

Contribution to our knowledge of *Aleurocybotus* Quaintance & Baker (Hemiptera: Aleyrodidae)

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Abstract: The genus *Aleurocybotus* Quaintance & Baker (Hemiptera: Aleyrodidae) is a newly recorded genus in China. This new record species *Aleurocybotus occiduus* Russell is redescribed with morphological illustrations and photographs from a scanning electron microscope (SEM). Its distribution and host plant are also provided. It is compared with *A. cereus* Martin and *A. graminicolus* (Quaintance) and the geographical distribution of *Aleurocybotus* are noted. An identification key to *Aleurocybotus* species is provided.

Key words: Aleyrodoidea; taxonomy; key; distribution

中国狭粉虱属 *Aleurocybotus* Quaintance & Baker 分类研究（半翅目：粉虱科）

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摘要: 对中国粉虱科狭粉虱属 *Aleurocybotus* 的种类进行了分类研究。记述了中国新记录属狭粉虱属 *Aleurocybotus* 及新记录种禾狭粉虱 *Aleurocybotus occiduus* Russell, 对其进行了重新描述, 并提供了基本信息, 地理分布和形态特征图。此外对狭粉虱属另外 2 个种 *A. cereus* Martin 和 *A. graminicolus* (Quaintance) 进行了简单讨论, 分析了该属种类的地理分布情况; 以伪蛹特征制作了狭粉虱属分种检索表。

关键词: 粉虱总科; 分类; 检索表; 分布

Introduction

The genus *Aleurocybotus* was originally established by Quaintance and Baker (1914) with *Aleurodes graminicolus* as its type species by monotypy, which Quaintance (1899) collected from an undetermined grass in Florida. Only three known species so far have been placed in this genus: *A. cereus* Martin, *A. graminicolus* (Quaintance), and *A. occiduus* Russell. Russell (1964) described *A. occiduus* from *Cypems rotundus* in Thermal, California. Quaintance (1899) described *A. graminicolus* from unidentified Poaceae grass in Florida, USA. Martin (2005) described *A. cereus* from *Lasiacis rugelii* in the Chiquibul Forest Reserve, Belize. Members of this genus are usually found on grass hosts in the Poaceae and Cyperaceae. Bink-Moenen (1983) originally separated the *Aleurocybotus graminicolus* group from the *A. setiferus* group according to the length and position of adult antennae, the gender difference in antennae length and their geographical distribution. Russell (2000) concurred and proposed a new genus, *Vasdaividius* with *Aleurocybotus indicus* as its type species by

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original designation, to accommodate the five Old World species (*V. cobarensis*, *V. concursus*, *V. indicus*, *V. miscanthus*, *V. setiferus*) formerly included in *Aleurocybotus*, including three species from Taiwan, China (Ko *et al.* 1998). In addition to the characteristics of the pupa, Russell (2000) separated *Aleurocybotus* from *Vasdavidius* by having feet with one smooth, normal claw and a claw-shaped appendage that appears fleshy in the former versus having feet with two smooth, normal claws, and a paronychium between claws.

Russell (2000) considered *Aleurocybotus* as a New World genus mainly distributed in the Nearctic and Neotropical Regions. *Vasdavidius* was considered an Old World genus and is mainly distributed in the Palearctic and Oriental Regions. Martin (1999) reported three species belonging to *Vasdavidius* in Australia. Here we collected *A. occiduus* in Zhejiang, China. This is the first time the genus *Aleurocybotus* has been recorded in China. This species is redescribed with morphological illustrations and photographs from a scanning electron microscope (SEM), and the host plant and distribution are also provided.

