

Associations of some *Glycaspis* Species (Homoptera: Spondyliaspidae) with their *Eucalyptus* Species Hosts

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Host associations of some species of *Glycaspis* Taylor are correlated with the current arrangement of the genus *Eucalyptus* L'Hérit, by Pryor and Johnson. The established extent of host specificity of *Glycaspis* species is recorded.

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INTRODUCTION

The *Glycaspis* — *Eucalyptus* host associations originally were based on the eucalypt classification of Blakely, 1955 (Moore, 1961a, 1970). A more recent tentative classification of the *Eucalyptus* alliance has now been given (Pryor and Johnson, 1971, 1981; Johnson, 1976), in which the species are grouped into three suballiances consisting of nine 'subgenera'.

The genus *Glycaspis* Taylor consists of three subgenera, and relevant species — host associations are here correlated with the more recent eucalypt classification.

The hosts of the 132 species of the two more primitive *Glycaspis* subgenera are exclusively *Eucalyptus* species.

The code letters preceding each eucalypt species name in this paper are those used by Pryor and Johnson.

Glycaspis — *Eucalyptus* ASSOCIATIONS

The importance of determining *Glycaspis* host associations became evident during early studies by the author on the genus *Glycaspis* in State Forests of New South Wales, when several species of *Glycaspis* and *Eucalyptus* intermingled in many discrete coastal and highland localities.

A number of the associations now known, suggest support for certain aspects of the continuing reclassification of the eucalypts by Pryor and Johnson. Examples of support are based on taxonomic and biological studies on *Glycaspis* species during more than 30 years, and reported in various papers and journals.

Examples

A. Extensive Australia-wide collections from, and observations on, more than 30 species contained in the three 'subgenera' *Angophora*, *Blakella* and *Corymbia*, have shown that *Glycaspis* species apparently do not colonize any species of the *Angophora* suballiance.

B. Species of the subgenus *Glycaspis* (*Synglycaspis*) colonize only species of the 'subgenera' *Idiogenes* and *Monocalyptus*, but not *Gaubaea*, the other 'subgenus' of the *Monocalyptus* suballiance.

C. Species of the subgenus *Glycaspis* (*Glycaspis*) colonize only species of each 'subgenus' of the *Symphyomyrtus* suballiance, namely *Eudesmia*, *Symphyomyrtus* and *Telocalyptus*.

D. The placement by Pryor and Johnson of their monotypic 'subgenus' *Idiogenes* (IAAA:A *E. cloeziana* F. Muell.) contiguous and prior to 'subgenus' *Monocalyptus* in the suballiance of the same name, is supported by *Glycaspis* (*S.*) *mactans* Moore colonizing IAAA:A *E. cloeziana*, MOG:A *E. umbra* R. T. Bak., MOG:C *E. acmenoides* Schau. and MOHEC *E. phaeotricha* Blakely and McKie (Moore, 1983: 179).

E. The inclusion of 'subgenus' *Telocalyptus* in the *Symphomyrtus* suballiance (Johnson, 1976) is supported by the occurrence of *G. (G.) clivosa* Moore (1977) on SBA:D *E. brachyandra* F. Muell., *G. (G.) operta* Moore (1984) on SBA:C *E. raveretiana* F. Muell., and an undetermined species of *Glycaspis* (*Glycaspis*) on SSA:A *E. howittiana* F. Muell. (Moore, 1984). These eucalypts are three of the four species now grouped as *Telocalyptus*. The fourth species, SBA:A *E. deglupta* Blume, does not occur naturally in Australia, and has not been sampled for *Glycaspis* species.

The characters of the male genitalia of *Glycaspis clivosa* and *G. operta* (placed in the tropical *caurina* group of species by Moore, 1983: 183) indicate their close affinity, and probably also that of their hosts.

F. The four eucalypt species EAC:A *E. tetradonta* F. Muell., EFAAA *E. similis* Maiden, EFC:A *E. miniata* A. Cunn. ex Schau. and EFC:B *E. phoenicea* F. Muell., of Pryor and Johnson's 'subgenus' *Eudesmia* of the *Symphomyrtus* suballiance, are hosts for species of *Glycaspis* (*Glycaspis*) (Moore, 1970, 1984), which supports the inclusion of at least those four eucalypt species in the *Symphomyrtus* suballiance.

