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Notes on the biology and behaviour of the Australian leaf beetle **Cleptor inermis Lefèvre, 1885** (Coleoptera Chrysomelidae Eumolpinae)

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Résumé

Nous donnons ci-dessous des observations sur la biologie et les plantes-hôtes des adultes de l'Eumolpine noir, *Cleptor inermis* LEFÈVRE de la région de Brisbane, Queensland, Australie. L'espèce se nourrit normalement des fleurs de la fève locale, *Pultenaea villosa* WILLD. (Leguminosae: Fabaceae) mais durant certaines périodes de l'année quand cette plante montre une diminution de la floraison, le coléoptère adopte une plante-hôte secondaire, *Leptospermum flavescens* SM., une Myrtaceae. On suppose donc que cette stratégie de changement de nourriture est un facteur important qui vise à maintenir d'importantes populations de *C. inermis* lors des fluctuations imprévisibles de la floraison des plantes-hôtes. Ce phénomène peut se comparer à la plante-hôte secondaire des Alticines et pourrait en quelque sorte expliquer la relative polyphagie des Eumolpines étant entendu que la larve de tous les Eumolpines connus est souterraine et polyphage sur racines.

Abstract

Observations are provided on the biology and adult host plants of the black leaf beetle, *Cleptor inermis* LEFÈVRE (Chrysomelidae: Eumolpinae) from the Brisbane district, Queensland, Australia. The species normally feeds on the flowers of the native pea-plant, *Pultenaea villosa* WILLD. (Leguminosae: Fabaceae) but during certain seasons when this pea displays limited flowering, the beetle adopts a secondary adult host plant, *Leptospermum flavescens* SM. (Myrtaceae). It is postulated here that this feeding strategy has been an important factor in maintaining large populations of *C. inermis* in the face of unpredictable seasonal fluctuations in floral supplies.

Introduction

The family Chrysomelidae are represented in Australia by about 2000 species (BRITTON, 1970; HAWKESWOOD, 1987b), but in general, little is known about the ecology and behavioural biology of even the most common species. From the personal observations of one of us (T. J. H.) on a large number of Chrysomelidae throughout Australia during the past 20 years, we regard most of the Australian genera and species as foliage feeders, the adults and larvae of which usually appear on their host food plants during spring to summer (August to March). It is during these months that the majority of native plants are actively growing and flowering and producing nutritious food for their insect hosts. However, it is apparently rare for Australian chrysomelids to feed on floral structures. Regarding the world Chrysomelidae, floral feeding is mostly known among adults of *Diabrotica, Aulacophora* and several other Galerucinae, Aulacoscelinae, Megascelinae and few phytophagous Eumolpinae. Feeding on pollen is much more widespread amongst the Criocerinae, Cryptocephalinae, some rare Chrysomelinae (*Hydrothassa*), Alticinae and others. Even though many Chrysomelidae are pollen feeders, it should not be assumed that they are also effective pollinators.

It should be also noted that the larvae of all known Eumolpinae live and feed underground upon the roots of several plant families, including the grasses Poaceae (Gramineae). These chrysomelids are exclusively polyphagous. Only exceptionally, is there a close relationship between the adult and larval host plant, mostly when there are no other choices. As a tendancy (JOLIVET, 1987), many world Eumolpinae are attracted as adults towards plants of the families Asclepiadaceae, Apocynaceae and Convolvulaceae but this is far from being a general rule. On the contrary, the root feeding Alticinae are polyphagous in the larval stage but oligophagous in the adult stage. It should also be mentioned that during periods of stress (e.g. drought) Alticinae adults survive by eating the leaves of non-host plants.

In Europe and elsewhere, a number of Chrysomelidae have been found to be active pollinators and non-destructive feeders of various herbaceous plants (see e.g. PROCTOR and YEO, 1973). However, in Australia, the only study yet published revealing pollination of native plants by leaf beetles is that of HAWKESWOOD (1983) who recorded the small *Pyrgoides dryops* (BLACKBURN) (Chrysomelinae) as a pollination vector of the winter- to spring-flowering wattle tree *Acacia leiocalyx* (DOMIN) PEDLEY (Mimosaceae) in the Brisbane area, Queensland. These small beetles, measuring only about 2.5 mm in length, also often occur in large localized populations and despite their small size, often transport relatively large quantities of pollen grains (viz. up to 150 *Acacia* polyads: 1200 pollen grains) during their forays.