Material and methods

All the puparia of *A. occiduus* were collected from Thousand Islet Lake (TIL), Chun'an, Zhejiang. The puparia were mounted following the method suggested by Wang (2015). The terminology of morphological structures of puparium follows Bink-Moenen (1983), Martin (1985), and Gill (1990). Puparial measurements and microphotographs were taken using an OLYMPUS microscope CX33. The habitus images were taken using the LEICA M165 C and digital camera Nikon D500. The scanning electron microscope (SEM) images were taken using a Hitachi TM4000Plus at 15kV/EHT and 20 Pa between 80× to 800× magnification. The SEM sample of the specimen was prepared for SEM studies by cutting the leaf along with a puparium, then mounting it on a stub on black carbon conductive adhesive. The specimens are deposited in the Insect Collection of Zhejiang Agriculture & Forestry University.

Taxonomy

Aleurocybotus Quaintance & Baker, new record to China

Aleurocybotus Quaintance & Baker 1914: 101.

Type species. *Aleurodes graminicola* Quaintance 1899, by monotypy.

Cephalic setae, eighth abdominal and caudal setae usually present, first abdominal setae present or absent. Vasiform orifice cordate, subcordate or subtriangular, posterior with closure at the posterior end. Operculum rectangular, long, slightly arc-shaped and shorter than wide, hind margin slightly curved anteriorly or straight, covering about half of orifice.

Distribution. China (Zhejiang) (new record); USA (Arizona, California, Florida, Hawaii, Texas) (Russell 1964; Quaintance 1899; Evans 2008); Peru (Evans 2008); Belize (Martin 1999); Mexico (Vejar-Cota *et al.* 2009)

Diagnosis. Yellowish, elliptical or sub oval, margin dentate or crenulated. Transparent, colorless wax on the dorsum and venter and white wax encircling pupal case margin. The submarginal area and dorsal disc are not clearly separated. Dorsal disc smooth or slightly

sculptured and membranous or slightly sclerotic. Longitudinal and transverse moulting suture reaching margin. Thoracic and abdominal segment sutures well-defined. Submedian depressions present on abdominal segment.

Remarks. The puparium of *Aleurocybotus* resembles that of *Aleurocyperus* in the shape, but differs from it in the presence of first abdominal setae, details of dorsal setae, and the antenna of male and female extending beyond posterior margin of proleg. The puparium of *Aleurocybotus* resembles that of *Vasdaavidius* in the shape of puparia and vasiform orifice but differs in the length and the position of antennae (Bink-Moenen 1983; Ko *et al.* 1998; Ko & Dubey 2007).

Key to puparia of the *Aleurocybotus* species of the world

1. Puparia relatively short and narrow; vasiform orifice cordate; margin crenulated; puparia with a pair of setae on posterior margin; the eighth abdominal setae not lateral to vasiform orifice; caudal furrow not obvious; host plant only Poaceae 2
- Puparia relatively long and wide; vasiform orifice elongate triangular; margin dentate; puparia without a pair of setae on posterior margin; the eighth abdominal setae lateral to vasiform orifice; caudal furrow obvious; host plants Poaceae and Cyperaceae *A. occiduus* Russell
2. Puparia about 0.57–0.78 mm long and 0.27–0.39 mm wide; puparia with a stripe of dark brown; anterior marginal setae present; vasiform orifice internally smooth *A. cereus* Martin
- Puparia about 1 mm long and 0.46 mm wide; puparia without a stripe of dark brown; anterior marginal setae absent; vasiform orifice internally corrugate *A. graminicolus* (Quaintance)

1. *Aleurocybotus occiduus* Russell, new record to China (Figs 1–4)

Aleurocybotus occiduus Russell 1964: 101.

Egg. Teardrop-shaped; yellow to brown; about 154 μm long, 66 μm wide; mainly distributed in the middle part of the lower surface of the leaves.

First instar nymph. Yellowish, long elliptical, about 238 μm long, 123 μm wide; the white waxy secretion present surrounding the body margin.

Second instar nymph. Yellowish, long elliptical, about 425 μm long, 229 μm wide; the whole puparium thickened; caudal setae present; eye spots red.

Third instar nymph. Pale yellow, long elliptical, about 768 μm long, 356 μm wide; submedian depressions present; eye spots red but smaller. Vasiform orifice elongate triangular.

