

FIRST RECORD OF *TAKECALLIS ARUNDINARIAE* (ESSIG) (HEMIPTERA: APHIDIDAE) FROM AUSTRALIA

I.Valenzuela¹, A.Boulton² and M.B.Malipatil¹

¹ Department of Primary Industries, Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, VIC 3156, Australia

² Industry & Investment NSW, Production Research (Horticulture), Yanco NSW, 2705 Australia
Email:iva@unimelb.edu.au

Summary

Records are presented of the aphid *Takecallis arundinariae* (Essig) from Victoria and New South Wales on bamboo hosts. These are the first records of *Takecallis* in Australia.

Keywords: aphid, exotic, bamboo

INTRODUCTION

The genus *Takecallis* Matsumura is characterized by a generally pale green to pale yellow color, by a narrow body with knobbed cauda and a clypeus bearing an anteriorly directed tubercle (nose-like projection) with 2 hairs (Qiao and Zhang 2004). Usually asexual forms are alate and to date, no sexual forms have been found. Aphids in the genus infest the underside of bamboo leaves (Poaceae) such as *Arundinaria*, *Phyllostachys*, *Pleioblastus*, *Sasaella* and *Sasa* spp. (Blackman and Eastop 1994), indicating an oriental origin for the genus although, some species such as *T. arundinariae* (Essig) and *T. taiwanus* (Takahashi) are now extensively distributed following the introduction of ornamental bamboos. Six species are now recognized *Takecallis affinis* L.K. Ghosh, *T. arundicolens* (Clarke), *T. arundinariae* (Essig), *T. assumentus* Qiao and Zhang, *T. sasae* (Matsumura) and *T. taiwanus* (Takahashi) (Favret, C. *Aphid Species File*). We present here the first records of this genus from Australia.

MATERIALS AND METHODS

Specimens used for morphological study were initially stored in 70% ethanol or slide-mounted and later deposited in the Victorian Agricultural Insect Collection (VAIC), DPI, Knoxfield centre, Victoria and the Agricultural Scientific Collection Unit (ASCU) Department of Industry and Investment, Orange Agricultural Institute, Orange, New South Wales. Aphid identifications were validated by Dr. Murray Fletcher (Orange Agricultural Institute) and Dr. Mallik Malipatil (DPI Victoria). Some specimens were preserved in absolute ethanol for molecular study of the mitochondrial cytochrome oxidase I gene. We amplified a 709 bp fragment using primers LCO1490 and HCO2198 from Folmer *et al.* (1994) following extraction and PCR protocols from Valenzuela *et al.* (2007). Sequences are lodged in GenBank.

RECORDS

NEW SOUTH WALES: Dubbo, 23.viii.2008, on

Bambusa sp. (sacred bamboo), alatae viviparae, A. Boulton, Agricultural Scientific Collection Trust (ASCT) numbers are 00166171 and 00166172. VICTORIA: Carlton North, 12.iv.2005, *Phyllostachys* sp., alatae viviparae, I.Valenzuela, VAIC numbers are 069774 – 069778 and GenBank accession number is GU135641.

DISCUSSION

The aphids observed in New South Wales and Victoria were mostly alates with some alate nymphs also collected in NSW, and occurred on the under side of the bamboo leaves. The specimens were identified using the keys in Blackman and Eastop (1994) and Qiao and Zhang (2004) for aphids on bamboo and *Takecallis* spp. respectively. *Takecallis arundinariae* had the following characteristics. They were pale green to yellow in color, with antennae longer than the body, the secondary rhinaria arranged in the dark area of the III antennal segment (Figure 1), the cauda pale or dusky and the body with dark longitudinal stripes on the thoracic dorsum. Abdominal tergites I to VII each have two dark “8 shaped” markings (Figure 2) (Essig 1917, Blackman and Eastop 1994, Qiao and Zhang 2004).

Takecallis arundinariae (Essig) was first described in 1917 infesting bamboo leaves in California and since has been recorded from India, China, Taiwan, Korea, Japan, England, New Zealand, North America (Blackman and Eastop 1994), Madeira (Franquinho-Aguiar and Albano-Ilharco 1997) and Brazil (Lazzari *et al.* 1999). Its favored hosts are bamboos *Arundinaria* and *Phyllostachys*, although it is also found on *Bambusa* and *Dendrocalamus*. Accounts of its hosts and distribution are given in Higuchi (1968, 1972), Blackman and Eastop (1994) and Qiao and Zhang (2004). Its life cycle in East Asia is unknown but appears to be permanently parthenogenetic elsewhere (Blackman and Eastop 1994).

