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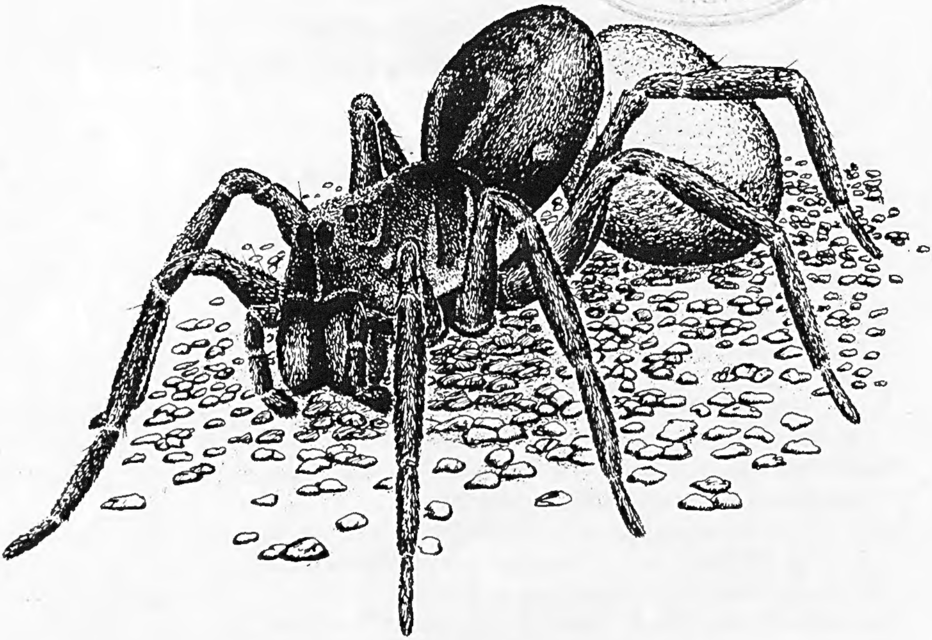

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COVER

Illustrated by Warren Reilly

Depicts a female wolf spider (family Lycosidae). The spider is draging her egg cocoon which is attatched to the spinnerets. When the young emerge they ride on the back of the female for several days, clinging to special club-shaped hairs, until they disperse.

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NEW AUSTRALIAN RECORDS OF PSYLLIPSOCIDAE, WITH COMMENT ON THE SPELLING OF *PSOCATHROPOS* RIBAGA (PSOCOPTERA: PSYLLIPSOCIDAE)

By C. N. Smithers
The Australian Museum, 6-8 College St., Sydney, N.S.W. 2000

Abstract

New records are given for *Psyllipsocus ramburii* S.-L. and *Psocathropos microps* (Enderlein) is recorded for the first time from Australia. Inconsistent spellings of *Psocathropos* Ribaga are discussed and the correct spelling determined.

Introduction

The Psyllipsocidae are a family of Psocoptera in which the adults have 3-segmented tarsi, long antennae (more than 20 segments) in which some segments are secondarily annulated, 2-segmented labial palps and a strong posterior spine on each paraproct. In winged forms the pterostigma is not more heavily sclerotized than the rest of the wing membrane and veins Cu_2 and IA end together at the wing margin. The female gonapophyses are reduced but the external valve is broad, membranous and setose. Most species of Psyllipsocidae are pale and live in protected situations in the dark. They shun bright light and are usually found in nature in caves, termite nests and under stones and are often also found in buildings, especially in cupboards and drawers. Two species, *Psocathropos lachlani* Ribaga and *Psyllipsocus ramburii* Selys-Longchamps have been recorded from Australia, the former from Queensland and the latter from all states except Queensland and the Northern Territory (Smithers 1964, 1972, 1975, 1979).

This note presents several new records of *P. ramburii* and the first for *Psocathropos microps* (Enderlein) from Australia.

New records

Psyllipsocus ramburii Selys-Longchamps

The complicated synonymy of this species is dealt with by Smithers (1967).

This is a parthenogenetic, polymorphic species with a range of forms from pale specimens with small eyes occurring in caves and other dark places to brownish specimens with well developed eyes in brighter habitats. Wing development varies from micropterous to macropterous states, the variation, at least in part, being due to environmental conditions, including crowding. Crowding during development tends to lead to macroptery (Badonnel 1959).

New Records. NEW SOUTH WALES : 2 nymphs, guano, Cliefden, Murder Cave, 2.iv., P. A. 1 ♀, 9 nymphs, New Cave, Belubula, near Orange, 4.ix.1965, G. D. Edwards. 4 ♀, on bench, Australian Museum, xii.1960, ? coll. 7 ♀, Chatswood, 14.ii.1962, J. V. Peters. 1 ♀, in millet broom, Lismore, 7.ii.1972, W. E. W. VICTORIA: 10 ♀♀, 1 nymph, Cave N1, Nowa Nowa, 18.vi.1974, E. Hamilton-Smith. WESTERN AUSTRALIA: 1 nymph, Abrakurrie Cave, 13.i.1964, P. Aitken. 4 ♀, Weebubbie Cave, Nullarbor, 27.xii.1964, E. Hamilton-Smith. 3 ♀, Abrakurrie Cave, Nullarbor, 30.xii.1965, G. S. Hunt. QUEENSLAND: 1 ♀, Riverston Cave, 8.ii.1974, E. Hamilton-Smith

This species has a very wide distribution. It has been recorded from Europe (widespread), North Africa, Britain, Ireland, Guam, Central and southern Africa, United States, Afghanistan, Australia, New Zealand, Chile and Cuba.

