

***Opisthoscelis nigra* Froggatt (Eriococcidae) is an armored scale *Maskellia nigra* (Froggatt) (Diaspididae) (Hemiptera: Coccoidea)**

NB Hardy & PJ Gullan

Department of Entomology, University of California, One Shields Avenue, Davis, California 95616-8584, USA (E-mail: nbhardy@ucdavis.edu; pjgullan@ucdavis.edu).

Abstract: In Australia, ca. 70 species of gall-inducing felt scales (Eriococcidae) have been described feeding on myrtaceous hosts, especially *Eucalyptus*. In contrast, only a single species of Myrtaceae-feeding and gall-inducing armored scale (Diaspididae) has been described. The diaspidid *Maskellia globosa* Fuller, the only named species of *Maskellia* Fuller, was described originally from sexually dimorphic galls on *Eucalyptus gomphocephala* in Western Australia but occurs also in other Australian states. Here we add a second species to the genus by transferring the gall-inducing *Opisthoscelis nigra* Froggatt (currently in Eriococcidae) to *Maskellia*, and redescribing the adult female and its gall. In the phylogenetic hypothesis of Morse and Normark (2006), the position of *Maskellia* within the Diaspididae is unresolved.

Key words: galls, armored scales, Diaspididae.

Introduction

The plant family Myrtaceae, is host to many (ca. 70) described species of gall-inducing Australian scale insects (Ben-Dov *et al.*, 2007; Gullan *et al.*, 2005). Most of these species are felt scales (Eriococcidae), and most gall-inducing felt scale species feed on *Eucalyptus*. Outside of the Eriococcidae, Australian gall-inducing scale insects feeding on myrtaceous hosts are more common on *Leptospermum* and *Melaleuca*. In fact, of the nine described species, only two feed on a host other than *Leptospermum* or *Melaleuca*. These are *Asterolecanium medium* Russell (Asterolecaniidae) on *Agonis* and *Maskellia globosa* Fuller (Diaspididae) on *Eucalyptus*. Fuller (1897) erected the genus *Maskellia* for a single species, *M. globosa*, which he described from *Eucalyptus gomphocephala* in Western Australia. *Maskellia globosa*, or the witch's broom scale, has been recorded from other Australian states and can be a serious pest of eucalypts, sometimes causing the death of large trees (Farrow, 1996). In his original description, Fuller noted that in 1895 he had collected a similar gall-inducing diaspidid from an unnamed plant in New South Wales. Shortly afterwards and from *Eucalyptus* in this region, Froggatt (1898) described a species that induces galls similar to those of *M. globosa* and placed it in the eriococcid genus *Opisthoscelis* Schrader. In his description, he mentions a "conical, pointed anal appendage", and he clearly figures a neckless adult male and a pygidium, both of which are diaspidid traits. We have examined specimens from Froggatt's collection and have concluded that *O. nigra* Froggatt is a diaspidid very closely related to *M. globosa*. In this paper we transfer Froggatt's species to *Maskellia* and redescribe the adult female and its gall.

Materials and methods

Freshly collected specimens were mounted one adult female per microscope slide. The slide-mounting method of Gullan (1984) was used. Measurements were made using an ocular micrometer attached to a compound microscope. All specimens listed were measured and the description is based on all available material. The morphological terms for Diaspididae follow those of Miller and Davidson (2005), except that we do not make the distinction between macroducts and microducts, preferring to use only that latter term as

it would appear that in diaspidids both are homologous to the microducts, or microtubular ducts found in other scale insects. The illustrations of the adult female was prepared with a drawing tube and the Adobe programs Photoshop CS and Illustrator CS. Following the convention for scale insects, the figure displays the dorsal body surface on the left side of the page, and the ventral body surface on the right. Enlargements of diagnostic features are located around the margin of the main figure; the sizes of these structures are provided in the text. Depositories are abbreviated as follows: ANIC, Australian National Insect Collection, CSIRO Entomology, Canberra, ACT, Australia; ASCU, Agricultural Scientific Collections Unit, Orange Agricultural Institute, NSW, Australia; BMNH, the Natural History Museum, London, UK.

