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ICFREALEYRODES STAT. REV. (HEMIPTERA: ALEYRODIDAE) WITH DESCRIPTION OF A NEW SPECIES FROM MYANMAR

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Abstract

Icfrealeyrodes Dubey & Sundararaj is removed from its synonymy of *Asialeyrodes* Corbett and redefined with a generic diagnosis provided. *Icfrealeyrodes indica* **rev. comb.** is proposed for *A. dubius* Martin & Mound. New combinations proposed include: *I. maesae* (Takahashi) **comb. nov.** for *Pseudaleyrodes maesae* Takahashi, and *I. radiata* (Pushpa & Sundararaj) **comb. nov.** for *A. radiata* Pushpa & Sundararaj. *Icfrealeyrodes totus* Dubey **sp. nov.** is described from Rih-dil Lake of Myanmar along with drawings and microphotographs and represents the first record of the genus *Icfrealeyrodes* in Myanmar. Puparial characters differentiating *Icfrealeyrodes* from *Asialeyrodes* are discussed. A key to puparia of the *Icfrealeyrodes* species is given.

Key Words: *Asialeyrodes*, *Icfrealeyrodes totus*, new combination, new species, Myanmar

Resumen

Se re-establece el género *Icfrealeyrodes* Dubey & Sundararaj se re-establece de su sinonimia con *Asialeyrodes* Corbett y se provee un diagnóstico redefinido del genéro. Se propone *Icfrealeyrodes indica* rev.comb. para *A. dubius* Martin & Mound. Las siguientes nuevas combinaciones son propuestas*: I. maesae* (Takahashi) comb. nov. para *Pseudaleyrodes maesae* Takahashi e *Icfrealeyrodes radiata* (Pushpa y Sundararaj) comb. nov. para *Asialeyrodes radiata* Pushpa y Sundararaj. Se describe e ilustra con dibujos y microfotografías *Icfrealeyrodes totus* Dubey sp. nov. del lago de Rih-dil en Myanmar. El genéro *Icfrealeyrodes* es nuevo en Myanmar. Se comenta sobre las características de las pupas del genéro *Icfrealeyrodes* y de *Asialeyrodes*. Se provee una clave para la identificación de las pupas de las especies de *Icfrealeyrodes.*

Palabras Clave: *Asialeyrodes, Icfrealeyrodes totus*, nueva combinación, nuevas especies, Myanmar

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The genus *Icfrealeyrodes* Dubey & Sundararaj (2006) was described for a single species, *I. indica* Dubey & Sundararaj, and was differentiated from *Asialeyrodes* by the presence of a complete submarginal furrow and the absence of a caudal furrow. Martin & Mound (2007) synonymized *Icfrealeyrodes* with *Asialeyrodes* Corbett citing "it is clearly a species of *Asialeyrodes*." We understand that they synonymized *Icfrealeyrodes* with *Asialeyrodes* because the complete submarginal furrow was present in 2 *Asialeyrodes* species, *A. maesae* (Takahashi) (=*Pseudaleyrodes maesae*) and *A. meghalayensis* Regu & David. Of these, the puparium of *A. maesae* lacks the caudal furrow and has a complete submarginal furrow, and differs by these characters from *Asialeyrodes*. Therefore, it is assignable to *Icfrealeyrodes* and hence *I. maesae* (Takahashi) **comb. nov.** is proposed for *P. maesae* Takahashi. Examination of holotype of *A. meghalayensis* Regu & David revealed that the complete submarginal furrow in the original description of this species is an error; the submarginal furrow is incomplete and terminates near the caudal furrow. Examination of paratype of *A. radiata* Pushpa & Sundararaj revealed that this species belongs to *Icfrealeyrodes* and hence, *I. radiata* (Pushpa & Sundararaj) **comb. nov.** is proposed. The genera *Asialeyrodes* and *Icfrealeyrodes* are exclusively known from the Oriental Region, and share characters such as, the submargin demarcated from dorsal disc by a suture, dorsal setae present and tracheal pores indicated. However, puparia of *Icfrealeyrodes* species have the submarginal furrow converging inwards and intersecting the area posterior to vasiform orifice, and caudal furrow absent. Puparia of *Asialeyrodes* species have the submarginal furrow diverging towards caudal pore or just terminating near caudal furrow, not intersecting the area posterior to vasiform orifice, and caudal furrow present, often filled with minute tubercles. Puparia of the new species described herein differs from the other species known from Myanmar, *A. dorsidemarcata* (Singh) by above mentioned generic characters of *Icfrealeyrodes*. David & Dubey

(2012) listed 27 species of whiteflies in 17 genera from Myanmar. The description of this new species adds one more genus and species to the Aleyrodidae fauna of Myanmar.

