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The bamboo mealybugs *Balanococcus kwoni* n.sp. and *Palmicultor lumpurensis* (Takahashi) (Hemiptera, Pseudococcidae)

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The purpose of this paper is to describe a new species of *Balanococcus* Williams that was previously misidentified as *Palmicultor bambusum* Tang.

Takahashi (1951) described a species of mealybug on bamboo from Kuala Lumpur, Malaysia, as *Trionymus lumpurensis* Takahashi. One of the important characters of this species is the presence of translucent pores on the hind coxae and minute duct-like pores on the surrounding derm next to each hind coxa. Tang (1992) later described *Palmicultor bambusum* Tang from China on bamboo. After examining authentic material of both species, Williams (2003) synonymised the name *P. bambusum* with *T. lumpurensis* under the new combination *Palmicultor lumpurensis* (Takahashi). Williams (2004) redescribed and illustrated the species in detail.

Recently, in a paper describing some species from Korea, Kwon *et al*. (2003) recorded *T. lumpurensis* and described and illustrated the species. Although these authors discussed the minute pores surrounding the hind coxae, these pores were not shown on the main illustration. In the same paper, the authors also redescribed another species as *Balanococcus bambusum* (Tang) (= *Palmicultor bambusum* Tang). The record and description of *T. lumpurensis* appear to be correct but it is clear from the work of Williams (2003) that the identity of *B. bambusum* by Kwon *et al*. (2003) is based on a misidentification and that the species is distinct and needs a new name.

Specimens collected recently in the Botanic Garden at Padua, Italy, are identical with the species described by Kwon *et al*. (2003) as *P. bambusum* and the opportunity is taken here to describe this species as new in the genus *Balanococcus*.

Methods. The description is based on 10 slide-mounted specimens, in good condition, and measurements are given as minimum and maximum, generally followed by the mean in parentheses. Terminology follows that used in Williams (2004).

Abbreviations for the depositories are as follows: DEAE (Department of Environmental Agronomy and Crop Production - Entomology, University of Padua, Italy); IAST (Entomology Division, National Institute of Agricultural Sciences and Technology, Suwon, Korea); ZIN (Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia); BMNH (The Natural History Museum, London, UK).

Balanococcus kwoni Pellizzari & Danzig, n. sp.

Balanococcus bambusum (not Tang, 1992); Kwon, Danzig & Park, 2003: 398 (misidentification).

Living specimens. Adult females elongate-oval, dark red, covered with fine, white, mealy wax.

Mounted specimens. Adult female (fig. 1) elongate, oval, sides sub-parallel, 3–4.57mm (3.58) long, 1.4–1.9mm (1.7) wide across fourth abdominal segment. Anal lobes barely perceptible, each with ventral surface bearing an apical seta 125–150 μm (137) long.

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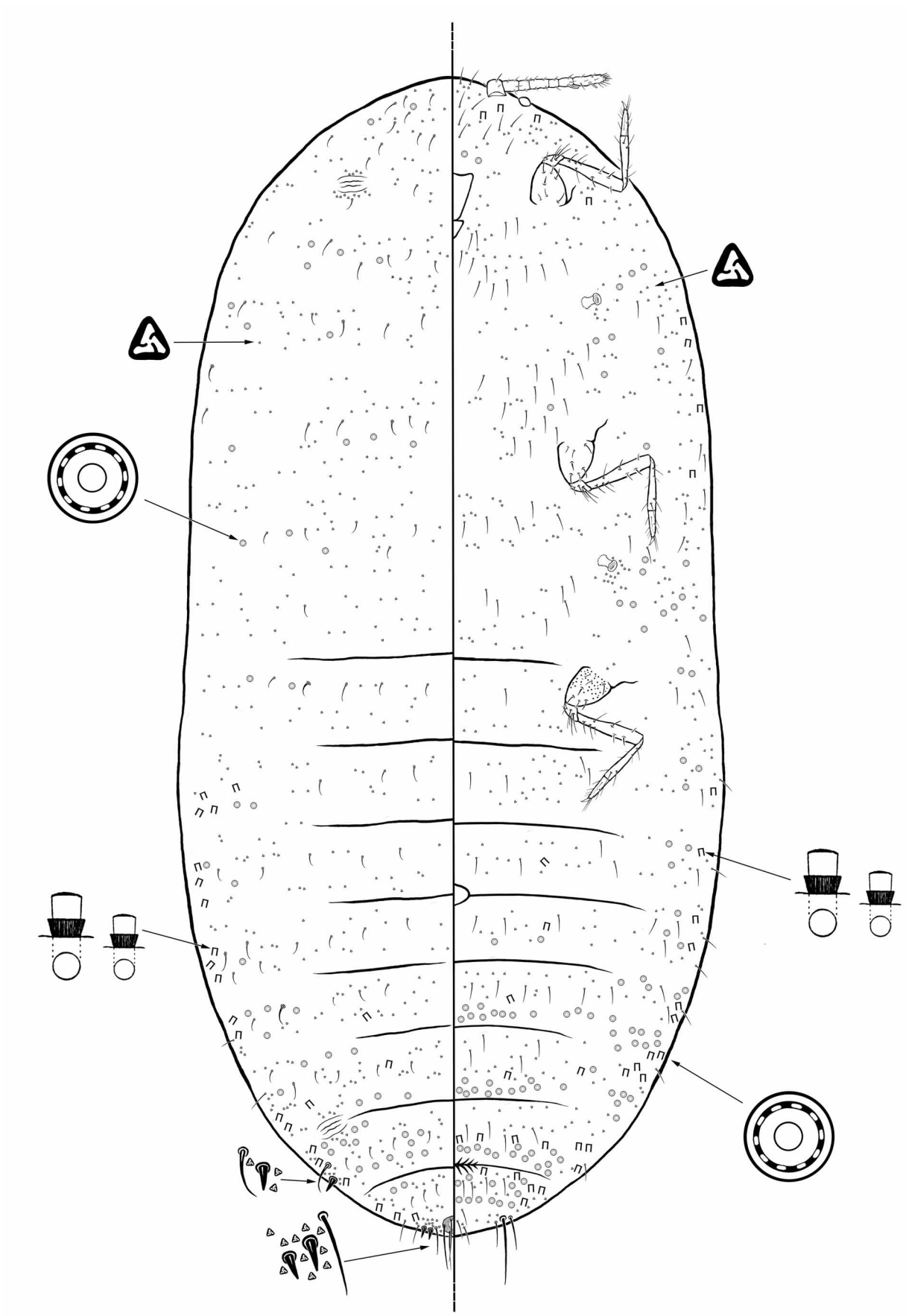

