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A redescription of *Yoyetta landsboroughi* (Distant) and *Y. tristrigata* (Goding and Froggatt) (Hemiptera: Cicadidae) and description of four new related species

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Abstract

This study provides redescriptions of two small cicada species, *Yoyetta landsboroughi* (Distant) and *Y. tristrigata* (Goding and Froggatt), from eastern Australia, based on a detailed morphological examination of available material. The status of *Y. toowoombae* (Distant) is re-examined and it is now formally recognised to be a junior synonym of *Y. landsboroughi*. Four new species of *Yoyetta* are described, also from eastern Australia. These are: *Y. cumberlandi* **sp. nov.**, *Y. fluviatilis* **sp. nov.**, *Y. nigrimontana* **sp. nov.**, and *Y. repetens* **sp. nov.**. Within each species (re)description, sections on distinguishing features, distribution, habitat and behaviour, and calling song structures are described and illustrated where appropriate.

Key words: Australia, behaviour, cicada, Cicadidae, distribution, habitat, morpho-taxonomy

Introduction

Each summer in Australia is marked by an emergence of acoustically-conspicuous insects: the cicadas. Of all cicada tribes recognised in Australia, Cicadettini is by far the most diverse, comprising the majority of smaller, thin-bodied species (Moulds, 2012). The genus *Yoyetta* Moulds was recently erected to accommodate nine Australian species, previously allocated to the genus *Cicadetta* Amyot. Examination of cicada specimen material housed in collections suggests that this genus may, once the species are fully described, be one of the most diverse

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(this is normally the long duration of silence in each phrase). The provision of closely-spaced and often repeated female cues in the male calling song is a particularly important behavioural adaptation for species that call actively in flight, such as *Y. aaede*, *Y. denisoni*, *Y. nigrimontana* **sp. nov.** and *Y. tristrigata*. In this case, a female only has limited opportunity to respond as the male flies past. When calling, the males of these species can be seen meandering actively past and through the vegetation at varying heights, listening for the appropriately-timed response of a female that is normally residing lower in the vegetation. Males also sometimes call from a stationary perch. Cicadas from the related genus *Birrima* also exhibit this behaviour (Ewart, 1995). Other *Yoyetta* species call mostly whilst stationary but will also often produce the call when moving between singing stations or moving around branches. The often repeated and predictable female cues in the calls of *Yoyetta* species provides potential for males to be attracted to human observers by the production of appropriately-timed, simulated wing-flicks (typically by snapping fingers, flicking leaves, tongue-clicks or finger nail clicks). However, our observations indicate that males will generally abandon communication and desert the area on production of one or more poorly-timed or out-of-place responses. Most males of species that call mainly whilst stationary will call quite readily in captivity (except for *Y. landsboroughi*), whereas those of species that call mainly in flight are often reluctant to call in confined spaces.

In this paper, we nominally split the genus *Yoyetta* into three morphologically separable species groups. The species dealt with here are all in the most diverse group: the *Yoyetta tristrigata* species group. While no obvious characters allowed further division of this species group, some intuitive relationships can be identified by broad similarities and also differences in calling song structure, behaviour and also, subtly, in morphology. Notably, *Y. landsboroughi*, *Y. nigrimontana* **sp.nov.** and *Y. fluviatilis* **sp.nov.** are all closely similar in appearance and characterised by the production of distinct non-coalesced syllable sequences in their calling songs (see Figures 5, 8 and 12). The tropical species, *Y. tristrigata* is considered to be the most unique member of the group, with its tropical distribution, very distinct male genitalia and thoracic colouration and its repeated, single pulse calling song. The timbal structure of this species does, nevertheless, show some similarities to *Y. landsboroughi*, *Y. nigrimontana* **sp.nov.** and *Y. fluviatilis* **sp.nov.** in that the long ribs occupy much of the timbal membrane (Figure 2). These three species, along with *Y. tristrigata*, all show defined pulse structuring in the expanded time plots of their calling songs (Figures 5, 8, 12 and 15). The remaining examples, *Y. celis*, *Y. cumberlandi* **sp.nov.** and *Y. repetens* **sp. nov.** appear to be closely related to one another with only minor differences in morphology. In terms of calling song structure, *Y. celis* and *Y. repetens* **sp. nov.** in particular are almost identical, with the former species differing only by a higher overall dominant frequency plateau (approximately 8–14 kHz; L. W. Popple recording data, 2015). However, *Y. cumberlandi* **sp. nov.** differs quite remarkably in both calling song structure and repetition rate (see Figures 23 and 24; c.f. Figures 19 and 20). This is accompanied by only minor differences in timbal morphology (Figure 2), indicating that the differences in calling song structure between these species may be more behavioural than physiological, reflecting their co-occurrence in the Sydney region.

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References

Bennet-Clark, H.C. (1997) Tymbal mechanics and the control of song frequency in the cicada *Cyclochila australasiae*. *Journal of Experimental Biology,* 200, 1681–1694.