Psocathropos microps (Enderlein)

Axinopsocus microps Enderlein, 1903. *Zool. Jb. Abt. Syst.* 19: 3; pl. I, figs 10-18.
Psoquilla microps (Enderlein). Enderlein, 1908. *Zool. Anz.* 33: 776.
Psocatropos lesnei Badonnel, 1931. *Ann. Sci. nat. Zool.* (10) 14: 254, figs 30-37.
Psocatrops microps (Enderlein). Badonnel, 1944. *Rev. franc. Ent.* 11: 59.

New records. NORTHERN TERRITORY : 1 ♂, 2 ♀, ex carpet, Darwin, 10.v. 1980, L. Radunz. 3 ♂, 5 ♀, ex flour from Singapore, Darwin, 21.v.82, B. Gower. 2 ♂, 2 ♀, 2 n, same locality, 24.v.82, B. Gower. This species has been recorded from Africa, Madeira, Java, Taiwan, Madagascar, Thailand, Cuba, Jamaica and Reunion.

Comments on the spelling of *Psocathropos* Ribaga

Ribaga (1899) erected *Psocathropos* for *P. lachlani* Ribaga which he described and illustrated from Naples, Italy. Subsequently this species has been recorded, either under its original name or as *Psocinella slossonae* Banks, from North America, Hawaii and Australia. Six other species are now regarded as being congeneric with it. These were originally described as *Dorypteryx* *astizi* Brethes (South America), *Axinopsocus microps* Enderlein (very widespread), *Gambrella pilipennis* Enderlein (India, Seychelles, Madagascar, Aldabras), *Vulturops floridanus* Corbett and Hargreaves (North America), *V. termitorum* Townsend (South America) and *Granthakita cuttackae* Behura and Dash (India).

There are about fifty papers in which members of the genus (mainly *P. lachlani* and *P. microps*) are mentioned in more than trivial fashion but the spelling of the generic name has been inconsistent, some authors using *Psocathropos* and others *Psocatropos.* Stability in nomenclature is important; both *P. lachlani* and *P. microps* occur in domestic situations and stored products and are of potential or actual economic significance and the names are likely to be required by entomologists engaged in economic work. An attempt to establish stability is made here through study of the history of the names.

Ribaga (1899) used *Psocathropos lachlani* in his text but *Psocathropos Laclani* in the caption to his figures. The latter is clearly an error as Ribaga states that the species is named for "Robert MacLachlan", the English neuropterologist. That author actually spelt his name McLachlan or M'Lachlan.

When Banks (1900) described *Psocinella slossonae* he compared it with *Psocathropos* and Enderlein spelt *Psocathropos* the same way when comparing it with his *Axinopsocus micropos* (Enderlein 1903). Later, however, Enderlein (1904) listed the genus as *Psocatropos* Ribaga in a synopsis of his classification of the order and used the same spelling in several papers between then and 1927. He later reverted (Enderlein 1931) to Ribaga's spelling when presenting a key to related genera. Badonnel (1932) mentions that Enderlein had pointed out to him that *Psocathropos lesnei* Badonnel was probably synonymous with *Psocathropos microps.* Williams (1932), Zimmerman (1948), Gurney (1949, 1950), Mockford and Gurney (1956) and Thornton (1964, 1981) all used Ribaga's spelling. Pearman (1936), in his outline classification of the order, was apparently undecided and listed the genus as *Psocat(h)ropos* although he later (Pearman 1960) used *Psocathropos.* In more than thirty other papers, representing the work of many authors, the spelling used is *Psocatropos* and this certainly has been the commoner form. These authors have, presumably, been following Enderlein's 1904 usage.

Ribaga did not explain the origin of the name. The change from *Psocathropos* to *Psocatropos* seems first to have occurred in Enderlein's synopsis (1904). It is not clear whether this was accidental or deliberately done because he wished to correct Ribaga's spelling to conform with the classical spelling of *Atropos*, the name of another genus which, combined with *Psocus*, probably provided the basis for Ribaga's name. If the change was deliberate it is an unjustified emendation under the "Code", even though the classical origins of the name do not require an "h". If it was accidental then it and subsequent usages are all to be regarded as incorrect subsequent spellings. In any case, in terms of the Code the correct spelling is *Psocathropos.*

Acknowledgement

I would like to thank the several collectors of the material listed in this paper for entrusting me with its study.