Materials and Methods

Puparia of the new species were collected by A. K. Dubey from Rhi-dil Lake, Myanmar. Puparia were mounted using the method described in Dubey & David (2012). The holotype of *A. meghalayensis* Regu & David and a paratype of *A. radiata* Pushpa & Sundararaj were examined from the National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute (IARI), India. The terminology for morphological structures is that of Bink-Moenen (1983), Martin (1985), and Gill (1990). The holotype of new species is deposited in the NPC, IARI, India. One paratype each will be deposited in the Natural History Museum, London, UK; United States Department of Agriculture, Maryland, USA and Zoological Survey of India, Kolkata, India. The measurements and drawings were made using Leica DM 1000 and DM 500 compound microscopes fitted with a drawing tube. Microphotographs were taken using Leica DFC 290 digital camera attached to DM 500.

Taxonomy

Genus *Icfrealeyrodes* Dubey & Sundararaj Stat. Rev.

Icfrealeyrodes indica Dubey & Sundararaj (2006): 127, by original designation. [Synonymized with *Asialeyrodes* by Martin & Mound (2007): 22.]

Diagnosis

Puparia broadly oval; dark brown to black, often with a fringe of wax around margin. Thoracic and caudal tracheal pores indistinct or slightly indicated, often armed with internal teeth. Submargin separated from dorsal disc by a submarginal furrow, converging posteriorly and intersecting area posterior to vasiform orifice. Submargin with a row of setae. First abdominal pair of setae present. Longitudinal and transverse moulting sutures reaching submedian area or extending to the submarginal furrow. Vasiform orifice small, subcordate to nearly triangular, usually located far anterior from submarginal furrow. Caudal furrow absent; if present, restricted to submargin only for a certain distance, not connecting with the posterior margin of vasiform orifice. Ventrally, tracheal folds indicated with stipples. Caudal fold margins slightly visible and may be mistaken for caudal furrow. Spiracles visible.

Comments

The puparia of *Icfrealeyrodes* are likely to be misidentified as *Asialeyrodes* due to their extreme similarities unless carefully observed. The puparia of *Icfrealeyrodes* species do not have a distinct caudal furrow, and the area posterior to vasiform orifice is intersected by the converging submarginal furrows; whereas, the puparia of *Asialeyrodes* species have a distinct caudal furrow connected with posterior margin of vasiform orifice and is often filled with minute tubercles, and the submarginal furrow usually diverges outwards and terminates near caudal tracheal pore.

Key to the Puparia of *Icfrealeyrodes* Species

1. Longitudinal and transverse moulting sutures not reaching submarginal furrow; dorsum with granular markings; dorsal disc reticulated with small granules; Taiwan. . . . . *I. maesae* (Takahashi) **comb. nov.**

—. Longitudinal and transverse moulting sutures reaching submarginal furrow; dorsum without granular markings; dorsal disc not reticulated with small granules. 2

2. Caudal and thoracic tracheal furrows marked with tubercles on submargin only; caudal furrow not reaching at base of vasiform orifice; submargin with long radiating lines; pro-, meso-, and metathorax with submedian pair of setae; India . . . . . *I. radiata* (Pushpa & Sundararaj) **comb. nov.**

—. Caudal and thoracic tracheal furrows absent, tubercles absent in these areas; submargin with polygonal markings; pro-, meso-, and metathorax without submedian pair of setae 3

3. A row of tubercles present on submedian area; thoracic tracheal pore regions deeply invaginated; paler area absent along the marginal crenulations; subdorsum with multiple rows of crescent-form papillae; India . . . . . *I. indica* Dubey & Sundararaj **rev. comb.**

—. A row of tubercles absent on submedian area; thoracic tracheal pore regions continuous with margin; a row of paler area present along the marginal crenulations; subdorsum tassellated with polygonal markings; Myanmar . . . . . *I. totus* Dubey **sp. nov.**

Icfrealeyrodes Totus Dubey **Sp. Nov.**
(Figs. 1-3 and 4-9)

Puparium

Dark brown, with fringe of white wax around margin (Fig. 9); found singly or in group of 4 puparia; found on lower surface of leaves; broadly oval, 1110-1190 µm long, 960-1050 µm wide.

Margin

Crenulate, 9-10 crenulations in 0.1 mm; each crenulation is associated with a yellow area, each paler area longer than wide (Fig. 3), nearly 2 times longer than the marginal crenulations. Thoracic and caudal tracheal pore areas not indicated or indicated by a small opening with a median tooth.

