

SHORT COMMUNICATION

## *Trionymus okiensis* sp. nov., a new species of mealybug from Japan (Hemiptera: Coccoomorpha: Pseudococcidae)

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**Abstract.** A new species of mealybug (Hemiptera: Sternorrhyncha: Coccoomorpha: Pseudococcidae), *Trionymus okiensis* sp. nov., is described based on adult females collected in Dougo Island, Shimane Prefecture, Japan, on Japanese silver grass, *Miscanthus sinensis* (Poaceae). The new species resembles *Trionymus frontalis* McKenzie, 1967 and *Dysmicoccus boninsis* (Kuwana, 1909), but differs from both those species in having 4 to 6 cerarii, relatively deep oral-collar tubular ducts of two different sizes on dorsum, a number of multilocular pores on the dorsum and more than 10 auxiliary setae on each anal lobe cerarius. A key to two species of *Trionymus* Berg, 1899 currently known from Japan is provided.

**Key words.** Hemiptera, Sternorrhyncha, Coccoidea, scale insects, Japanese silver grass, morphology, taxonomy, description, Oki Islands, Palearctic Region

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### Introduction

*Trionymus* Berg, 1899 is a genus of mealybugs (Hemiptera: Coccoomorpha: Pseudococcidae) that mainly infest Poaceae, living under the leaf sheaths (DANZIG & GAVRILOV-ZIMIN 2015). The taxonomy and morphology of Japanese grass-infesting mealybugs have not been adequately studied. Although there are currently 121 valid species of *Trionymus* described worldwide, only one species has been recorded from Japan (KANDA 1959, DANZIG & GAVRILOV-ZIMIN 2015, TANAKA 2016, GARCÍA MORALES et al. 2017). It is likely that many more members of the genus are present in Japan.

During a faunal survey of scale insects in Shimane Prefecture, Japan, I found an undescribed species of *Trionymus* infesting Japanese silver grass, *Miscanthus sinensis* Andersson (Poaceae), on an island located in the prefecture. This paper describes and illustrates this species new to science, based on the morphology of the adult female.

### Materials and methods

The slide-mounting method used was that of TANAKA (2014), which was slightly modified from KAWAI (1980). The morphology of mounted specimens was examined under a phase-contrast compound light microscope (Olympus BH2-PH, Tokyo, Japan). A combination of an ocular micrometer and an objective micrometer were used to make measurements of specimens. For all measurements, the value for the holotype is given, followed by the range for all specimens studied in parentheses (N = 4 for *T. okiensis* sp. nov.). The morphological terminology and description format mostly follow WILLIAMS (2004). The holotype and one paratype of the new species described here are deposited in the National Museum of Nature and Science, Tsukuba, Japan (NSMT), and two paratypes are deposited in the Ehime University Museum, Matsuyama, Japan (EUMJ). The holotype and two paratypes of *Trionymus frontalis* McKenzie, 1967 and specimens of *Dysmicoccus boninsis*



