

## Review of the biology and host-plants of the Australian jewel beetle *Julodimorpha bakewelli* (White, 1859)(Coleoptera: Buprestidae)

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**Abstract:** A review is provided on the biology and host-plants of the Australian jewel beetle *Julodimorpha bakewelli* (White, 1859)(Coleoptera: Buprestidae). The beetle is known to breed in *Eucalyptus* species (Myrtaceae) as larvae and the adults have been recorded visiting flowers of *Acacia* (Mimosaceae), although this record has never been verified. The review also contains references and discussion regarding the habit of the males of this species to attempt mating with brown beer-bottles.

### Introduction

The large brown buprestid, *Julodimorpha bakewelli* (White, 1859) occurs in the arid and semi-arid areas of Queensland, New South Wales, South Australia, Victoria and Western Australia. The species was originally described by White (1859) as *Stignodera* (sic) *bakewellii* from “mallee scrub” in Australia [exact locality not specified]. In the past *Julodimorpha* has been regarded as monotypic but Bellamy (2003) noted that “a consensus is developing about the likelihood that two species exist over the wide expanse of habitat from which *Julodimorpha* has been recorded”: I have not heard anything about this “consensus” and at the time of writing (Jan. 2005) no revisions of the genus had been published. Most of the field observations on the species have been undertaken in Western Australia. The species is presently placed in the subfamily Buprestinae, of the tribe Julodimorphini (Bellamy, 2003).

### Biological Review

Larval host-plant: *Eucalyptus* sp. (Myrtaceae)(Carter, 1929).

Adult host-plant: *Acacia calamifolia* Lindley (Mimosaceae)(Tepper, 1887).

Biology: Tepper (1887) briefly noted that he collected this species from flowering *Acacia calamifolia* (Mimosaceae) in South Australia, although this record has never been verified. Carter (1929) recorded this species as breeding in the roots and trunks of mallee trees (*Eucalyptus* species, Myrtaceae) in inland Australia. At least one female has been recorded ovipositing in damp sand (Hawkeswood & Peterson, 1982; see also record below). The males are known to mistake the ends of discarded “stubby” bottles as females which they attempt to mate with (Gwynne & Rentz, 1983, 1984). The first published indication of this phenomenon was by Douglas (1980) who published a photograph of a male *J. bakewelli* attempting to copulate with a 370 ml beer bottle in Western Australia (Fig. 1). Douglas (1980) noted that the adults appear during August and September, flying over heath; the female is much larger than the male and does not fly; mating occurs on the ground (Fig. 2). Douglas (1980) also made the interesting observation that the males also often congregate at surveyor’s yellow marking tapes attracted by the colour. Douglas (1980) finally illustrated a male attempting to mate with a beer bottle (stubby) which has a similar pattern and colour to the female beetle. During 12-13 September 1981, adults of *J. bakewelli* were common flying about 1-2 metres above the ground at a site 12 km south-east of Dongara, Western Australia (Gwynne & Rentz, 1983). These appeared to be males apparently seeking the larger flightless females crawling on the ground; on two occasions, a flying male was observed to descend onto a stubby and attempt copulation; and a search yielded

two other stubbies with male beetles; the males were either positioned at the side or “mounted” on the top of the bottle, with genitalia everted and attempting to insert the aedeagus; only one stubby without a beetle was located; a short experiment was conducted in which four stubbies were placed on the ground in an open area and within 30 minutes, two of the bottles had attracted male beetles to the stubbies which were apparently acting as “supernormal releasers” for male copulation attempts in that they resembled large females; the shiny brown colour of the glass is similar to the shiny yellow-brown elytra of the female *J. bakewelli* (a discarded wine bottle of a different colour brown held no attraction; in addition, rows of regularly spaced, small tubercles around the base of the bottles reflect light in a similar way to punctations [puncturations] on the elytra of the beetle; these along with the colour and shape of the bottles may well enhance their resemblance to females. Schlaepfer *et al.* (2002) noted that the phenomenon of *Julodimorpha* mating with bottles was an evolutionary trap where the cue and elicited behaviour is mate recognition based on morphological appearance, where the alteration of native environment was the presence of beer bottles on the ground which resemble the beetle carapace, where the unexpected outcome was that males attempt to mate with the beer bottles and finally there is a consequence of no reproductive output leading to death. Schlaepfer *et al.* (2002) point out that organisms often rely on environmental cues to make behavioural and life-history decisions. However, in environments which have been altered suddenly by humans, formerly reliable cues might no longer be associated with adaptive outcomes, In such cases, organisms can become trapped by their evolutionary responses to the cues and experience reduced survival or reproduction (Schlaepfer *et al.*, 2002). Ecological traps occur when organisms make poor habitat choices based on cues that correlated formerly with habitat quality (Schlaepfer *et al.*, 2002). A trap can lead to extinction if a population falls below a critical size threshold before adaptation to the novel environment occurs (Schlaepfer *et al.*, 2002). Hawkeswood & Knowles (1985) recorded possible predation of *J. bakewelli* by the Australian Kestrel (*Falco cenchroides*).

Life-stages: The egg, larva and pupa have not been described.

Published collection records with biological data: 12 km E of Greenhead, Western Australia (c. 30°05'S, 115°10'E), 3 Sept. 1978, A.M. Douglas, female ovipositing in the ground in damp sand near the base of a *Calothamnus* plant (Myrtaceae) (Hawkeswood & Peterson, 1982).

Further comments: Bellamy (2003) overlooked the host record of Tepper (1887), the observations of Douglas (1980) and the evolutionary paper of Schlaepfer *et al.* (2002).

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Fig. 1. Male *J. bakewellii* attempting to mate with a discarded stubby (beer bottle) in Western Australia (from Douglas, 1980).



Fig. 2. Male mating with real female on the ground in Western Australia (from Douglas, 1980).