We examined specimens of *M. globosa* from the following locations in Australia: New South Wales: 5 adult females and 1 second-instar female, Towrang Stockade, ex galls on *Eucalyptus melliodora*, 9.v.1999, L.G. Cook (ANIC); Queensland: 5 adult females, Goondiwindi, Tourist Park, Hungerford Street, 28°33'S, 150°18'E, ex galls on *E. populnea*, 15.viii.2004, N.B. Hardy (ANIC); South Australia: 1 adult female with DNA voucher No. LGC00383, Kimba, ex gall on *Eucalyptus* sp., 5.ix.2005, L.G. Cook (ANIC); Western Australia: 1 adult female with DNA voucher No. LGC02-80, Cape Le Grande National Park, Dunn Rock, 33°55'23"S, 122°20'46"E, ex gall on *Eucalyptus* sp., 8.x.2002. L.G. Cook and M.D. Crisp (ANIC); 1 adult female with DNA voucher No. LGC02-39, 11 km N of Mount Ragged, Balladonia Road, 33°22'12"S, 123°23'34"E, ex gall on *Eucalyptus* sp., 20.ix.2002, L.G. Cook and M.D. Crisp (ANIC); 1 adult female with DNA voucher No. LGC02-75, Kings Park, Perth, ex gall on *E. gomphocephala*, 24.ix.2002, M.D. Crisp (ANIC).

Results and discussion

Maskellia nigra (Froggatt) comb. nov.

Opisthoscelis nigra Froggatt, 1898: 376"378.

Material studied

Types. Australia, New South Wales: 1 lectotype adult female, ex dry twig gall on card mount (1 of 2 galls on card), only label: "282" (W.W. Froggatt's accession notebook for 282 only says: "*O. nigrina*" [sic] (ASCU); this specimen is here designated as the lectotype in order to fix and stabilize the current concept of the name; the slide has been labeled.

Paralectotypes. New South Wales: 1 adult female and 5 dry galls, 2 labels: "61 / *O. nigra*," and "*Opisthoscelis nigra*, Froggatt / Australia. Ex coll. Froggatt" (BMNH); Other material. Queensland: 5 adult females (2 parasitized and another with DNA voucher No. TK503), Brisbane Botanical Gardens, Mt Coot-tha, 27°29'S, 157°57'E, ex gall on *Eucalyptus* sp., 21.viii.2004, P.J. Gullan and N.B. Hardy (ANIC).

Description

Gall (Fig. 1) with slender spur-shaped projection arising from globular stem swelling. Height 11.7–16.0 mm measured from bottom of stem; length of spur 6.9–11.6 mm; base of spur 1.6–3.5 mm wide; length of stem affected by gall 10.6–22.4 mm; orifice 0.1–0.5 mm in diameter.

Slide-mounted adult female (Fig. 2) with body outline turbinate, abdomen long and tapered; body length 3.6–4.7 mm, greatest width at level of anterior spiracles, 1.6–2.9 mm.

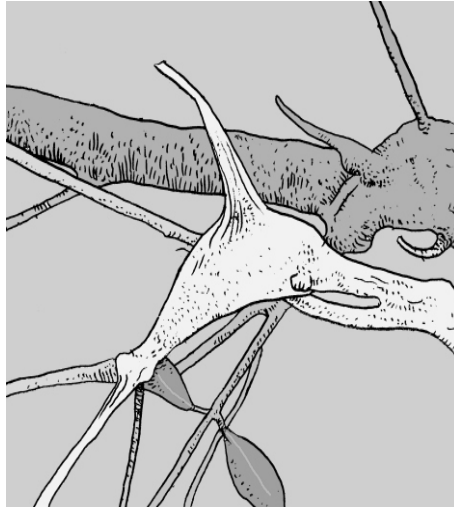


Figure 1. Gall of adult female of *Maskellia nigra*.

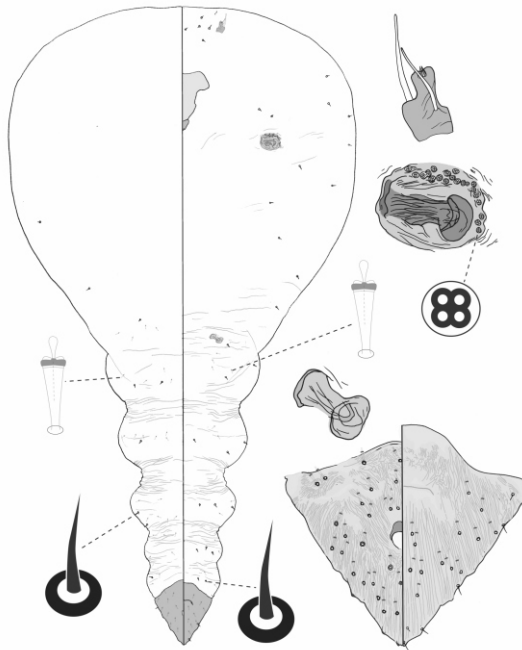


Figure 2. Adult female of *Maskellia nigra* comb. nov.