Puparium. Puparia yellow to brown, long elliptical, about 987 μm in length, 423 μm in width, with filamentous waxy secretions around the margins.

Margin. Dentate, 13–14 crenulations in 100 μm , usually widest at the second to third abdominal segments. There is no obvious thoracic tracheal comb.

Dorsum. Flat. The transverse molting suture reaches body margin, as do longitudinal moulting suture. Separation of submargin area from the dorsal disc not obvious. Longitudinal moulting suture reaching margin and the transverse moulting suture reaching submargin. Thoracic and abdominal segment sutures well defined. Median length of abdominal segments I–VIII (A1–A8): A1: 55.56 μm , A2: 57.84 μm , A3: 63.21 μm , A4: 61.92 μm , A5: 62.61 μm , A6: 59.76 μm , A7: 30.65 μm , A8: 49.82 μm . Submedian depressions present on abdominal segments I–VII.



Figure 1. The leaves of host plant *Miscanthus floridulus* infested by the nymph of *Aleurocybotus occiduus*. A. Puparium; B. Egg, first and second instar nymph; C. Empty pupal case, parasitized; D. Third instar nymph; E. Empty pupal case; F. Empty pupal case, parasitized.

Vasiform orifice. Elongate triangular, with teeth, a little longer than wide, about $65.37\ \mu\text{m}$ long, $56.54\ \mu\text{m}$ wide, and posterior with closure at the posterior end. Operculum rectangular, about $24.41\ \mu\text{m}$ long, slightly arc shaped and shorter than wide, about $37.93\ \mu\text{m}$, accounting for about half of the vasiform orifice. Lingula spatulate, about $39.73\ \mu\text{m}$ long and $17.33\ \mu\text{m}$ wide, extending beyond operculum, contained in orifice. Caudal furrow extends from vasiform orifice to the posterior of the margin.

Chaetotaxy. Only caudal setae and eighth abdominal setae present. Caudal setae long, about $70.23\ \mu\text{m}$. The eighth abdominal setae short, about $14.74\ \mu\text{m}$ long.

Venter. Thoracic and caudal tracheal folds discernible. Thoracic legs not obvious. Self-depressions caused by protrusions on the plant surface.

Habitus. Puparia typically found on the mid surface of the leaf. Most are scattered and occasionally aggregated. They are usually arranged in the same direction. Generally there are no ants around.