References

Badonnel, A., 1932. Contribution a l'etude de la fauna du Mozambique–Voyage de M. P. Lesne (1928-1929). 7e note. Supplement aux Copeognathes. *Bull. Soc. zool. Fr.* 57: 105-117, 14 figs.

Badonnel, A., 1959. Developpement des ailes de *Psyllipsocus ramburi* Selys-Longchamp: essai d'interpretation. *Bull. Soc. zool. Fr.* 8(1): 91-98, 2 figs.

Banks, N., 1900. A new genus of Atropidae (*Psocinella* n.g.). *Ent. News* 11(4): 431-432, illustr.

Enderlein, G., 1903. Neue Copeognathen aus Kamerun. *Zool. Jb. Abt. Syst.* 19: 1-18, pl. 1.

Enderlein, G., 1904. Untitled note. *Zool. Zbl.* 11(3): 84-89.

Enderlein, G., 1931. The Percy Sladen Trust Expedition to the Indian Ocean in 1905. . . . . . . .VIII. Die Copeognathen fauna der Seychellen. *Trans. Linn. Soc. Lond.* (Zool.) (2)19: 207-240, 52 figs., pls 14-16.

Gurney, A. B., 1949. Distributional and synonymic notes on Psocids common to Europe and North America with remarks on the distribution of Holarctic insects (Corrodontia). *J. Wash. Acad. Sci.* 39(2): 56-65.

Gurney, A. B., 1950. *Psocids likely to be encountered by Pest Control Operators.* National Pest Control Assoc. U.S.A.

Mockford, E. L. and Gurney, A. B., 1956. A review of the Psocids, or book-lice and bark-lice of Texas (Psocoptera). *J. Wash. Acad. Sci.* 46: 353-368, 53 figs., 1 map.

Pearman, J. V., 1936. The Taxonomy of the Psocoptera: Preliminary sketch. *Proc. R. ent. Soc. Lond.* (B) 5: 58-62.

Pearman, J. V., 1960. Some African Psocoptera found on rats. *Entomologist* 93: 246-250, 6 figs.

Ribaga, C., 1899. Descrizione di nuovo genere e di una nuova specie di Psocidi. *Riv. Pat. veg. Padova* 8: 156-159, pl. 7.

Smithers, C. N., 1964. New records of cave and mine-dwelling Psocoptera in Australia. *J. ent. Soc. Qd* 3: 85.

Smithers, C. N., 1967. A catalogue of the Psocoptera of the World. *Aust. Zool.* 14(1): 1-145.

Smithers, C. N., 1972. A collection of Psocoptera (Insecta) from Western Australia including four new species. *Aust. Zool.* 17(1): 15-23, 25 figs.

Smithers, C. N., 1975. New Psocoptera records from Australian caves. *Aust. ent. Mag.* 2(3): 45-46.

Smithers, C. N., 1979. Three new species and some new records of Psocoptera from Tasmania. *Aust. ent. Mag.* 6(4): 61-68, 12 figs.

Thornton, I. W. B., 1964. Air-borne Psocoptera trapped on ships and aircraft. *Pacific Ins.* 6(2): 285-291, fig. 1.

Thornton, I. W. B., 1981. The Psocoptera of the Hawaiian Islands. Parts I and II. Introduction and Nonendemic Fauna. *Pacific Ins.* 23(1-2): 1-49, 26 figs.

Williams, F. X., 1932. Two immigrant Psocidae in Hawaii. *Proc. Hawaii Ent. Soc.* 8: 8.

Zimmerman, E. C., 1948. *Insects of Hawaii.* Honolulu. 2 vols. (Corrodentia: 2: 217-252, figs 121-137).

OVIPOSITIONAL BEHAVIOUR OF *SPHODROPODA TRISTIS* SAUSSURE (MANTODEA: MANTIDAE)

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Abstract

Females of the mantid *Sphodropoda tristis* Saussure dig holes in sandy soil, in which they lay oothecae. The possibility of similar behaviour in other Australian mantids and the finding of an ootheca under a rock is discussed.

Although Key (1970) stated that the ootheca of *Rhodomantis* "is formed beneath the surface of sandy soil" there appear to be no published observations of this behaviour. A female of *Sphodropoda tristis* Saussure has been twice observed by R. C. C. to lay oothecae in soil at Mt Gravatt, Brisbane. The observations are recorded below.

On 24 February 1981, a female mantid was observed under recently completed house extensions. It was lying on a sandy part of a former lawn, 1 m in from the outer edge of the extension. The tip of the abdomen was placed in a hole and was exuding a white frothy substance. Two hours later the mantid had disappeared and the hole was filled with loose sand. Two days later an ootheca was found at the site, buried 2 cm below the surface.

The following afternoon, a mantid, possibly the same one, was found on an area of dry turf 1 m from the original site and, again, 1 m from the outer edge of the extension. It had dug and apparently abandoned a conical hole 2 cm deep with surface diameter of 2 cm. When found the mantid was 3 cm away digging a second hole, using its forelegs alternately, much like a dog digging, throwing the soil backwards and sideways. Grass roots seemed to hinder this excavation. At a depth of 3 cm the mantid turned and extended its abdomen into the hole but then, evidently, became disturbed by the observer.