Dorsum

Tessellated, usually square-shaped or rectangular but polygonal forms also present. Submargin completely demarcated from dorsal disc by a submarginal furrow, intersecting caudal area posterior to vasiform orifice. Submarginal furrow slightly invaginated at first abdominal segment area. Submargin with a row of 9 pairs of hair-like setae (3 pairs anterior to transverse moulting suture and 6 pairs posterior to it). Of the 3 pairs on cephalothorax, 1 pair each on laterad of cephalic, pro-, and mesothorax. Of the 6 pairs on abdomen, 1 pair each laterad of abdominal segment I and IV to caudal area. Longitudinal and transverse moulting sutures reaching submarginal furrow, longitudinal moulting suture crenate along median line. The median length of abdominal segment VII slightly smaller (5-10 µm) than VI. Cephalothoracic and abdominal segment sutures visible. Submedian pockets and depressions present on cephalothoracic and abdominal segments. Geminate pores up to 56 pairs, scattered on outer submedian/subdorsal area, a row of geminate pores present each on submargin along the marginal teeth, subdorsum along submarginal suture and submedian area along submedian depressions. Caudal and thoracic tracheal furrows absent. Polygonal tassellations posterior to vasiform orifice smaller than surrounding tassellations, but indistinct on submargin (Fig. 3). The distance between posterior end of the orifice and puparial caudal margin measured 155-157 µm long.

Vasiform Orifice

Subcordate, slightly wider than long, 35-42 µm long, 38-43 µm wide. Operculum similarly shape, completely filling the orifice and obscuring the lingula, 23-25 µm long, 22-28 µm wide. Lingula concealed, setose, with a pair of minute setae at tip.

Venter

Antennae reaching base of prothoracic legs, 55-67 µm long, keel 3-6 µm long. A pair of minute setae present at middle of pro-, meso- and metathoracic legs. Caudal and thoracic tracheal folds without stipples but wavy markings present (Fig. 5). Spiracles visible.

Chaetotaxy

Anterior marginal setae 12-22 µm long and posterior marginal setae 23-31 long. Cephalic setae 70-126 µm long, first abdominal setae 83 µm long; eighth abdominal setae cephalolaterad of vasiform orifice 21-35 µm long, and caudal setae positioned near caudal pore, 13-18 µm long. Submargin with 9 pairs of hair-like setae, 37-62 µm long. Ventral setae 27-30 µm long (15 µm in one puparium), 42-56 µm apart.

Types Examined

HOLOTYPE. Myanmar, Rhi-dil Lake, one puparium on slide, on unidentified plant, 28.iv.2012, A. K. Dubey, NPC (IARI).

PARATYPES. Eight puparia on 8 slides, data same as of holotype (FRI-1; IARI-4; NHM-1; USDA-1; ZSI-1).