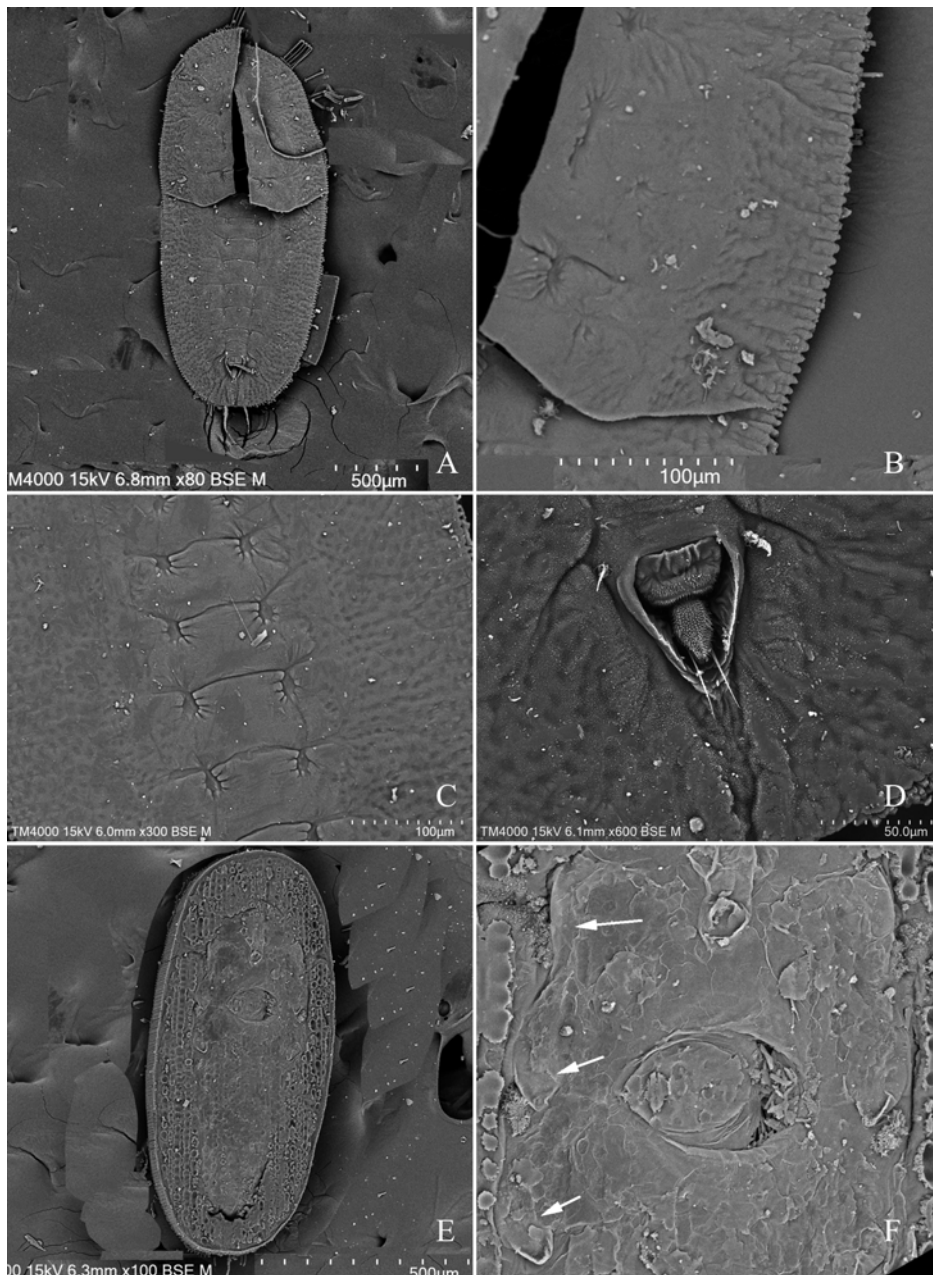


Figure 2. Scanning Electron Microscope (SEM) photographs of *Aleurocybotus occiduus*. A. Puparium, dorsal view; B. Margin; C. Submedian depression; D. Vasiform orifice and operculum; E. Puparium, ventral view; F. Thoracic legs.

Host Plant. Cyperaceae: *Cyperus rotundus*; Poaceae: *Cenchrus echinatus*, *Chloris* sp.,

Cynodon dactylon, *Echinochloa crus-galli*, *Oryza sativa* L., *Paspalum dilatatum*, *Paspalum notatum*, *Setaria italica*, *Sorghum halepense*, *Sorghum vulgare* var. *sudanese*, *Stenotaphrum secundatum*, *Zea mays* (Russell 1964; Evans 2008), *Miscanthus floridulus* (new record).

Specimens examined. 21 puparia on 16 slides, **China**, Zhejiang, Chun'an, TIL, 29°34'N, 118°53'E, 19-VIII-2021, Mingjian XU & Linqian LU leg., on *Miscanthus floridulus*. The specimens are deposited in the Insect Collection of Zhejiang Agriculture & Forestry University.

Distribution. China (Zhejiang); USA (Arizona, California, Hawaii, Texas) (Russell 1964; Evans 2008); Peru;; Mexico (Vejar-Cota *et al.* 2009).