The mantid ran quickly towards the outer edge of the extension but, when deterred by the observed, it returned under the extension to a sandy area 1 m from the former location. This site was less than 0.5 m from the edge of the extension and in close proximity to a croton shrub (*Codiaeum* sp.). The mantid immediately began digging very swiftly and within 3 minutes had dug a hole to a depth of 3 cm. It then turned and extended the end of its abdomen into the hole and remained in this position for almost 2 hours, occasionally twitching its abdomen or flexing its forelegs. During this period a frothy white ootheca was being exuded into the hole (Fig. 1). The mantid eventually withdrew its abdomen and lay motionless at full length beside the hole for 3 minutes before filling it with sand. It accomplished this by using its mid and hind legs in a scrabbling sideways motion to push loose sand into the hole. After 3 seconds of leg movement the mantid rested for 1 minute. It repeated this process 9 times, completely filling and smoothing

Fig. 1. *Sphodropoda tristis* Saussure, ♀, laying its ootheca in a hole it had dug in the ground.

over the hole which was then indistinguishable from the surrounding sand patch. The ootheca from this site was dug out 2 days later.

All the activities recorded were within 1 m of the outer edge of the extensions which were 2 m above ground level. The ground had been previously covered by a couch grass lawn top-dressed with sand, and largely disturbed during the building activities. The withered and dying remaining grass was interspersed with small sandy patches.

The two oothecae are dark brown, 2.5-3.0 cm long and are flattened in the dorso-ventral plane. In each the egg-line is obscure and somewhat flattened and deformed. Apart from deformation through being laid in the soil and being encrusted with sand grains, the oothecae are similar in size and composition to a large ootheca of *Mantis octospilota* Westwood, a genus with species found in Europe, Africa, Asia and North America. The *S. tristis* female from the last site was captured and is now preserved in the Queensland Museum together with its ootheca.

Sphodropoda tristis Saussure is a medium-sized mantid (length *ca.* 6 cm), widespread in northern and inland Australia. It seems to be essentially a shrub dweller although very early instars of the various species of *Sphodropoda* and also of *Pseudomantis*, a genus with species of somewhat similar size and habits, are frequently found at a low level or running freely on the ground. Adult females of some species of *Sphodropoda* are short-winged and flightless but others are frequently caught at lights.

On 16 September 1981 Dr D. C. F. Rentz found an ootheca on the underside of a stone *ca.* 2 cm in the ground at Karagullen near Kelmscott, Western Australia. Unfortunately, nymphs emerged and died during a period when the ootheca was not under observation and thus could not be reared to the stage where positive identification could be made. They appear to be either a species of *Pseudomantis* or another species of *Sphodropoda.*

The females of *Rhodomantis*, the genus which Key (1970) recorded as forming oothecae in the soil, are very short-winged and are usually found on low grasses or free-running on the ground. The short-winged females of *Coenomantis* and the small females of *Bolbe* (length *ca.* 1 cm) and *Cliomantis* (length *ca.* 1.5 cm) are also ground dwellers. It is probable that they, too, lay their oothecae in the ground.

Acknowledgements

We wish to thank Dr G. B. Monteith for initiating contact between the authors, Dr D. C. F. Rentz for helpful comments and suggestions, Dr P. B. Carne for critically reading the manuscript and Mr J. P. Green for preparation of the illustration.

Reference

Key, K. H. L., 1970. Mantodea (Praying Mantids). Chapter 16, pp. 294-301 *in: The Insects of Australia. A textbook for students and research workers.* Melbourne University Press, Melbourne.

VANESSA ITEA (F.) (LEPIDOPTERA: NYMPHALINAE) OVIPOSITING ON *PARIETARIA DEBILIS* G. FORST. IN AUSTRALIA

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Larvae of the Australian admiral butterfly, *Vanessa itea* (F.) utilise both the native *Urtica incisa* and the introduced *U. urens* as food plants and in Tasmania larvae have also been recorded feeding on the introduced ornamental *Soleirolia soleirolia* (all family Urticaceae) (Common and Waterhouse, 1981).

On 18 September 1983, a specimen was observed ovipositing on another member of the Urticaceae, *Parietaria debilis* G. Forst. at Ginninderra Falls, New South Wales. The eggs were deposited in a pair on the undersurface of a petiole, near the leaf base.

P. debilis has been recorded as a larval food plant for this butterfly in New Zealand (Sharell, 1971).

Acknowledgement

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References

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Revised edition. Angus and Robertson, Melbourne. 682 pp.

Sharell, R., 1971. *New Zealand insects and their story.* Collins, Auckland and London. 258 pp.

GREGARIOUS PARASITOIDISM IN AUSTRALIAN MUTILLIDAE (HYMENOPTERA)

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Abstract

"*Ephutomorpha*" *ignita* (Smith) and "*E.*" *submetallescens* Turner develop gregariously on their mud-nesting hymenopterous hosts. The implications of this type of development in the biology of mutillids are briefly discussed.

