellizzari & Russo, 2005
<i>Kaweckia alpina</i> (Pellizzari)	+				Pellizzari & Russo, 2005
<i>Kaweckia glyceriae</i> (Green)	+				Pellizzari & Russo, 2005
* <i>Ovaticoccus agavacearum</i> Pellizzari & Kozár			+		Present paper
* <i>Ovaticoccus agavium</i> (Douglas)	+	+	+		Pellizzari & Russo, 2005
* <i>Ovaticoccus exoticus</i> Pellizzari & Kozár			+		Present paper
<i>Pseudochermes fraxini</i> (Kaltenbach)	+	+			Pellizzari & Russo, 2005
<i>Rhizococcus agropyri</i> Borchsenius	+	+			Pellizzari & Russo, 2005

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TABLE 1. (continued)

Species	N	S	Si	Sa	Validation source
* <i>Rhizococcus cactearum</i> (Leonardi)	+				Marotta & Garonna, 1991
* <i>Rhizococcus coccineus</i> (Cockerell)		+	+		Marotta & Garonna, 1991; Longo <i>et al.</i> , 1994
<i>Rhizococcus cynodontis</i> (Kiritchenko)	+		+		Pellizzari & Russo, 2005
<i>Rhizococcus insignis</i> (Newstead)	+		+		Pellizzari & Russo, 2005
<i>Rhizococcus pseudinsignis</i> (Green)	+				Pellizzari & Russo, 2005
<i>Rhizococcus tavnigani</i> (Goux)		+			Present paper

<sup>1</sup>Specimens of this species were mentioned by Kozár (2009) as *Uhleria?* near *araucaria* **sp. n.**

<sup>2</sup>This species was mentioned by Kozár (2009) as *Uhleria? araucariae araucariae* (Maskell)

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