In Australia, *Takecallis arundinariae* has the potential

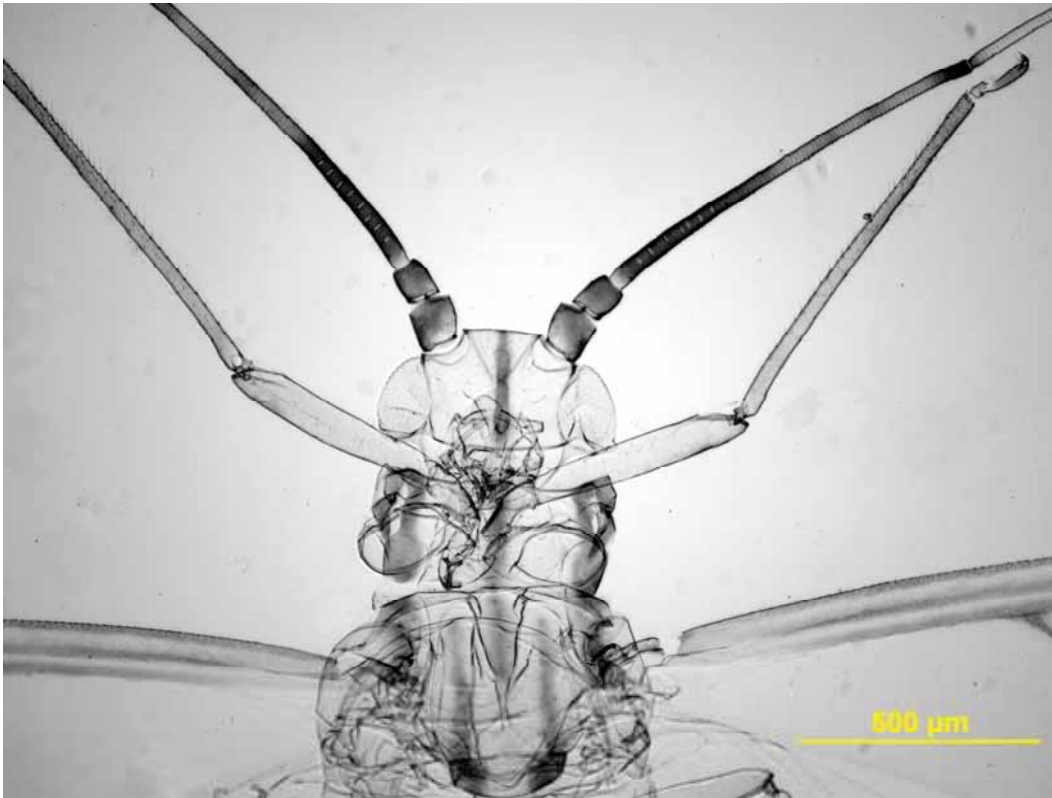


Figure 1. *Takecallis arundinariae*, alata vivipara. To show sclerotization of the secondary rhinaria in the third antennal segment.