Introduction

Wasps of the family Mutillidae develop as parasitoids on the enclosed and inactive immature stages of other wasps, bees, flies, beetles, moths (Brothers, 1972) or cockroaches (Mickel, 1974). (The last host relationship is not proven since Mickel suggested that the mutillid was utilising an evaniid parasitoid of cockroach oothecae rather than developing directly on the cockroach eggs. He could find no evidence of evaniid exuvia in oothecae from which mutillids had emerged, however, and it does not seem to me necessary to postulate such a complicated relationship, particularly in view of the range of hosts previously recorded for Mutillidae.) In all cases thus far noted, each host specimen or "protein packet" has produced a single mutillid specimen, although the deposition of more than one egg on a single host is apparently not uncommon (Mickel, 1928; Brothers, 1972). Evidence of the development of more than one mutillid on a single host specimen in two closely related species of Australian Mutillidae is thus of considerable interest.

Observations

During a recent visit to Australia, I discovered six female specimens of "*Ephutomorpha*" *ignita* (Smith) which had been reared from the cocoons of *Pison spinolae* Shuckard (Larridae), a mud nester, by E. F. Riek in 1950 (two females and three host cocoons) and 1952 (four females and one host cocoon). (Although the mutillids mentioned in this paper are referred to the genus *Ephutomorpha*, this is done merely for convenience and in accordance with past practice. They are actually members of one of the numerous new genera to be described for the Australian fauna.) This host relationship was confirmed by a further two females of "*E.*" *ignita* reared by E. McC. Callan in 1972. All specimens were collected in Canberra, A.C.T. Although such corroborated host records are of considerable interest *per se*, examination of the four host cocoons proved even more interesting. Each cocoon, about 13 to 15 mm long, has a hard and rather brittle wall and contains four cocoons of the mutillid. Three of the host cocoons (1950) had been opened artificially for investigation of the contents, and these contain dead mutillid larvae or pupae in addition to some empty mutillid cocoons. One such host cocoon had been opened when the mutillid larvae had barely started spinning, so that it is impossible to be sure that it contained four mutillids, but such is my impression. The fourth host cocoon (1952) contains no dead mutillids and has a single exit hole of about 1.5 mm diameter in its anterior end, through which all four mutillids must have emerged. The mutillid cocoons are typical for the family, being thin-walled, papery and pale brown in colour. They are arranged somewhat irregularly in the host cocoon, but are more or less parallel to each other along the long axis of the host cocoon. Measurement of size is difficult, but the mutillid cocoons are approximately 7 to 9 mm long, and the associated females are all about 7 mm in length.

A second species, closely related to "*E.*" *ignita*, shows a similar relationship with its host. This is "*Ephutomorpha*" *submetallescens* Turner, which was reared from mud nests of *Abispa* sp. (Eumenidae) by H. Hacker in 1912 (four females and two males) and by E. C. Dahms in 1961 (three females and one male) and 1966 (five females). All of these specimens were collected in Brisbane, Queensland. Although no host remains have been preserved, Dahms informed me that more than one specimen had emerged from a single cell of the host, up to about four per cell. That four specimens may have emerged from one cell is further indicated by the fact that four of the five specimens from 1966 emerged on the same day. (Some of the specimens escaped during the course of experiments on sex attraction, however, and have not been preserved).

I have also examined two specimens, a male and a female, of an apparently undescribed species closely related to "*E.*" *ignita* and "*E.*" *submetallescens.* These specimens were reared from a single mud nest by T. F. Houston in 1964 in Adelaide, South Australia, and both emerged on the same day, but there is no indication as to whether they emerged from the same cell or not.

Discussion

The above observations have lead me to conclude that it is probable that the Australian mutillids comprising the group including "*E.*" *ignita* and "*E.*" *submetallescens* are parasitoids of mud nesting Hymenoptera, and that up to about four mutillids may develop on a single host individual.

The effects of such a situation of gregarious parasitoidism are varied. It means that a female need find fewer hosts for production of a certain number of offspring than must a female of a species which requires a different host individual for development of each mutillid. This must be particularly advantageous when individuals of the host are rare or widely dispersed. Despite this advantage, multiple parasitoidism in Mutillidae seems to be rare. Even mutillids which utilise mud nesting Hymenoptera elsewhere, such as species of *Dolichomutilla* and *Sphaeropthalma* (*s.s.*), do not produce more than one individual per host specimen (Brothers, pers. obs.). This rarity may be due to the behavioural characteristics of the mutillid larvae. Most previous work has indicated that mutillid larvae are very voracious, will consume all available food, and will often even finish off a second (and even third) host individual if this is offered just before the first has been consumed (Brothers, 1972; Ferguson, 1962). The many instances where more than one egg is laid on a single host, and yet only one mutillid is produced, must involve the destruction of all but one of the eggs or larvae by the survivor, probably because of its voracity. This behaviour must be modified in gregarious parasitoids to enable the sibling larvae to coexist without attacking each other.