Etymology

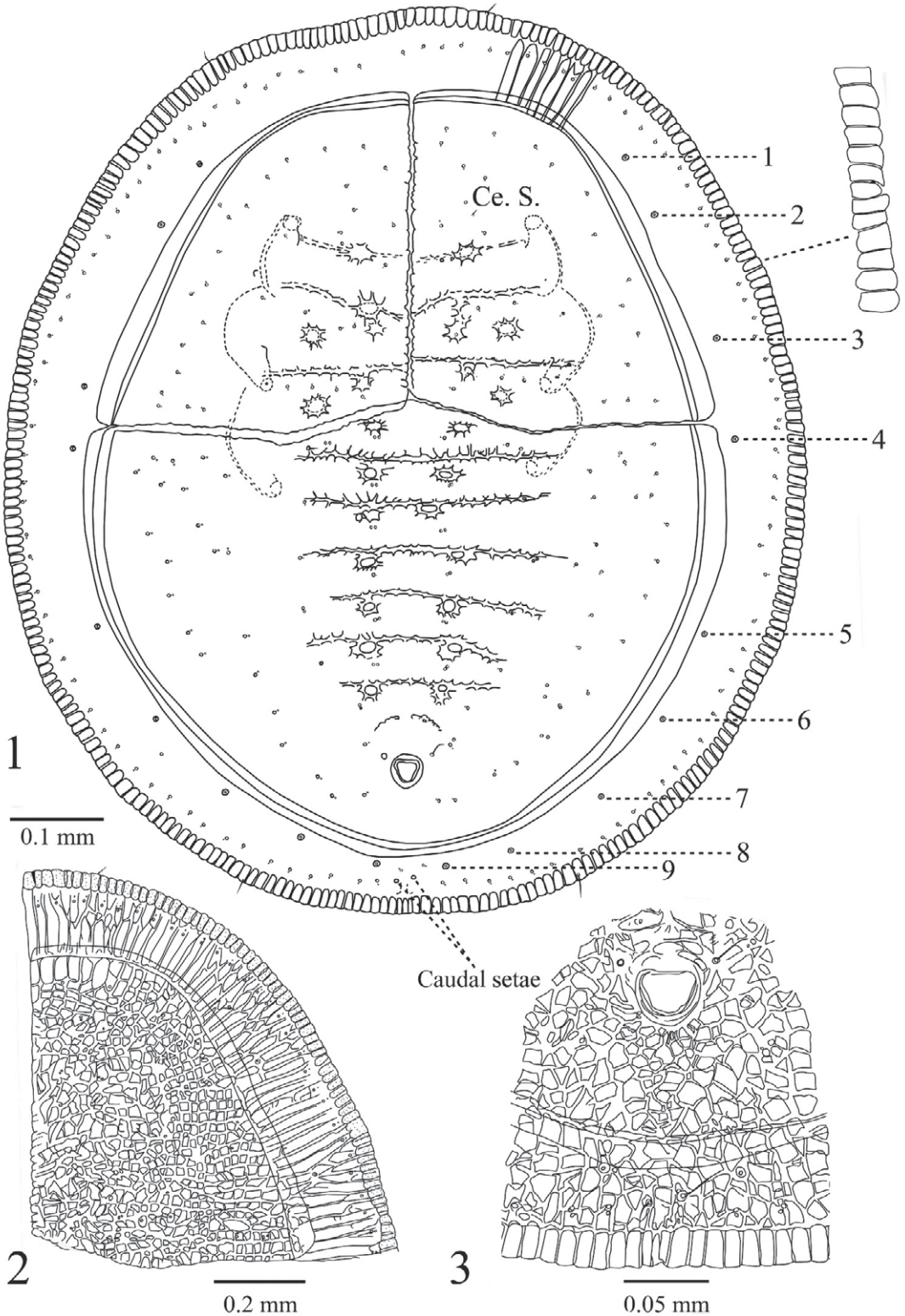
The name of new species is derived from a Latin word '*totus*' that means 'complete', it is focusing on the complete submarginal furrow.

Remarks

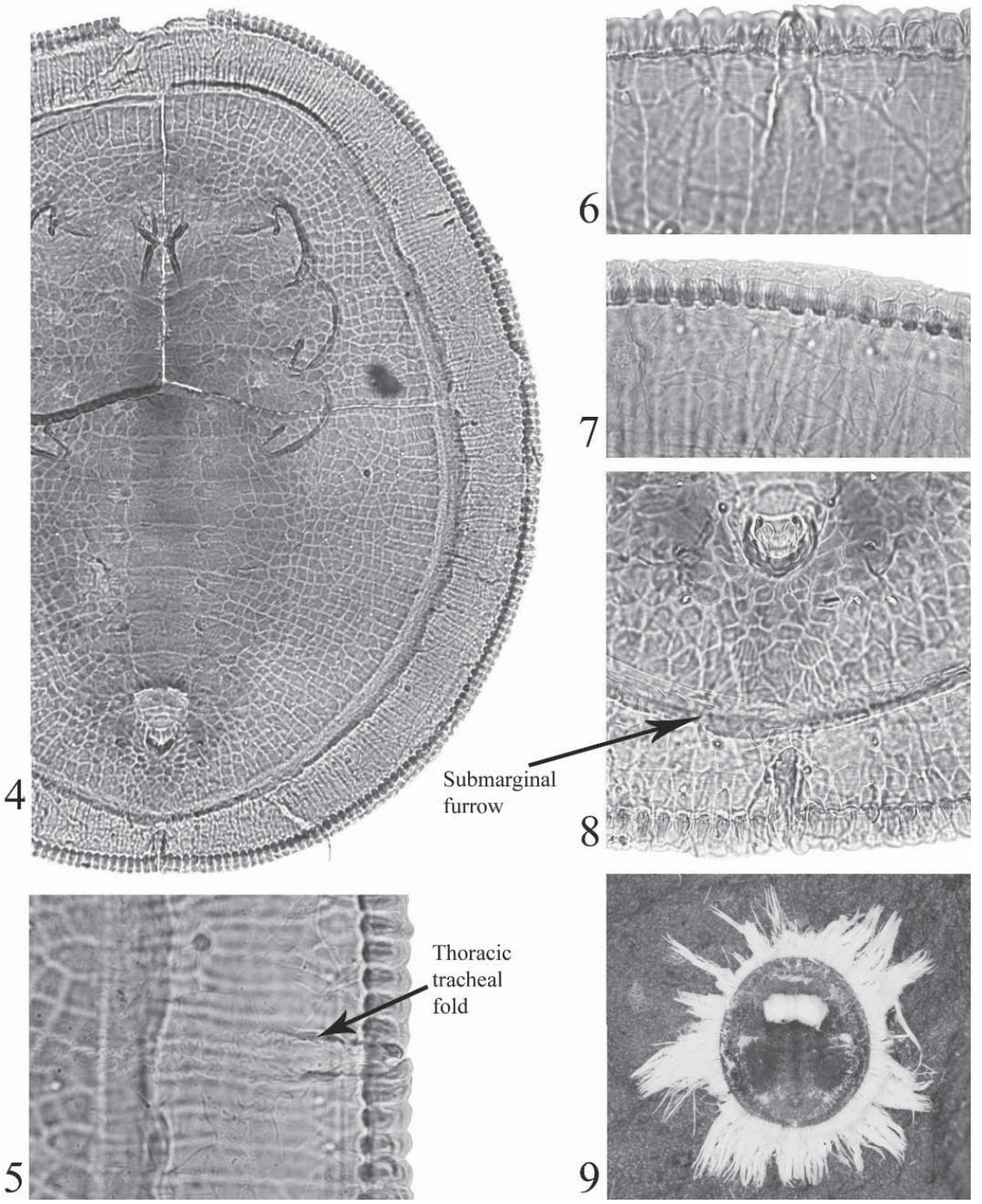
Puparia of *I. totus* **sp. nov.** resemble those of *I. indica* but differs in having dark brown color, a row of paler area along the marginal crenulations, tessellated dorsum, and by the absence of tubercles on submedian area of abdominal segments. This species differs from *I. reticulata* by the absence of tubercles in tracheal furrows.