FIGURE 1. Adult female of *Balanococcus kwoni* **n. sp.**

Venter. Antennae each 250–275 μm (260) long, with 7 segments (rarely 6, when 3rd segment with a weak sign of segmentation). Legs small and slender, hind coxa 50–60 μm long, hind trochanter + femur 170–185 μm (177) long, hind tibia + tarsus 170–190 μm (182) long; claw without denticle, 20–25 μm long. Claw digitules longer than claw, knobbed; tarsal digitules 30–40 μm (36) long, knobbed. Translucent pores present on hind coxae. Labium 75–100 μm (87) long, shorter than clypeolabral shield. Spiracles with associated trilocular pores. Circulus present, small, round, not divided by intersegmental fold, 55–75 μm (67) wide. Trilocular pores evenly distributed. Multilocular disc-pores sparse on body submargin and present in transverse rows on abdominal segments, numerous on segments VII and VIII, present also on segments VI and V. Oral collar tubular ducts of two sizes, both with deep collars, larger 6 μm long, 3.4 μm wide, smaller 4 μm long and 2.4 μm wide, more numerous in last abdominal segments, distributed among multilocular disc pores, present also on margin of head and thorax and rare over medial part of abdominal segments. Ventral setae sparse, slender, longer on posterior abdominal segments.

Dorsum. Ostioles poorly developed, each with 4 or 5 trilocular pores on each lip. With two pairs of cerarii: anal lobe cerarii each with 2 conical setae, 1 or 2 auxiliary setae and 8–10 trilocular pores. Penultimate cerarii with 2 conical setae and 2–5 trilocular pores; sometimes one conical seta is replaced by a flagellate seta. Anal ring 65–80 μm (73) wide, with 2 rows of pores and 6 anal ring setae, each 120–150 μm (138) long. Trilocular pores evenly distributed. Multilocular disc pores present in transverse rows on posterior abdominal segments, and sparse on body margin and on head. Oral collar tubular ducts similar in size to those on dorsum, more numerous on margin of last abdominal segments, rare on margin of thorax. Dorsal setae short and slender.

Material examined. **Holotype**: adult female, **Italy**, Botanic Garden of Padua, on *Pseudosasa japonica* 16.XI.2006, G. Pellizzari, slide n. 1328/1, DEAE.

Paratypes: 19 adult females, **Italy**, same date and locality as holotype, slides n. 1328/2-1328/16, DEAE; 2 females in ZIN; 3 females in BMNH; **South Korea**, SE Yangle, flower shop, *Phyllostachys*, 3.IX.2000, G.M. Kwon, slide n. 0104031-GM08, 1 female, ZIN.

Other material: Italy, 2 males and some unmounted females, same date and locality as holotype are deposited in the collection of DEAE; **South Korea**, 12 adult females, Daseo-ri, Chuja, Bukjeju, on *Pseudosasa japonica*, 12.VI.2001, G.M. Kwon, IAST.