Gregarious parasitoidism must also have a marked influence on the size of the mutillids produced, since size is strongly affected by the amount of food consumed by the larva. Ferguson (1962) was able to produce particularly large specimens of two species of *Photopsis* by overfeeding, and Mickel (1924) showed that *Dasymutilla bioculata* (Cresson) had a bimodal size distribution because it was a parasitoid of two host species which differed in size. It is thus to be expected that the size of an individual mutillid of a species which is a gregarious parasitoid will be determined not only by the size of the host individual utilized, but also by the number of mutillid individuals developing on the host. Unfortunately, the material available to me is insufficient to indicate whether such a relationship actually holds or not. Sizes in the species involved do not seem to vary more than in other mutillids, but this may be because the number of mutillids produced per host individual is rather constant, or else because the number of mutillids produced per host may somehow be influenced by the size of the host.

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References

Brothers, D. J., 1972. Biology and immature stages of *Pseudomethoca f. frigida*, with notes on other species (Hymenoptera: Mutillidae). *Univ. Kansas Sci. Bull.* 50: 1-38.

Ferguson, W. E., 1962. Biological characteristics of the mutillid subgenus *Photopsis* Blake and their systematic values (Hymenoptera). *Univ. California Publs Ent.* 27: i-iv, 1-92.

Mickel, C. E., 1924. An analysis of a bimodal variation in size of the parasite *Dasymutilla bioculata* Cresson (Hymen.: Mutillidae). *Ent. News* 35: 236-242, pl. 6.

Mickel, C. E., 1928. Biological and taxonomic investigations on the mutillid wasps. *Bull. United States nat. Mus.* 143: i-x, 1-351, pl. 1-5.

Mickel, C. E., 1974. Mutillidae miscellanea: taxonomy and distribution. *Ann. ent. Soc. America* 67: 461-471.

THE LIFE HISTORY OF *CHAETOCNEME PORPHYROPIS* (MEYRICK AND LOWER) (LEPIDOPTERA: HESPERIIDAE: PYRGINAE)

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Abstract

The life history of *Chaetocneme porphyropis* is described and larval food plants listed.

Introduction

The purple brown-eye skipper butterfly, *Chaetocneme porphyropis* (Meyrick and Lower), is confined to the rain forests of northern Queensland between Innisfail and Daintree and on the Atherton Tableland. Its life history has been previously unknown. The observations recorded here were made over a number of years, on specimens in the wild and larva raised on potted plants exposed to the elements.

Life history

Egg (3 examined). Translucent whitish, domed, slightly higher than wide, 1 mm at base. Shell with 21 coarse, vertical ribs.

First instar. Head granulated, at first red, later turning brown. Divided by a median, longitudinal, groove and bearing two blunt apical points. Body red and finely haired, prothorax brown or black. Length 4 mm.

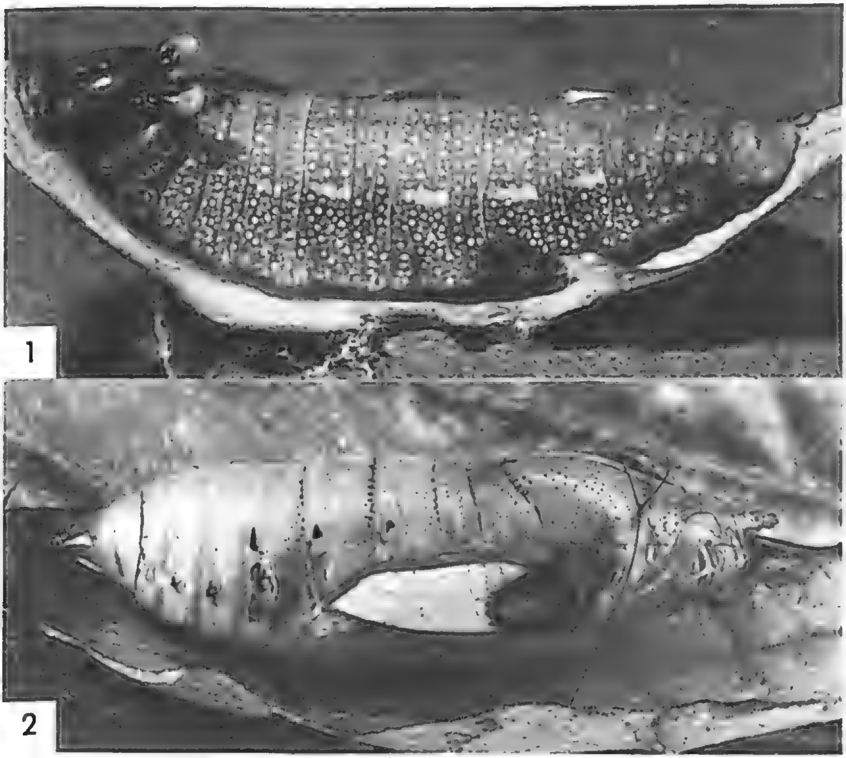
Third instar. Head brown, paler centrally and bearing two swollen horns, orange at their apex. Body uniform orange-brown and covered with small white spots. Each segment bears a subdorsal pair of orange, elongate patches, longitudinal in direction. Prothorax pale brown. Length 14 mm.