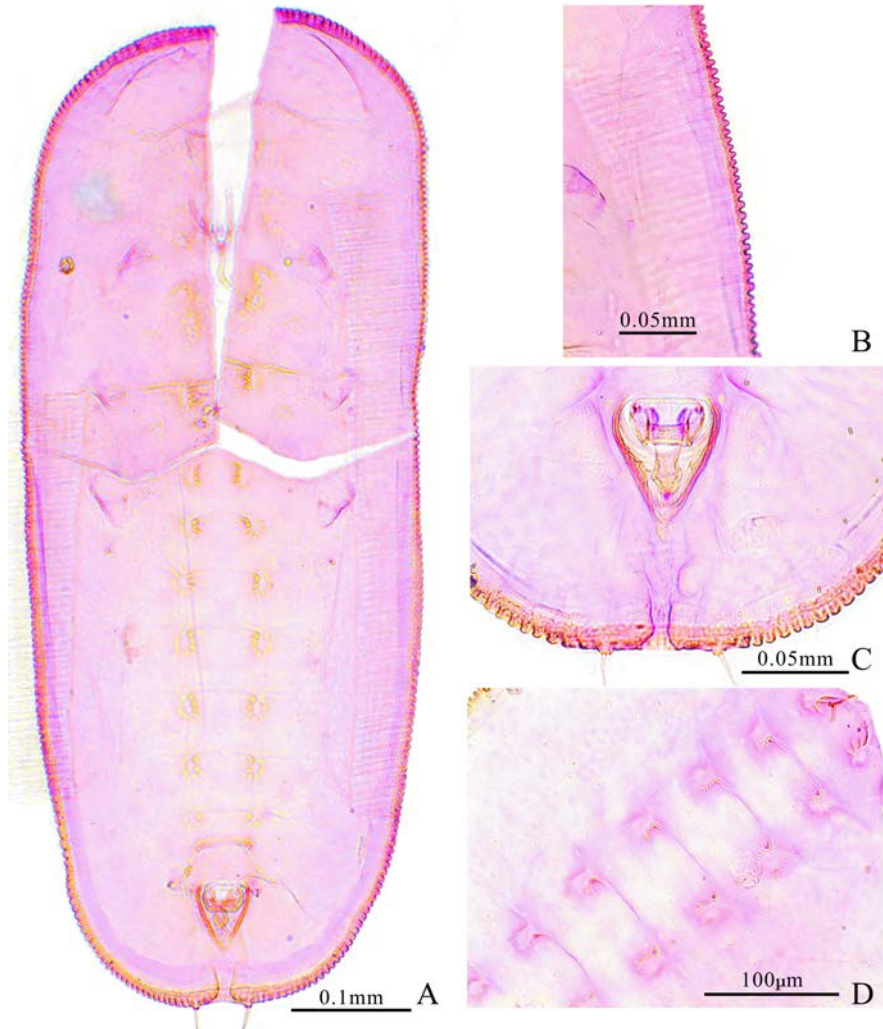


Figure 3. *Aleurocybotus occiduus*, slide mounted specimen. A. Puparium; B. Margin; C. Vasisform orifice, operculum, lingula and caudal furrow; D. Abdominal segments and submedian depression.

Remarks. This species is similar in shape to *Aleurocybotus cereus*, but the submedian depression of *A. occiduus* is more obvious. The submarginal glands absent, but the caudal setae present. The submarginal rim of *A. occiduus* is more narrow and indistinct. Compared

with *Aleurocybotus graminicolus*, *A. occiduus* is similar in shape and color but differs in the number of submedian depressions and the shape of vasiform orifice and operculum.