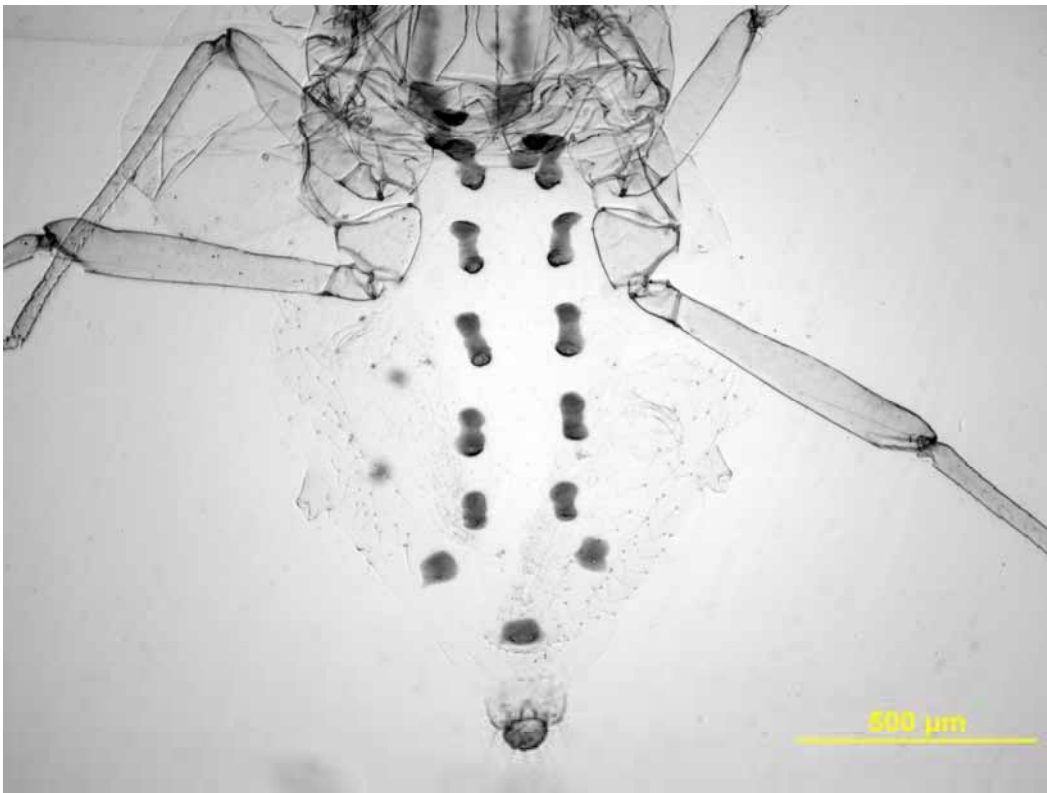


Figure 2. *Takecallis arundinariae*, alata vivipara. To show dark longitudinal "8 shaped" rows in abdominal tergites I to VII.

of becoming a pest of bamboos given that favorable hosts are already present. A number of exotic bamboo species are commercially grown in Australia for ornamental purposes and as fodder food for animals kept in captivity e.g. zoos and sanctuaries. It is likely that *T. arundinariae* would colonize preferred bamboo hosts such as *Phyllostachys* and *Arundinaria* spp., species commonly grown in Australia. Conversely, there are also a small number of native bamboo species that could serve as hosts such as *Bambusa arnhemica*. But, to date the observed pattern of occurrence is sporadic and aphid numbers tend to be low.

We amplified a portion of the COI gene to use it in a molecular based identification system from online DNA sequence databases such as GenBank (National Centre for Biotechnology Information) and BOLD systems (Barcode of Life Data systems). Queried sequences are compared with highly similar sequences from reference taxa which have been identified, allowing molecular comparative studies and rapid species, genus or family level identification. *Takecallis* is currently underrepresented in these databases nevertheless; we can observe that same COI clones exist in BOLD systems database; three *T. arundinariae* specimens from Hawaii (USA), British Columbia (Canada) and Auckland (New Zealand) have identical COI sequence as the specimen from Victoria, indicating a worldwide distribution of the same mitochondrial lineage (BOLD specimens are held in the Canadian National Collection of Insects, Arachnids and Nematodes).

REFERENCES

- Blackman, R.L. and Eastop, V.F. (1994). Aphids on the world's trees: an identification and information guide. *CAB International in association with the Natural History Museum*, Wallingford. 894-895 pp.
- Essig, E. O. (1917). Aphididae of California. New species of Aphididae and notes from various parts of the state, but chiefly from the campus of the University of California, Berkeley, California. *University of California Publications in Entomology Technical Bulletin* **1**: 301-346.
- Favret, C. *Aphid Species File*. Version 1.0/3.5. [11 June 2009]. <<http://Aphid.SpeciesFile.org>>.
- Folmer, O., Black, M., Hoeh, W., Lutz, R. and Vrijenhoek, R. (1994). DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* **3**: 294-299.
- Franquinho-Aguiar, A.M. and Albano-Ilharco, F. (1997). New records of aphids (Homoptera: Aphidoidea) from Madeira Island. *Boletín de Sanidad Vegetal Plagas* **23**: 565-570.
- Higuchi, H. (1968). A revision of the genus *Takecallis* Matsumura. *Insecta Matsumurana* **31**: 25-33.
- Higuchi, H. (1972). A taxonomic study of the subfamily Callipterinae in Japan (Homoptera: Aphididae). *Insecta Matsumurana* **35**: 19-126.
- Lazzari, S.M.N., Zonta de Carvalho, R.C. and Cardoso, J.T. (1999). *Takecallis arundinariae* (Essig) (Aphididae, Drepanosiphinae, Phyllaphidini): first record in Brazil and comparison to *Takecallis taiwanus* (Takahashi). *Revista Brasileira de Zoologia* **16**: 865-870.
- Qiao, G.X. and Zhang, G.X. (2004). Review of the genus *Takecallis* Matsumura (Homoptera: Aphididae: Myzocallidinae) from China and description of one new species. *The Raffles Bulletin of Zoology* **52**: 373-378.
- Valenzuela, I., Hoffmann, A.A., Malipatil M.B., Ridland P.M. and Weeks, A.R. (2007). Identification of aphid species (Hemiptera: Aphididae: Aphidinae) using a rapid PCR-RFLP method based on the *cytochrome oxidase* subunit I gene. *Australian Journal of Entomology* **46**: 305-312.

This page left blank intentionally.