Final instar (Fig. 1). Head as in third instar but paler centrally. Body as in third instar but paler and spots and patches less well defined. Length 32 mm.

Pupa (Fig. 2). Smooth, head bears a short projection which is roughly spherical at the tip, pale yellowish with small brown spots. Wing cases bear a patch of white and pale brown, margined with dark brown. The white area is posterior to the smaller brown area and consists of waxy scales. Length 25 mm.

Food plants. The food plant most often selected is *Neolitsea dealbata* (R.Brown) Merr., but *Litsea leefeana* (F.Muell.) Merr. and *Cryptocarya* sp. aff. *C. rigida* are also used. All belong to the family Lauraceae.

Notes. Eggs are laid singly on the upper side of mature leaves. First instar larva construct a shelter by eating out a horse-shoe shaped section of leaf and bending the centre piece backwards. This process is accomplished by constructing a silken hinge at the attached end of the isolated section, which gradually raises the piece until it has travelled through 180 degrees. Larva assume a hunched posture beneath the roof of the shelter and feed at night. Immature foliage is not used in shelter construction as it loses its shape upon drying. I have not observed *Chaetocneme porphytopis* to construct the domed, igloo type shelter, sealed along its entire perimeter, apart from a hole eaten in the



Figs 1, 2. *Chaetocneme porphyropis*: (1) final instar larva; (2) pupa.

hinge, that is constructed by *Chaetocneme beata* (Hewitson) and *Netrocoryne repanda expansa* Waterhouse on the same plants. As the *Chaetocneme porphyropis* larva grows, further shelters of the same type are constructed but these differ from the first instar shelter in that the isolated end is anchored by a silken thread. Some larva have been observed to detach and caste away old shleters. Late instar larva construct shelters by cutting out the centre of one leaf and bending it down upon another. The centre piece is anchored at eight or more places and pupation occurs within the final shelter. Pupa are suspended beneath the roof of this shelter by a cremaster and "Y" shaped central girdle, the fork of which supports the pupa. Pupal duration is from two to five weeks.

Adults are on the wing throughout the year, being most numerous in October/November and April/May. There are two generations annually which overlap considerably, life cycles taking from 18 to 35 weeks. Adults fly in the late afternoon and are most often seen along rainforest edges feeding at flowers.

Acknowledgements

Thanks are extended to B. P. M. Hyland and A. K. Irvine, Division of Forest Research, C.S.I.R.O., Atherton, for identifying the food plants.

A SIMPLE PENETROMETER FOR LABORATORY AND FIELD USE

By A. D. Wright and S. C. Fuller
CSIRO, Division of Entomology, Private Mailbag No. 3, Indooroopilly, Qld, 4068

Abstract

An inexpensive and easily constructed penetrometer is described and compared with other designs.

Introduction

Penetrometers have often been used to relate feeding preferences of phytophagous insects to the mechanical hardness of plant tissues and penetrometer designs have ranged from very simple to fairly complex. We used selected features of earlier designs in a penetrometer to measure the hardness of the epidermis of water hyacinth, *Eichhornia crassipes* (Mart.) Solms., because none of the earlier designs possessed the combination we required of simple construction, low cost, easy operation in the laboratory and the field, and the ability to repeat measurements with standard errors less than 10% of means with a sample size of ten.

Previous designs

The penetrometer devised by Williams (1954) to relate feeding preferences of acridid grasshoppers to leaf hardness was very simple and has been widely used (Tanton, 1962; Taylor and Bardner, 1968; Thomas, 1974). A leaf to be tested was placed across the mouth of a specimen tube and held taut by pressing a cork, penetrated by a glass capillary tube, into the specimen tube. A pin was placed into the capillary tube with the point resting on the leaf and sand was added to a receptacle attached to the head of the pin. The weight of sand needed to cause the pin to penetrate the leaf was measured. Different aspects of this basic design have been improved by various workers.

Leaf mounting

Thomas (1974) used glue to secure delicate leaves to the bottom of the cork to prevent stretching, while Feeny (1970), Beckwith and Helmers (1976) and Wint (1979) prevented stretching by clamping leaves between two flat surfaces.

Penetration

Feeny (1970), Beckwith and Helmers (1976) and Wint (1979) used a flat-ended rod rather than a pointed pin to simulate the shearing and tearing actions of insect mandibles. However, a pointed pin may be more appropriate for simulating penetration by hemipteran mouthparts.

Application of force

While Feeny (1970) continued to use sand to apply weight, Wint (1979) avoided having a separate weighing operation by using measured volumes of water. In designs unsuitable for use in the field, Cherrett (1968) applied force with a spring and pulleys while Beckwith and Helmers (1976) used a lathe carriage driven by an electric motor.