Cleptor inermis is an unusual purple-black chrysomelid about 8 mm long with olive-black reflections from the thorax and elytra (HAWKESWOOD, 1987b, plate 159); the species usually occurs commonly during spring to summer in woodlands, heathlands and dry sclerophyll forests in the Brisbane area during September to November (HAWKESWOOD, 1987b). The biology and life-stages are poorly known; one of us (T. J. H.) has recorded adult *C. inermis* feeding on the petals and other floral structures of the pea *Pultenaea villosa* WILLD. (Fabaceae) (fig. 1) and tea-tree *Leptospermum flavescens* SM. (Myrtaceae) (HAWKESWOOD, 1985, 1987b) (fig. 2). New observations on feeding biology and behaviour are provided below.

Fig. 1. Close-up *Cleptor inermis* on the petals of *Pultenaea villosa* (Fabaceae) at Brisbane, Queensland. (Photograph: T. J. HAWKESWOOD, from HAWKESWOOD, 1987b). Scale line: 5.0 mm.

Fig. 2. *Cleptor inermis* feeding on the nectar and floral structures of *Leptospermum flavescens* (Myrtaceae) at Brisbane, Queensland. (Photograph: T. J. HAWKESWOOD). Scale line: 5.0 mm.

Materials and methods

During the spring and summers (i.e. September to November) of the years 1982-1986, various opportunistic field observations on the biology and behaviour of *C. inermis* were undertaken in woodland/dry sclerophyll forest on the Griffith University grounds, Brisbane, Queensland, Australia by the senior author. Observations were recorded in the field and during September 1984 a number of specimens were examined in the field with a X30 field microscope for pollen grains. Voucher specimens of *C. inermis* have been deposited in the insect collection of the Entomology Department, Department of Primary Industries, Indooroopilly, Brisbane, Queensland.

Observations

During September to early November 1982 and 1983, the senior author observed large numbers of *C. inermis* on mature flowering bushes (1.0-1.5 m high) of *P. villosa* WILLD. growing in native bushland on the Griffith University grounds, Brisbane, Queensland. Up to 20-25 beetles per plant per observation period were counted; usually they occupied the most prolific flowering plants. Mating occurred on the clusters of flowers at ends of branches and amongst flowers, small crowded leaves and twigs lower down towards the base of the plants. Adults were usually encountered actively feeding on petals and stamens. Examination showed that between 1-5% of all flowers in any one portion of a plant had suffered feeding damage; many flowers had been totally consumed, i.e. all the reproductive structures and petals had been eaten. No other beetles, apart from a few, small, black, unidentified leaf beetles (probably of the genus *Ditropidus*, Cryptocephalinae), measuring about 1.0 mm long, visited the flowers. Feral honey bees, *Apis mellifera* L. and a few native bush bees, *Trigona carbonaria* SMITH (both Apidae: Hymenoptera), visited the flowers but were not near as common as *C. inermis*. (In another area of Brisbane during the same seasons, HAWKESWOOD recorded the buprestids *Stigmodera sexplagiata* GORY and *Melobasis cuprifera* (LAPORTE & GORY) on *P. villosa* flowers; HAWKESWOOD, 1982, unpub. data). *Cleptor inermis* adults were usually very wary and displayed thanatosis (free-fall and death feign escape mechanism) when disturbed or closely approached. *C. inermis* were apparently host specific to *P. villosa*, although a few were stragglers on leaves of the grass-tree *Xanthorrhoea johnsonii* LEE (Xanthorrhoeaceae) and *Eucalyptus* and *Angophora* species (Myrtaceae) growing nearby or amongst *P. villosa*. No feeding occurred on these plants which were not flowering at the time when observations were undertaken.