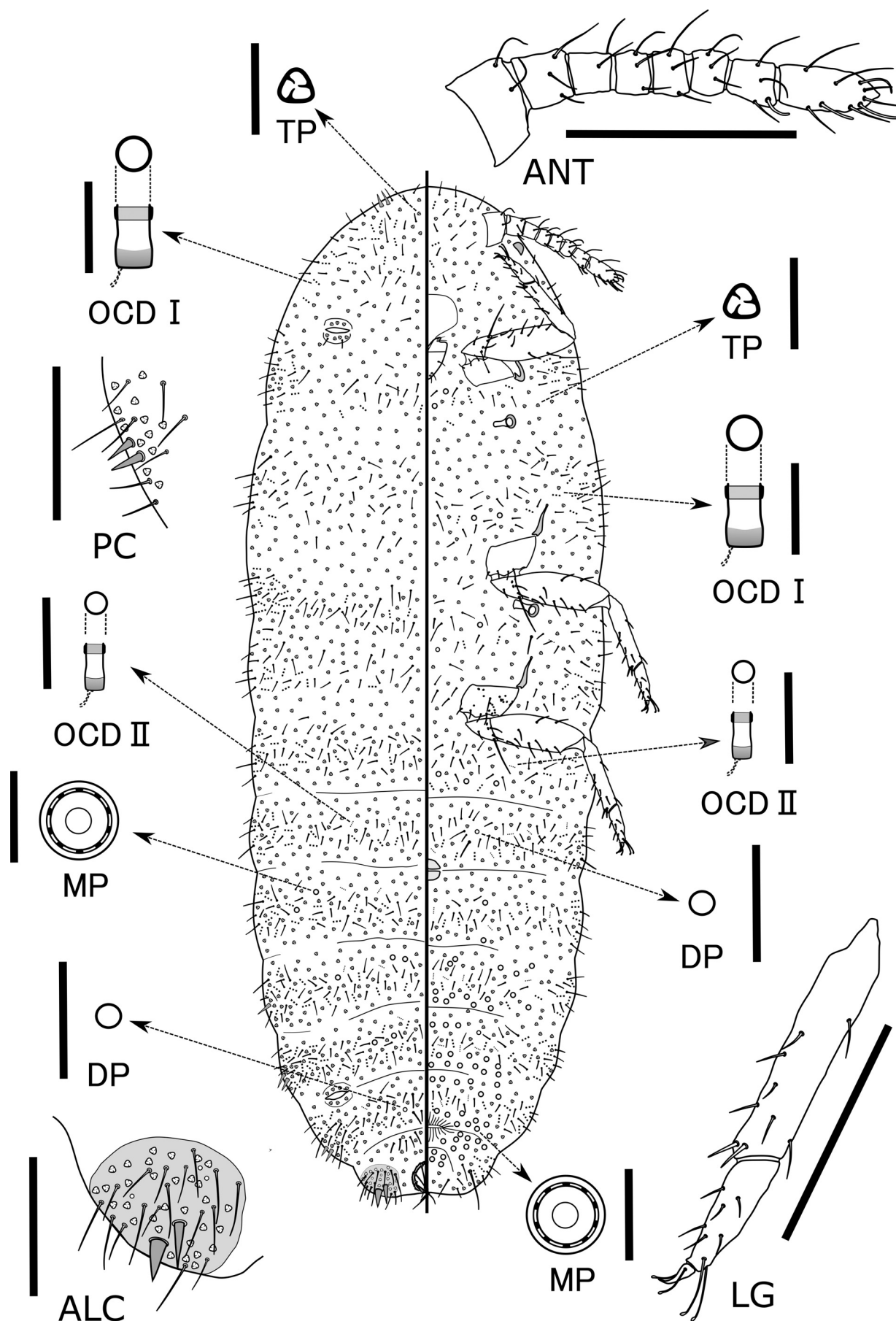


Fig. 1. *Trionymus okiensis* sp. nov., left side dorsal view, right side ventral view. ALC – anal lobe cerarius; ANT – antenna; DP – discoidal pore; LG – hind tibia, tarsus and claw; MP – multilocular pore; OCD I – large type of oral-collar tubular duct; OCD II – small type of oral-collar tubular duct; PC – penultimate cerarius; TP – trilocular pore. Scale bars: 200 µm for ANT, LG; 100 µm for ALC, PC; 10 µm for others.

(Kuwana, 1909) examined for comparison in this study are deposited at the Bohart Museum of Entomology, University of California, Davis, USA (UCDC) and in Dr. Shozo Kawai's scale insect collection at the Tokyo University of Agriculture, Tokyo, Japan (KTUA), respectively.

## Taxonomy

### *Trionymus okiensis* sp. nov.

(Fig. 1)

**Type material.** HOLOTYPE: adult ♀, JAPAN: SHIMANE / PREFECTURE: Oki Islands, / Dougo Island, / Okinoshima-cho, / Kaminagu. 24.X.2014 // Host plant: *Miscanthus / sinensis* ANDERSSON / H. TANAKA coll. // *Trionymus okiensis* / Tanaka, 2018 / HOLOTYPE [red label]\* (mounted on a slide by itself, NSMT-I-Ho 00083. PARATYPES: 3 adult ♀♀, JAPAN: SHIMANE / PREFECTURE: Oki Islands, / Dougo Island, / Okinoshima-cho, / Kaminagu. 24.X.2014 // Host plant: *Miscanthus / sinensis* ANDERSSON / H. TANAKA coll. // *Trionymus okiensis* / Tanaka, 2018 / PARATYPE [blue label] (on three slides, 1 slide NSMT-I-Ho 00084, 2 slides in EUMJ).