Collections from seven other species of 'subgenus' *Eudesmia* have indicated that they do not seem to be hosts of *Glycaspis* species.

G. Pryor and Johnson (1981: 524) record that the eucalypt '. . . *E. (SI) bakeri* is related to western and central Eremaean species . . .'. This is supported by *G. (G.) inusitata* Moore (1985) colonizing *E. bakeri* Maiden at ca50km W of Warwick, Queensland. *G. inusitata* is included in the *deirada* group complex of species which are found mainly in Western Australia and central southern areas to Elliston, in South Australia, and on 15 hosts contained in Pryor and Johnson's Section Bisectaria which includes *E. bakeri*.

H. Pryor and Johnson (1981: 524) also record that: 'The two species of Squamosae (a Series (SIQ) of eucalypt species in Section Bisectaria), on the other hand, show no close relation with any of the trans-Eremaean species . . .'. Support is given to this finding, by *G. (G.) nancyana* Moore colonizing SIQ:A *E. squamosa* in the Sydney area of New South Wales. The closest relationship of *G. nancyana* is with *G. (G.) rylstonensis* Moore (1970) found on the solely eastern eucalypt species SNEEF *E. blakelyi* Maiden near Rylstone, New South Wales. It has no close relationship with *G. (G.) deirada* or its complex.

The second species of the Series Squamosae, SIQ:E *E. pachycalyx* Maiden and Blakely, of north Queensland, has not been sampled for possible *Glycaspis* associations.

I. Leaves of SNEET *E. brassiana* S. T. Blake were colonized by nymphs under round lerps, and adults, of *Glycaspis* (*Glycaspis*) *brimblecombei* Moore during April 1986. The small tree on which it was very prolific, was growing in the Australian National Botanic Garden, Canberra, and looked healthy. It was grown from seed collected by L. D. Pryor during April 1979, at 0.4km W of Daru Island airstrip terminal, and probably planted as seed the following spring (pers. comm. M. Carver, CSIRO, 1986).

Pryor and Johnson have placed *E. brassiana* in their Series Tereticornes which includes four known hosts of *G. brimblecombei*, namely SNEEB *E. tereticornis* Sm., SNEEF *E. blakelyi*, SNEEJ *E. dealbata* A. Cunn. and SNEEP *E. camaldulensis* Dehnh. The placement of *E. brassiana* is thus supported by the occurrence of *G. brimblecombei* on it as host.

The chemistry and metabolism of the colonized plant in Canberra would necessarily be modified by the presence or absence of certain soil chemicals and by the general environment of Canberra compared with its natural habitat of far northern Cape York

and SW Papua. A similar association, of *E. camaldulensis* and *G. (G.) baileyi* Moore was reported (Moore, 1961b) in insect-host controlled colonizing experiments, the natural host being SECAC *E. saligna* Sm. The natural distributions of *E. saligna* and *E. camaldulensis* are not known to overlap in any region.

The distribution of *G. brimblecombei* is not known to be north of latitude *ca* 20°S, so it is assumed that it does not occur where *E. brassiana* grows naturally.

The following examples may be considered speculative, but seem expedient when the *Glycaspis*—host associations are considered.

J. Pryor and Johnson (1981: 525) also comment: '*E. camaldulensis* is the most widespread eucalypt, and consists of fairly different but intergrading ecogeographic races . . . '.

The three species *G. brimblecombei*, *G. blakei* Moore and *G. eremica* Moore all utilize SNEEP *E. camaldulensis* as host, in three areas each of which overlap in part, throughout the host's extensive continental distribution (Moore, 1971, 1975, 1978). This may indicate that the eucalypt species consists of three separate taxa, though two only are at present recognized.

K. In a suggested general phylogeny of the eucalypt 'subgenera' and suballiances (Johnson, 1972: 14; 1976: 159), the *Monocalyptus* suballiance is placed before the *Symphyomyrtus* suballiance, whereas *Monocalyptus* is placed after *Symphyomyrtus* in Pryor and Johnson, 1981: 504.