Cooley, J.R. & Marshall, D.C. (2001) Sexual signaling in periodical cicadas, *Magicicada* spp. (Hemiptera: Cicadidae). *Behaviour,* 138, 827–855.
http://dx.doi.org/10.1163/156853901753172674

Coombs, M. (1996) Seasonality of cicadas (Hemiptera) on the Northern Tablelands of New South Wales. *Australian Entomologist,* 23, 55–60.
Distant, W.L. (1882) On some undescribed Cicadidae from Australia and the Pacific region. *Proceedings of the Zoological Society of London*, 1882, 125–134.
Distant, W.L. (1915) On some Australian Cicadidae. *Annals and Magazine of Natural History*, 16, 50–53. http://dx.doi.org/10.1080/00222931508693683
Dugdale, J. (1972) Genera of New Zealand Cicadidae (Homoptera). *New Zealand Journal of Science,* 14, 856–882.
Emery, D.L., Emery, S.J., Emery, N.J. & Popple, L.W. (2005) A phenological study of the cicadas (Hemiptera; Cicadidae) in western Sydney, New South Wales, with notes on plant associations. *Australian Entomologist,* 32, 92–101.
Ewart, A. (1995) Cicadas. *In*: Ryan, M. (Ed.), *Wildlife of greater Brisbane*. Queensland Museum, Brisbane, pp. 79–88.
Ewart, A. (1998) Cicadas, and their songs, of the Miles–Chinchilla region. *Queensland Naturalist,* 36, 54–72.
Ewart, A. & Marques, D. (2008) A new genus of grass cicadas (Hemiptera: Cicadoidea: Cicadidae) from Queensland, with descriptions of their songs. *Memoirs of the Queensland Museum,* 52, 149–202.
Ewart, A. & Popple, L.W. (2001) Cicadas, and their songs, from south-western Queensland. *Queensland Naturalist* 39: 52–71.
Goding, F.W. & Froggatt, W.W. (1904) Monograph of the Australian Cicadidae. *Proceedings of the Linnean Society of New South Wales,* 29, 561–670.
Greenup, L.R. (1966). Some factors affecting the distribution of cicadas in the Monaro region of New South Wales. *Journal of the Entomological Society of Australia,* 2, 61–3.
Haywood, B.T. (2006) A study of the cicadas (Hemiptera: Homoptera) in the south east of South Australia – Part II. *South Australian Naturalist,* 80, 48–53.
Lane, D.H. (1995) The recognition concept of speciation applied in an analysis of putative hybridization in New Zealand cicadas of the genus *Kikihia* (Insects: Hemiptera: Tibicinidae). *In:* Lambert, D.M. & Spencer, H.G. (Eds.), *Speciation and the recognition concept: theory and application*. Johns Hopkins University Press, Baltimore, Maryland, pp. 367–421.
Moulds, M.S. (1988) The status of Cicadetta and Melampsalta (Homoptera: Cicadidae) in Australia with the description of two new species. *General Applied Entomology,* 20, 39–48.
Moulds, M.S. (1990) *Australian cicadas*. New South Wales University Press, Kensington, NSW, 217 pp.
Moulds, M.S. (2005) An appraisal of the higher classification of cicadas (Hemiptera: Cicadoidea) with special reference to the Australian fauna. *Records of the Australian Museum,* 57, 375–446. http://dx.doi.org/10.3853/j.0067-1975.57.2005.1447
Moulds, M.S. (2012) A review of the genera of Australian cicadas (Hemiptera: Cicadoidea). *Zootaxa,* 3287, 1–262.
Moulds, M.S. & Cowan, S.A. (2002) Cicadoidea. *In*: Cassis, G. & Gross, C.F. (Eds.), *Zoological Catalogue of Australia*. Australian Biological Resources Study, Canberra, pp. 55.
Popple, L.W. (2013) A revision of the *Pauropsalta annulata* Goding & Froggatt species group (Hemiptera: Cicadidae) based on morphology, calling songs and ecology, with investigations into calling song structure, molecular phylogenetic relationships and a case of hybridisation between two subspecies. *Zootaxa,* 3730 (1) , 1–102. http://dx.doi.org/10.11646/zootaxa.3730.1.1
Popple, L.W. & Strange, A.D. (2002). Cicadas, and their songs, from the Tara and Waroo Shires, southern central Queensland. *Queensland Naturalist*, 40, 15–30.
Sanborn, A. (1999) Cicada (Homoptera: Cicadae and Tibicinidae) type material in the collections of the American Museum of Natural History, California Academy of Sciences, Snow Entomological Museum, Staten Island Institute of arts and Sciences, and the United States National Museum. *Florida Entomologist,* 82, 34–60. http://dx.doi.org/10.2307/3495835
Sanborn, A. (2014) *Catalogue of the Cicadoidea (Hemiptera: Auchenorrhyncha).* Academic Press/ Elsevier, London, 1001 pp.
Shiyake, S. (2007) *World Cicadas 200*. Osaka Museum of Natural History, Osaka, 126 pp.
Sueur, J. & Aubin, T. (2004) Acoustic signals in cicada courtship behaviour (order Hemiptera, genus *Tibicina*). *Journal of Zoology,* 262, 217–224. http://dx.doi.org/10.1017/S0952836903004680
Williams, G. (2002) A taxonomic and biogeographic review of the invertebrates of the Central Eastern Rainforest Reserves of Australia (CERA) World Heritage Area, and adjacent regions. *Technical Reports of the Australian Museum,* 16, 1–28. http://dx.doi.org/10.3853/j.1031-8062.16.2002.1353