**Description. Adult female.** Body elongate oval, 2.6 (2.5–3.0) mm long and 1.0 (1.0–1.1) mm wide, derm membranous; segmentation relatively well-developed. Anal lobes distinct but not prominent, dorsum of each lobe with a weakly sclerotized area and ventral surface with a long apical seta, 144–147 (133–166) µm long. Antenna 358–370 (326–370) µm long, with 7 or 8 segments and many flagellate setae; subapical segment with 1 fleshy seta and apical segment with 3 or 4 fleshy setae. Legs well-developed, with many flagellate setae; hind trochanter + femur 320–330 (300–330) µm long, hind tibia + tarsus 334 (313–340) µm long; claw 30 (30–33) µm long. Ratio of lengths of hind tibia + tarsus : trochanter + femur 1.0 (1.0–1.1); ratio of lengths of hind tibia to tarsus 2.1 (1.9–2.2). Paired tarsal digitules present, subequal in length and both minutely knobbed. Translucent pores few, present on hind coxa only. Labium about 77 (75–81) µm long, shorter than clypeus. Circulus present between 3<sup>rd</sup> and 4<sup>th</sup> ventral abdominal segments, 55 (50–55) µm long and 70 (62–74) µm wide, divided by intersegmental line. Ostioles present, each with inner edges of lips not sclerotized; anterior ostioles each with a total for both lips of 21–30 trilocular pores and 2–4 (0–4) setae; each posterior ostiole with a total of 10–11 (7–11) trilocular pores and 0 (0–1) setae for both lips. Anal ring 92 (80–92) µm wide, with 2–3 rows of cells, bearing 6 setae, each seta 145–155 (138–162) µm long. Cerarii numbering 5 (4–6) pairs, with 1 pair of frontal cerarii on head, other cerarii situated on posterior abdominal segments, but occasionally some cerarii lacking. Anal lobe cerarii situated on sclerotized cuticle, each containing 2 conical setae, each seta 26–29 (27–33) µm long and about 8–10 (8–14) µm wide at base; plus 18–19 (13–19) auxiliary setae and concentration of trilocular pores. Penultimate cerarii each containing 2 conical setae and a few auxiliary setae, situated on membranous cuticle. Cerarii situated further forward generally each with a pair of conical setae and a few auxiliary setae, or with 1 conical seta and with or without a few auxiliary setae.

**Dorsum.** Setae slender and flagellate, each 15–60 (13–60) µm long, longest setae present on posterior part of abdomen. Trilocular pores evenly distributed. Oral-collar

tubular ducts of two sizes present: (i) large-type ducts, each about 3–4 µm in diameter, obviously wider than a trilocular pore, present in band across most abdominal segments, marginal area of head and thoracic segments, and medial area of thoracic segments; (ii) small-type ducts, each about 1.5–2 µm in diameter, relatively sparse on abdominal segments, intermixed with the larger type. Discoidal pores sparse, mostly situated on posterior segments. Multilocular disc pores each 7–9 µm wide, present on abdominal segments as follows: I 0 (0), II 1 (0–1), III 1 (0–1), IV 2 (1 or 2), V 6 (1–6), VI 10 (2–10), VII 2 (1–5), VIII 0 (0).

**Venter.** Ventral surface bearing slender flagellate setae, each 20–78 (20–86) µm long, longest on posterior part of abdomen and head. Multilocular disc pores, each 7–9 µm wide, mostly present on posterior abdominal segments, occasionally a few present on some segments of head, thorax and anterior abdomen. Trilocular pores evenly distributed. Oral-collar tubular ducts present in two sizes, same as on dorsum: large type ducts with diameter 3–4 µm (diameter slightly larger than that of a trilocular pore) present in irregular band on head, in transverse bands on all thoracic and abdominal segments, but mostly concentrated on abdominal segments; small-type ducts more sparsely distributed on most abdominal segments, intermixed with the larger type. Discoidal pores rarely present, mostly situated on posterior segments.

**Differential diagnosis.** The only other species of *Trionymus* so far known from Japan, *T. kobotokensis* Kanda, 1959, can be relatively easily distinguished from *T. okiensis* sp. nov. using the identification key below.

Outside Japan, *T. okiensis* sp. nov. is quite similar to *T. frontalis* McKenzie, 1967 so far only known from California, USA (GARCIA MORALES et al. 2017) in having a pair of frontal cerarii, oral-collar tubular ducts of two different sizes on the dorsal surface, and a circulus divided by an intersegmental line. However, the new species is distinguishable from *T. frontalis* by the following characters (characters of *T. frontalis* are given in parentheses): cerarii numbering 4–6 pairs (3 pairs); relatively deep oral-collar tubular ducts on dorsum present in two distinctly different sizes (different types of dorsal ducts are difficult to distinguish from each other, and the ducts are so shallow that outer ductules can be hardly seen in slide-mounted specimens); legs short, with hind trochanter + femur 300–330 µm long (legs relatively long, with hind trochanter + femur 420–458 µm long).