It appears that the species of subgenus *Glycaspis* (*Synglycaspis*) constitute the most ancient group in the genus because of the number of antennal rhinaria and their disposition (Eastop, 1958), and because of the gall-forming, flat and round-lerp forming habits of the species (Moore, 1961 *et seq.*).

Species of the subgenus *Glycaspis* (*Glycaspis*) construct the more advanced lerp shapes of round, oval, cloverleaf, square and rectangular, and bear progressively fewer antennal rhinaria, thus indicating that the group is of more recent origin than *Glycaspis* (*Synglycaspis*) in the evolutionary sequence of the genus.

The *Symphyomyrtus* suballiance may thus be considered of more recent origin than the *Monocalyptus* suballiance.

L. The species *G. atkinsoni* Moore (1984) colonizes EFAAA *E. similis* Maiden, and appears to be nearest to *G. violae* Moore (1970) which is known to occur on SUG:A *E. cambageana* Maiden and possibly SUP:V *E. melanophloia* F. Muell. *E. cambageana* is included in the 'box' group of eucalypts, and *E. melanophloia* in the 'ironbark' group (Chippendale, 1968).

E. similis is included in the 'subgenus' *Eudesmia* of Pryor and Johnson, 1971.

It is suggested that *E. similis* may have affinities with the 'box' and 'ironbark' groups of *Eucalyptus*.

HOST SPECIFICITY

Indications now suggest that certain species of *Glycaspis* are host-specific, and others may be termed Series-specific in the context of Pryor and Johnson's classification of the eucalypts (1971).

The above two categories of *Glycaspis* are listed, with the hosts alphabetical. Such lists are obviously incomplete and prone to revision because of limitations on past studies. They will provide a ready reference to most *Glycaspis* species hosts, thus facilitating identifications of *Glycaspis* species.

Lerp shapes are referred to in the lists by the following letters: G = galls; F = flat lerps; R = round; R-O = round to oval; CL = cloverleaf; S = square; RT = rectangular lerps.

Glycaspis spp. regarded as host-specific.

Subgenus *Synglycaspis*

| | | | |
|--------------------|----|----------------------|---|
| <i>amplificata</i> | on | <i>E. acmenoides</i> | G |
| <i>encystis</i> | on | <i>agglomerata</i> | G |
| <i>brunosa</i> | on | <i>coccifera</i> | G |
| <i>surculina</i> | on | <i>conglomerata</i> | G |
| <i>wallumaris</i> | on | <i>conglomerata</i> | R |
| <i>morgani</i> | on | <i>diversifolia</i> | G |
| <i>ecphymata</i> | on | ? <i>dives</i> | G |
| <i>perthecata</i> | on | <i>haemastoma</i> | G |
| <i>icterica</i> | on | <i>marginata</i> | R |
| <i>munita</i> | on | <i>nitida</i> | G |
| <i>phreata</i> | on | <i>oblonga</i> | F |
| <i>belua</i> | on | <i>pauciflora</i> | G |
| <i>cyta</i> | on | <i>pilularis</i> | G |
| <i>seriata</i> | on | <i>pilularis</i> | R |
| <i>cyrtoma</i> | on | <i>piperita</i> | G |
| <i>planaria</i> | on | <i>piperita</i> | F |
| <i>longaeva</i> | on | <i>pulchella</i> | G |
| <i>nundlensis</i> | on | <i>radiata</i> | F |
| <i>immaceria</i> | on | <i>rossii</i> | G |
| <i>tagmata</i> | on | <i>rodwayi</i> | F |
| <i>obvelata</i> | on | ? <i>sieberi</i> | G |
| <i>constricta</i> | on | <i>stricta</i> | G |
| <i>inclusa</i> | on | <i>umbra</i> | G |
| <i>orientalis</i> | on | <i>umbra</i> | R |