Etymology. The species is named after Gi-Myon Kwon, who collected this new species in South Korea.

Host plant: *Pseudosasa japonica, Phyllostachys* (Gramineae)

Distribution. South Korea (Daseo-ri, Chuja, Bukjeju); Italy (Padua, Botanic Garden).

Comments. The genus *Balanococcus* Williams is characterised by the presence of numerous oral collar tubular ducts on the dorsum and venter, distributed around the entire body margin, and multilocular disc-pores with a similar distribution but also present in transverse rows on the abdomen. Only *B. caucasicus* Danzig and *B. orientalis* Danzig & Ivanova possess the marginal band consisting of tubular ducts only (Danzig, 1998). The new species has dorsal and ventral tubular ducts and multilocular disc-pores around the margin and submargin of the entire body, but in low numbers.

Biological observation. Live females are dark red in colour. They lay dark-red eggs in a white waxy ovisac that sometimes covers part of the female body. Post-reproductive dead females, egg-laying females, eggs in ovisacs and dead males were collected under the leaf sheaths of *Pseudosasa japonica* in the Botanic Garden of Padua (Italy) in November 2006. On March 2nd, 2007, only groups of eggs were found under the leaf sheaths of the infested plants, so the species overwinters in the egg stage. Overwintering eggs had started to hatch by the end of March and the first adults (males and females) were observed on April 24th.

The binomen *Balanococcus bambusum* (Tang) cannot be retained among the synonyms of *P. lumpurensis*, and so the list of synonyms under *P. lumpurensis* as reported in ScaleNet (Ben-Dov *et al*., 2007) should be emended as follows:

Palmicultor lumpurensis (Takahashi, 1951)

Trionymus lumpurensis Takahashi, 1951: 12; Kwon, Danzig & Park, 2003a: 417.
Palmicultor bambusum Tang, 1992: 597. Synonymised by Williams, 2003: 68.
Saccharicoccus bambusus (Tang), Fang *et al*., 2001:104. Change of combination.
Palmicultor lumpurensis (Takahashi), Williams, 2003: 68, change of combination; Williams, 2004: 453.

According to the literature, the host plants and distribution of *P. lumpurensis* are as follows:

Host plants: *Bambusa* sp. (Takahashi, 1951), *Lingnania cerosissima* (Tang, 1992), *Bambusa blumeana*, *B. philippinensis* (Williams, 2004), *Phyllostachys* sp. (Kwon *et al*., 2003), *B. oldhamii and* A*rundinaria* sp. (Hodges & Hodges, 2004) (Fam. Gramineae).

Distribution: China, Hong Kong, Malaysia, Philippines, Vietnam, Australia (Queensland) (Williams, 2003; 2004); South Korea, (Kwon *et al*., 2003), USA (Florida) (Hodges & Hodges, 2004).

In addition to the above information reported in the literature, further information on this species can be found in the following links: http://www.doacs.state.fl.us/pi/enpp/ento/t-lumpurensis.html; http://www.bamboocraft.net/forum; and http://www.texasbamboosociety.org.

They indicate that *P. lumpurensis*, first recorded in Florida in 2002, has spread to several counties in Florida, Texas and California (USA), and is affecting several other species of *Bambusa* (*B. multiplex*, *B. beecheyana*, *B. textiles* and *B. tuldoides*).

Comments on mealybugs of bamboo

Over 30 species of pseudococcids are known to occur worldwide on different species of bamboo (Ben-Dov *et al*., 2006). Several of these species are legless mealybugs belonging to the tribe Serrolecaniini, revised by Hendricks and Kosztarab (1999). More recently, Williams and Miller (2002) provided a key to the *Antonina* species occurring on bamboo. Among the legless mealybugs, *Tangicoccus elongatus* (Tang) is considered to be a serious pest of bamboo in China, while *Antonina nakaharai* Williams & Miller, *A. praetiosa* Ferris and *Chaetococcus bambusae* (Maskell), have spread to several parts of the world but are considered to be only minor pests of bamboo. *P. lumpurensis* has spread more widely from its native area in only a few years and now causes severe damage to bamboos, killing new shoots and affecting the aesthetic look of the plants (Hodges & Hodges, 2004).

The new species, *B. kwoni*, has so far been recorded from only South Korea and Italy (Botanic Garden of Padua). It is worth mentioning that the bamboo plants in the Botanic Garden of Padua were planted in the second half of the nineteenth century and, according to the Curator of the Botanic Garden, no further introductions of bamboo plants have occurred since. The mealybugs were concealed under the leaf sheaths and no sign of the infestation (wax, honeydew, sooty mould) was detectable on the plants.

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