Discussion

Takahashi (1934) described *Pseudaleyrodes maesae* from Taiwan, but was unsure as to which genus to place it and later (Takahashi, 1942) transferred it to *Asialeyrodes*. Takahashi (1934: 47) stated "caudal furrow absent"; this character and complete submarginal furrow assign this species to *Icfrealeyrodes*. *Asialeyrodes* species described in the past 2 decades from the Oriental Region led us to recognize better characters and separate this lineage from *Cockerelliella* and *Icfrealeyrodes* (in *Cockerelliella*, the submarginal furrow demarcates only



Figs. 1-3. *Icfrealeyrodes totus* **sp. nov.** 1, holotype puparium. 2, cephalothorax, dorsal surface. 3, posterior abdominal area, submarginal furrow and caudal setae. (Digits 1-9 indicating positions of submarginal setae).



Figs. 4-9. *Icfrealeyrodes totus* **sp. nov.** 4. holotype puparium. 5, thoracic tracheal fold. 6, thoracic tracheal pore. 7, submarginal paler area along crenulations. 8, posterior abdominal area, submarginal furrow and caudal setae. 9, puparium, habitus.

cephalothorax, and terminates nearly opposite to abdominal segment II, but does not reach the caudal furrow). *Pseudaleyrodes maesae* is not a member of *Asialeyrodes*, but rather agrees with characters of *Icfrealeyrodes*, thus, *I. maesae* (Takahashi) a new combination is proposed. In

addition, *I. indica* **rev. comb.** has resulted from revalidation of the genus *Icfrealeyrodes*. Examination of a paratype of *A. radiata* revealed that it has a complete submarginal furrow and tuberculate caudal furrow which is restricted to submargin only, and is transferred to *Icfrealeyrodes*. It may be noted that *Asialeyrodes* species have caudal furrow connected with posterior ends of the vasiform orifice. A perusal of literature also suggested that *A. lushanensis* Ko and *A. spherica* (Sundararaj & Dubey) are not congeners of *Asialeyrodes*; the latter, *A. spherica*, differs from *Asialeyrodes* by the absence of submarginal furrow, and from *Rhachisphora* by the absence of rhachises. *A. lushanensis* differs from *Asialeyrodes* by the absence of the first abdominal setae, and the longitudinal moulting suture reaches submarginal furrow. Further studies are needed on *Asialeyrodes* species including the less understood morphology of *A. dorsidemarcata* (Singh).

Acknowledgments

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