Subgenus *Glycaspis*

| | | | |
|---------------------|----|----------------------|-------|
| <i>riguensis</i> | on | <i>E. argophloia</i> | R-O |
| <i>inuitata</i> | on | <i>bakeri</i> | S, RT |
| <i>rylstonensis</i> | on | <i>blakelyi</i> | ? R |
| <i>clivosa</i> | on | <i>brachyandra</i> | R |
| <i>rubritincta</i> | on | <i>brevifolia</i> | R |
| <i>onychis</i> | on | <i>brevifolia</i> | R |
| <i>blakei</i> * | on | <i>camaldulensis</i> | CL |
| <i>eremica</i> | on | <i>camaldulensis</i> | CL |
| <i>emphanes</i> | on | <i>cambageana</i> | RT |
| <i>subita</i> | on | <i>cornuta</i> | R |
| <i>deirada</i> | on | <i>dundasii</i> | RT |
| <i>montana</i> | on | <i>dunnii</i> | R |
| <i>exsertae</i> | on | <i>exserta</i> | R |
| <i>keremae</i> | on | <i>exserta</i> | R-O |
| <i>monita</i> | on | <i>fasciculosa</i> | R-O |
| <i>flavilabris</i> | on | <i>goniocalyx</i> | R |
| <i>caurina</i> | on | <i>jensenii</i> | R |
| <i>infucata</i> | on | <i>leptopoda</i> | R |
| <i>collina</i> | on | <i>melanophloia</i> | R |

*one authentic record on *tereticornis*

| | | | |
|-----------------------|----|---------------------|-----|
| <i>neureta</i> | on | <i>melliodora</i> | R-O |
| <i>egregia</i> | on | <i>moluccana</i> | R |
| <i>mannifera</i> | on | <i>moluccana</i> | R |
| <i>praescopula</i> | on | <i>orgadophila</i> | R-O |
| <i>lacustris</i> | on | <i>ovata</i> | R-O |
| <i>pilata</i> | on | <i>paniculata</i> | R |
| <i>kurrajongensis</i> | on | <i>paniculata</i> | R-O |
| <i>mellialata</i> | on | <i>paniculata</i> | R-O |
| <i>permista</i> | on | <i>paniculata</i> | R-O |
| <i>suavis</i> | on | <i>populnea</i> | R |
| <i>imponens</i> | on | <i>punctata</i> | R |
| <i>operta</i> | on | <i>raveretiana</i> | R |
| <i>siliciflava</i> | on | <i>robusta</i> | RT |
| <i>xanthopepla</i> | on | <i>seeana</i> | R |
| <i>sudicola</i> | on | <i>sideroxylon</i> | R-O |
| <i>atkinsoni</i> | on | <i>similis</i> | R |
| <i>nancyana</i> | on | <i>squamosa</i> | R |
| <i>struicis</i> | on | <i>tereticornis</i> | R |
| <i>felicitaris</i> | on | <i>tetraptera</i> | R |
| <i>lucrosa</i> | on | <i>tetrodonta</i> | R |
| <i>wagaitjae</i> | on | ? <i>tetrodonta</i> | R |
| <i>dobsoni</i> | on | <i>viminalis</i> | R |

Glycaspis spp. regarded as Series-specific

Subgenus *Synglycaspis*

| | | | |
|-------------------|---------------------|---------------|---|
| <i>aggregata</i> | on 2 spp. in Series | Haemastominae | R |
| <i>conserta</i> | on 2 spp. in | Obliquae | R |
| <i>cyanoreia</i> | on 2 spp. in | Obliquae | R |
| <i>endasa</i> | on 2 spp. in | Piperitae | R |
| <i>salebrosa</i> | on 2 spp. in | Piperitae | R |
| <i>temenicola</i> | on 2 spp. in | Piperitae | R |

Subgenus *Glycaspis*

| | | | |
|-------------------|---------------------|--------------|-----|
| <i>wondjinae</i> | on 3 spp. in Series | Albae | R |
| <i>anota</i> | on 2 spp. in | Miniatae | R |
| <i>quornensis</i> | on 2 spp. in | Moluccanae | R |
| <i>aurosala</i> | on 2 spp. in | Ochrophloiae | RT |
| <i>whitei</i> | on 2 spp. in | Polyanthemae | R |
| <i>baileyi</i> | on 3 spp. in | Salignae | R |
| <i>ignea</i> | on 3 spp. in | Salignae | R-O |
| <i>granulata</i> | on 3 spp. in | Salignae | RT |
| <i>johnsoni</i> | on 3 spp. in | Tereticornes | R |
| <i>pratensis</i> | on 2 spp. in | Tereticornes | R |
| <i>minuscule</i> | on 4 spp. in | Viminales | R |

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