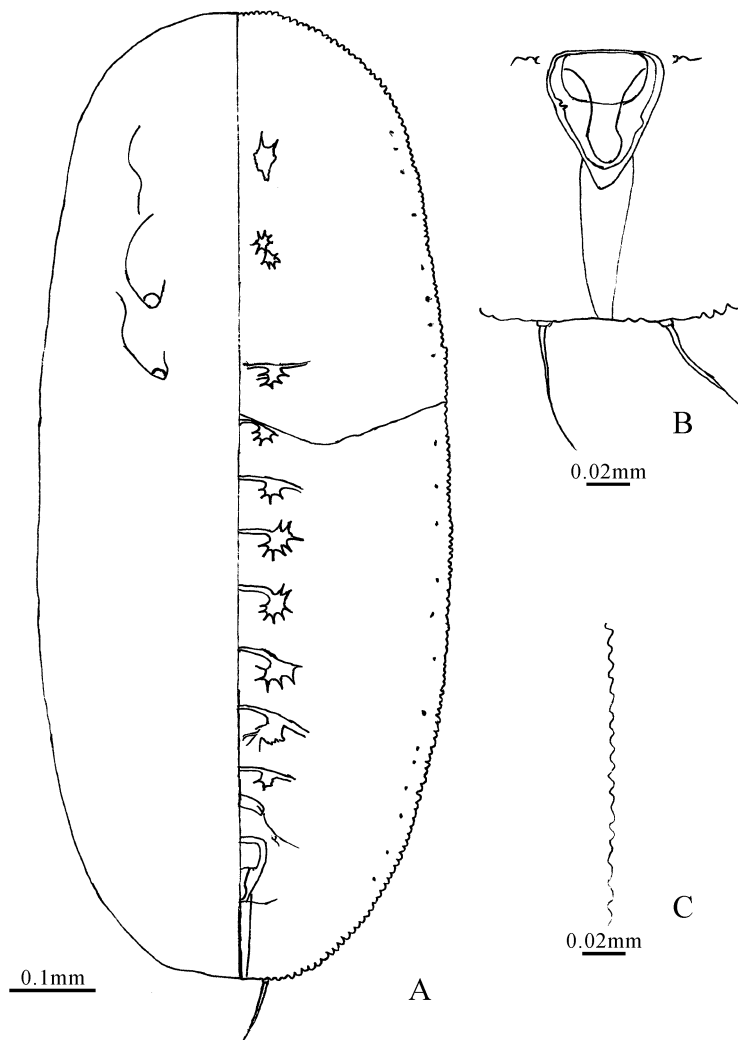


Figure 4. *Aleurocybotus occiduus*. A. Puparium, dorsal (right) and ventral (left) views; B. Vasiform orifice; C. Margin.

2. *Aleurocybotus cereus* Martin

Aleurocybotus cereus Martin 2005: 11.

Distribution. Belize (Martin 2005).

Host Plant. Poaceae: *Lasiacis rugelli* (Martin 2005).

Diagnosis. Elongate-oval, with a dense and finely flocculent white secretion. Margin crenulate, usually widest at the metathorax/ abdominal segment I. Thoracic tracheal pore hidden. Dorsum almost flat. Longitudinal moulting suture reaching the margin, transverse moulting sutures not reaching the margin. Vasiform orifice rounded-cordate. Operculum

laterally-rounded trapezoidal, occupying about half of vasiform orifice. Lingula cylindrical, rounded posteriorly (Martin 2005).

Remarks. Martin (2005) described this species from Belize on *Lasiacis rugelli*. It occurs individually or in clusters under the leaves of the host grass, with smaller groups typically occurring near the leaf base. The body surface is full of white waxy secretions. There were few signs of attendance of ants or scale insects.

3. *Aleurocybotus graminicolus* (Quaintance)

Aleurodes graminicolus Quaintance 1899: 89.

Distribution. USA (Florida) (Quaintance 1899).

Host Plant. Poaceae (Quaintance 1899).

Diagnosis. Oblong elliptical, yellow to brown, with a stripe of dark brown; no obvious waxy secretion. Margin minutely crenulated. Abdominal segments distinct in middle, but fading towards the margins. Vasiform orifice cordate, about four-fifths as wide as long. Operculum nearly trapezoidal, rounded at angles, filling one third of vasiform orifice. Lingula spatulate, occupying about three-fourths length of orifice; lingula setae present (Quaintance 1899).

Remarks. This species was described from Florida by Quaintance (1899) on an unknown Poaceae grass. There are few studies on this species.

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