Eyes not detected. Antennae 1-segmented; length 28–40 μm ; with 2 fleshy setae plus 2 ceoloconic sensilla. Tentorial box 225–310 μm long, 160–210 μm wide, with plate-like anterior extensions. Labium 1-segmented, ca 75 μm long, 65–85 μm wide, with 3 pairs of setae. Anterior spiracles each 75–95 μm long, 35–50 μm wide across atrium, each with 10–25 perispiracular pores, each pore quadrilocular, ca. 3 μm wide; posterior spiracles each 65–85 μm long, 30–40 μm wide. Anal opening 10–20 μm wide, 135–175 μm from apex of

pygidium. Pygidium triangular, with 3 pairs of vestigial lobes; plates absent; cuticle finely striated. Microducts ca. 15 μm long, scattered on dorsal and ventral surfaces of metathorax and abdomen, pygidium with 35–80 ducts on dorsal surface and 20–40 ducts on ventral surface, perivulvar pores absent. Body setae minute, 6–20 μm long, with acute apices; ventral body surface with ca. 10 setae between antennae, few setae scattered along margin and submargin of thorax, 2 or 3 setae on each abdominal segment plus ca. 5 setae on pygidium; dorsal body surface with only a few marginal setae on thorax plus 0–2 setae on each abdominal segment.

Adult females of *M. nigra* can be distinguished from those of *M. globosa* only by having a long, tapered abdomen (*M. globosa* with abdomen much shorter). We also found that sequences of a fragment of Elongation factor-1 alpha, including 2 fast-evolving introns, from one specimen of *M. globosa* (GenBank accession No. DQ145470) and one specimen of *M. nigra* (DNA voucher No. TK503) were identical (unpublished data). This extreme similarity in terms of morphology and sequence data suggests that *M. globosa* and *M. nigra* may be different forms of the same species. However (1) *M. globosa* is very widely distributed throughout Australia, (2) *M. nigra* is known only from New South Wales and southern Queensland, and (3) the gall morphology of *M. nigra* is very distinctive and has not been recorded outside of this range. Given the above differences, and in the absence of appropriate molecular sampling of populations, we do not synonymize these taxa.

Acknowledgments

Many thanks to Jon Martin from the BMNH, and Peter Gillespie from the ASCU for arranging specimen loans. Thanks also to Dug Miller for providing comments on a draft of the manuscript. This research was supported by a National Science Foundation PEET grant, DEB-0118718, awarded to PJG.

References

- Ben-Dov, Y., Miller, D.R. & Gibson, G.A.P. 2007. 'ScaleNet, Scales on a Specified Host Query Results.' Available at <http://www.sel.barc.usda.gov/scalenet/scalenet.htm> [Accessed on 16 July 2007].
- Farrow, R.A. 1996. Insect pests of eucalypts on farms and plantations. Identification Leaflet No. 11. Witch's broom scale. CSIRO, Australia.
- Froggatt, W.W. 1898. Notes on the subfamily Brachyscelinae, with descriptions of new species. Part V. Proceedings of the Linnean Society of New South Wales 23:370-379.
- Fuller, C. 1897. A gall-making diaspid. Agricultural Gazette of New South Wales, 8:79-580.
- Gullan, P.J. 1984. A revision of the gall-forming coccoid genus *Apiomorpha* Rübsaaman (Homoptera: Eriococcidae: Apiomorphae). Australian Journal of Zoology Supplemental Series, 97:1-203.
- Gullan, P.J., Miller, D.R. & Cook, L.G. 2005. Gall-inducing scale insects (Hemiptera: Sternorrhyncha, Coccoidea). In: Biology, Ecology, and Evolution of Gall-Inducing Arthropods (eds A. Raman, C.W. Schaefer and T.M. Withers), pp. 159-229. Science Publishers, Enfield, USA; Plymouth, UK.
- Miller, D.R. & Davidson, J.A. 2005. Armored Scale Insect Pests of Trees and Shrubs. Cornell University Press, Ithaca.