During 1984, *P. villosa* flowered very poorly and slightly earlier, in August. Only a few *C. inermis* were observed on *P. villosa* towards the end of its flowering in early September when flowering of another plant in the immediate area, *Leptospermum flavescens* SM. (Myrtaceae) commenced. *L. flavescens* flowered very profusely during the latter part of September and in the first half of October, more so than in previous seasons when flowering was very poor; in fact, many plants in the large stand where observations were undertaken, did not flower at all during previous seasons. No *C. inermis* were observed on *L. flavescens* during 1982 and 1983, but in 1984, they appeared in large numbers on the flowers where they fed extensively on pollen, nectar and the tough calyx-tubes and ovaries (fig. 2). Up to 30 beetles were counted on each of several mature flowering bushes (1.2-1.8 m high). On 9 September 1984, 20 beetles were examined with a X30 field microscope; 18 beetles carried *L. flavescens* pollen (90%). A closer examination of 5 beetles revealed that 80-500 ($\bar{X} = 260 \pm 200$) pollen grains (crude estimates) were carried on their bodies. (The pollen grains of *L. flavescens* are relatively large and tend to stick together in clumps on the beetle body). Pollen grains were detected on most parts of their bodies; the majority of pollen was attached to the head, thorax and abdominal sternites, in the grooves between the thorax and abdomen, and on the hairy legs. Some specimens exuded a dark yellow liquid from the mouth when handled.

During the 1985 and 1986 seasons, *C. inermis* was less common but again visited flowering *P. villosa* and displayed similar behaviour to that observed during 1982 and 1983.

Conclusions

In the Brisbane area, *C. inermis* is the most common chrysomelid beetle in native woodland/dry sclerophyll forest habitats during spring to early summer. This beetle is adapted to feed on the floral parts of two botanically unrelated but sympatric, mass-flowering native plants. It is most likely that this feeding strategy has resulted in the maintenance of large populations of *C. inermis* in the advent of seasonal fluctuations in floral food supplies. *C. inermis* is a destructive feeder and a non-pollinator of *P. villosa*. Conversely, because the floral morphology and attractants of *L. flavescens* differ significantly from those of *P. villosa*, *C. inermis* is usually a non-destructive feeder and undoubtedly a pollen vector of *L. flavescens*. This is the first species of Chrysomelidae to be recorded as a pollinator of *L. flavescens* (8 other families are known to be pollinators of this plant, see HAWKESWOOD, 1987a) and the first anthophilous native Australian species known to feed in this manner on two native host plants.

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Entomologie et Médecine légale. Datation de la mort. Acariens trouvés sur des cadavres humains.

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Résumé

Les insectes et les acariens colonisant les cadavres humains peuvent donner des informations sur la datation de la mort et d'autres conclusions médico-légales. Très peu d'informations sont disponibles pour les acariens.

Summary

The insects and the acari colonizing human corpses can provide valuable information concerning the time and manner of death in forensic medicine. There are few records of acari.

Introduction

L'application de l'entomologie à la médecine légale est actuellement un moyen d'investigation reconnu essentiel pour fixer la datation de la mort, aussi bien s'il s'agit d'un cadavre récent ou d'un cadavre ayant dépassé le stade de la rigidité cadavérique. En outre, l'enquête entomologique approfondie peut aussi mettre en évidence des données utiles en médecine légale (7, 2, 5, 9, 8).

Depuis 1947, l'un d'entre nous pratique cette technique à l'Institut de Médecine légale et de Criminalistique de l'Université de Liège, d'abord avec Feu P. le Prof. P. MOUREAU, puis avec son successeur M. le Prof. A. ANDRÉ et toute l'équipe des médecins-légistes que nous tenons à remercier: G. BRAHY, G. DESOIGNIES, P. DODINVAL, J. DOMBRET, B. EUGÈNE, J. LAMBERT, J. QUIRINI, H. SCHREIBER, J. TINANT, J. WARIN, P. WATRIN.

Sans une telle association, l'étude n'est ni possible, ni efficace. En outre, les insectes et les acariens (nécrophages, nécrophiles (prédateurs ou parasites), omnivores ou opportunistes) concernent une faune importante et variée qu'un seul entomologiste ne peut pas