*Trionymus okiensis* sp. nov. is also similar to *Dysmicoccus boninsis* (Kuwana, 1909), the pantropical pest of sugarcane (*Saccharum officinarum* L.), in having a pair of frontal cerarii and oral-collar tubular ducts of two different sizes on the dorsal surface. However, it differs from *D. boninsis* in the following characters (characters of *D. boninsis* are given in parentheses): more than 10 auxiliary setae on each anal lobe cerarius (fewer than 10); multilocular pores on the dorsum (without dorsal multilocular pores); circulus divided by an intersegmental line (circulus not divided); and narrow and parallel-sided body with the ratio of its maximum length to maximum width 2.5–2.7 (body usually



relatively broad, with ratio of maximum body length to maximum body width 1.7–2.0).

**Etymology.** The new species is named after the archipelago where it was first collected (Dougo Island is one of the Oki Islands), combined with the Latin suffix “-ensis” indicating the place of origin, in order to form an adjective.

**Comments on the classification.** Some species of the genus *Trionymus* are very close to several species belonging to *Dysmicoccus* Ferris, 1950 and the current definitions of these genera are probably arbitrary (WILLIAMS 2004). Most researchers follow MCKENZIE (1967), who placed species with 6 or more pairs of cerarii in *Dysmicoccus*, and species with 5 or fewer pairs of cerarii in *Trionymus*. However, on this basis it is difficult to determine the generic position of *Dysmicoccus angustifrons* (Hall, 1926), which possesses 2–6 (sometimes up to 10) pairs of cerarii (DANZIG & GAVRILOV-ZIMIN 2015), resulting in some controversy about its placement (e.g., DANZIG & GAVRILOV-ZIMIN 2015, MATILE-FERRERO et al. 2015). A similar taxonomic problem probably occurs also in *T. okiensis* sp. nov. because it has 4–6 cerarii. In this study, *T. okiensis* is placed tentatively in *Trionymus* based on its morphological similarity to *T. frontalis* (i.e., having two types of oral-collar ducts on dorsum, a small number of multilocular pores on dorsum, a circulus divided by an intersegmental line, and cerarii fewer than 6 pairs).

#### Key to the Japanese species of *Trionymus*

(adapted and modified from DANZIG  
& GAVRILOV-ZIMIN 2015)

- 1 Head with one pair of cerarii; dorsal oral-collar tubular ducts of two different sizes. .... *T. okiensis* sp. nov.
- Head without cerarii; oral-collar tubular ducts absent from dorsum. .... *T. kobotokensis* Kanda, 1959

#### Other material examined

##### *Trionymus frontalis* McKenzie, 1967

*Trionymus frontalis* McKenzie, 1967: 471.

**Type material examined.** HOLOTYPE: adult ♀, *Trionymus / frontalis* McKenzie / TYPE / UCD type# 142 // No. 58G25-3 Cal. Dept Agri / Loc. Chatsworth / Los Angeles Co., CALIF., / July 9 -1958 / ex. *Elymus* sp. / (leaf sheath) / L. R. Gillogly coll. (UCDC). PARATYPES: 2 adult ♀♀, *Trionymus / frontalis* McKenzie / PARATYPE // No. 58G25-3 Cal. Dept Agri / Loc. Chatsworth / Los Angeles Co., CALIF., / July 9 -1958 / ex. *Elymus* sp. / (leaf sheath) / L. R. Gillogly coll. (UCDC).

##### *Dysmicoccus boninsis* (Kuwana, 1909)

*Dactylopius (Pseudococcus) boninsis* Kuwana, 1909: 161.

*Dysmicoccus boninsis* (Kuwana): FERRIS (1950: 57). See GARCÍA MORALES et al. (2017) for a full bibliography.

**Material examined.** 2 adult ♀♀, JAPAN: BONIN ISLANDS: Chichi-jima Island, Komagari, 23.ii.1969, host plant: *Saccharum officinarum* L., S. Kawai coll.; 3 adult ♀♀, Haha-jima Island, 15.iii.1981, host plant: *Panicum repens* L., S. Kawai coll. (all KTUA).

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