Two novel adult food plants for the green and gold stag beetle *Lamprima aurata* (Scarabaeoidea: Lucanidae) in Coastal Tasmania

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Introduction

The green and gold stag beetle Lamprima aurata is common and widespread in eastern and coastal Tasmania (Fearn, 1996). Because the annual emergence of this large and colourful beetle occurs around the festive season the Tasmanian public ubiquitously referring to it as the "Christmas beetle" although elsewhere in Australia this name is reserved for species of Anoplognathus (Rutelinae). Lamprima aurata is common in coastal and near coastal habitats in eastern Australia from southern South Australia to at least the Cape Tribulation area of north Queensland (C. Reid pers. comm., S. Fearn unpublished data). Six other morphologically similar members of the genus occur in Western Australia (L. micardi), New South Wales (L. imberbis), Lord Howe Island (L. insularis), Norfolk Island (L. aenea) and New Guinea (L. adolphinae). Lamprima aurata has the most extensive range through a wide variety of climate envelopes and thus habitats.

This in part appears to have resulted in wide variations in colour and size. Morphological characters such as male body size and mandible length appear to represent a cline with such characters becoming increasingly larger towards the equator (S. Fearn, unpublished data). Extensive regional variation has led to many synonyms being erected over the years some of which are still in common use (e.g. *L. latreillii* for Queensland specimens). Hangay and De Keyzer (2017) provide a detailed overview of the taxonomic history of the *Lamprima* group.

Lamprima aurata displays a similar ecology across its range with larval development taking place in decomposing timber: typically subterranean root systems and stumps in cooler, drier portions of its range in the south and tablelands and increasingly logs and standing dead trees in the more humid portions of its range in the tropics (S. Fearn, unpublished data, Fearn, 1996). Adults display considerable trophic flexibility, feeding on a wide variety of native and introduced trees and shrubs as well as nectar-rich blossom and rarely, overripe fruit. The only L. aurata population for which larval and adult trophic ecology is well studied is the Tasmanian one (Fearn, 1996, 2015, 2016). The most common adult food source is the sap from shoots of trees and shrubs. Female L. aurata have small, apparently non-functional mandibles (in terms of trophic ecology) whereas the enlarged mandibles of males serve a twofold purpose: severing shoot tips to initiate sap flow and fighting other males to defend cut shoot tips and the attendant females attracted to them (Fearn, 1996, 2016). So far in Tasmania three smooth barked eucalypts are known adult host trees (Eucalyptus viminalis, E. globulus, E. ovata), also the coastal shrub Ozothamnus turbinatus, an ornamental Asian Photinia sp. tree an apricot tree Prunus armeniaca and the native grass Lomandra longifolia (Fearn, 1996, 2015, 2016).

Field Observations

On 07/01/2017 the author was conducting entomological field work in dune scrub land east of Greens Beach township, central north coastal Tasmania (GDA 94: 0479605mE 5452268mN). A male *L. aurata* was observed in flight, circling the crown of a mature coast wattle *Acacia sophorae* into which it alighted. In 40 years of observing *L. aurata* in the wild, the author had never seen this species feeding on any species



Plate 1. Mating pair of *Lamprima aurata* on *Clematis decipiens* at Greens Beach, Tasmania. Note severed shoot tip of vine. Photograph: Simon Fearn.

of Acacia. Subsequent investigation revealed the beetle had landed on the stem of a native vine Clematis decipiens H. Eichler ex Jeanes (Ranunculaceae), growing up through the A. sophorae where several other males had gathered and were actively feeding on the vine in the usual way: by snipping off a terminal shoot with their mandibles. Further field work over the following two weeks revealed that both C. decpiens and L. aurata were common in the area. Many mating pairs of L. aurata were discovered feeding on severed terminal shoots of the host vine (Plate 1). All the specimens of C. decipiens examined by the author were growing up through mature stands of A. sophorae (Plate 2). Specimens of the vine were collected and lodged with the Tasmanian Herbarium and a series of L. aurata collected and lodged in the entomology collections of Queen Victoria Museum and Art Gallery (QVMAG)(Registration numbers QVM:2017:12:0605-0639).

22/01/2017 the author was On conducting entomological field work in coastal woodland at the Bridport Wildflower Reserve, Adams Beach, Bridport, coastal north east Tasmania (GDA 94: 0532296mE 5463192mN). A large aggregation of L. aurata was observed on four saplings of drooping she-oak Allocasuarina verticillata (Lam.) L. A .S. Johnson (Casuarinaceae). All four saplings were approximately 4m in height and all were within 2m of each other. Approximately 50 L. aurata were actively feeding and copulating on the foliage of the A. verticillata. The majority of the beetles was on the lee



Plate 2. *Clematis decipiens* growing over mature *Acacia sophorae* in dune scrub land at Greens Beach, Tasmania. Photograph: Simon Fearn.



Plate 3. Aggregation of *Lamprima aurata* on lee side of *Allocasuarinae verticillata* at Bridport, north east Tasmania. Photograph: Simon Fearn.

side of the easternmost tree (Plate 3) with the greatest wind protection. It was not possible to make an accurate count of the beetles present as additional specimens in flight were arriving throughout the observations. Males had severed individual terminal shoots with their mandibles and both sexes were observed lapping up sap from the cut ends. Mating pairs were at the terminal cut end of shoots and their combined weight had bowed the shoots down so that close observations and photographs could be easily taken (Plate 4.). Over the following week a series of single males that were unsuccessful in obtaining a mate were collected as voucher specimens and lodged in the entomology collection of QVMAG (Registration numbers QVM:2017:12: 0640-0676).

Discussion

Both Clematis decipiens and Allocasuarina verticillata are newly documented food plants for L. aurata and further illustrate the considerable flexibility of adult trophic ecology in this species (Fearn, 1996, 2015, 2016). It would appear that male L. aurata in particular are able to assess, locate and exploit a wide range of vegetation types with high sap/nutrient content. Given the wide range of food plants across several families that are known to be exploited, it is possible that preferences in any given region may vary from year to year depending on individual plant conditions due to climatic variables such as rainfall and temperature. The late B. P. Moore (in Hangay and De Keyzer, 2017) suggests that varying levels of methyl salicylate in native foliage may act as an attractant to concentrate Lamprima beetles. The situation in Tasmania would tend to indicate that there is a wide range of as yet undocumented adult food plants throughout the extensive mainland range of L. aurata, particularly in the botanically speciose tropics. In both examples recorded in this work, it was only males that were observed to cut shoot tips and provide the sap food source so eagerly sought after by females. Males were observed engaged in identical combat and mate guarding behaviours as previously documented for Tasmanian specimens (Fearn, 1996, 2015, 2016).



Plate 4. Mating pair of *Lamprima aurata* on *Allocasuarinae verticillata* at Bridport, north east Tasmania. Note female feeding on sap exuding from shoot tip severed by male. Photograph: Simon Fearn.

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