Description of the new design

The penetrometer (Fig. 1) consisted of a burette (not shown) which delivered water into a receptacle (a) which was fixed to a pin-holder with pin (b). The pin was introduced into a guide block (f) fitted with a glass capillary tube (e) which also penetrated the centre of the upper plate (d) of a leaf-holder. When a leaf was clamped between the upper (d) and lower (g) plates of the holder, the pin rested on the leaf surface until the weight in the receptacle was sufficient to force the pin through the leaf.

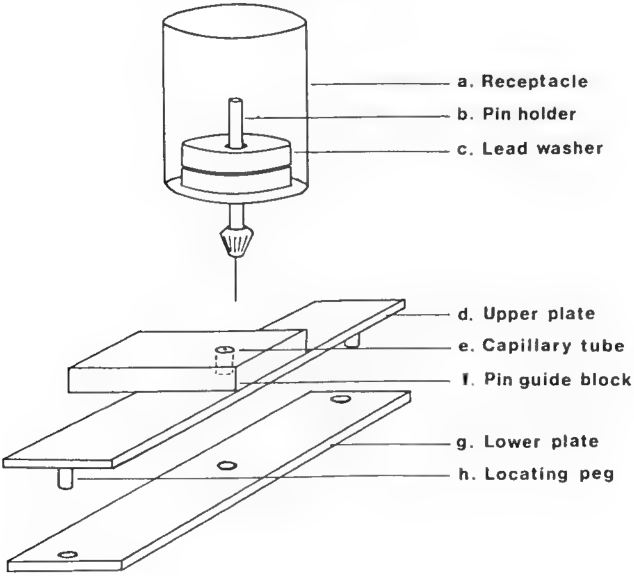


Fig. 1 The penetrometer

The burette accurately controlled water flow and measured the volume (i.e. weight) delivered. Preloading the receptacle with lead washers (c) of known weight allowed a greater range of hardness to be measured. The chuck-type pin-holder enabled easy exchange of pins of different diameters and its shank extended up inside the receptacle to locate preload washers. The points of pins were ground off to form a flat end to simulate shearing by mandibles of weevils and caterpillars which attack water hyacinth in Australia. This also made the moment of penetration easily discernible because flat-ended pins were found to penetrate more suddenly than pointed pins.

The leaf-holder was made of clear perspex to enable accurate positioning of leaves, necessary to avoid areas of leaf damage. The capillary tube (e) minimised friction on the pin which, after penetration, passed through a small hole in the lower plate of the holder. The upper and lower plates were aligned by locating pegs (h) and held together by clamps. During use the guide block, made wider than the top plate, was clamped to a rigid stand. The lower plate was not used when measuring the hardness of robust structures, such as petioles of water hyacinth, which were simply held against the upper plate by hand.

Representative results

The repeatability of measurements was tested by finding the weights necessary to cause penetration at ten different places on a single sheet of carbon paper. Carbon paper was used because it required approximately the same weight for penetration as the epidermis of water hyacinth and because under the microscope it appeared to be of more uniform texture than alternative papers. With a pin of 0.85 mm diameter (0.57 mm^2 cross section), the mean weight required was 153.82 gm with a standard error of 2.27 or 1.5% of the mean, well within the limits of repeatability required. Table 1 presents typical measurements of water hyacinth hardness using the same pin and shows that variances were greater than with the carbon paper but, with one exception, standard errors were still within 10% of means.

TABLE 1
Estimates of the epidermal hardness, in gm required for penetration, of the laminae and petioles of the youngest five leaves of ten water hyacinth plants.

Leaf position	Lamina			Petiole		
	Mean	S.E.	S.E. as % of mean	Mean	S.E.	S.E. as % of mean
1	108.6	3.25	2.99	162.0	16.90	10.43
2	116.6	4.96	4.26	218.4	5.96	2.73
3	112.3	2.72	2.42	233.2	5.83	2.50
4	112.8	3.47	3.08	232.4	6.85	2.95
5	113.9	4.59	4.03	241.8	8.36	3.46

References

Beckwith, R. C. and Helmers, A. E., 1976. A penetrometer to quantify leaf toughness in studies of defoliators. *Environ. Ent.* 5: 291-294.

Cherrett, J. M., 1968. A simple penetrometer for measuring leaf toughness in insect feeding studies. *Econ. Ent.* 61: 1736-1738.

Feeny, P., 1970. Seasonal changes in oak leaf tannins and nutrients as a cause of spring feeding by winter moth caterpillars. *Ecology* 51: 565-581.

Tanton, M. T., 1962. The effect of leaf "toughness" on the feeding of larvae of the mustard beetle *Phaedon cochleariae* Fab. *Entomologia exp. appl.* 5: 74-78.

Taylor, W. E. and Bardner, R., 1968. Leaf injury and food consumption by larvae of *Phaedon cochleariae* (Coleoptera: Chrysomelidae) and *Plutella maculipennis* (Lepidoptera: Plutellidae) feeding on turnip and radish. *Entomologia exp. appl.* 11: 177-184.

Thomas, P. A., 1974. Some investigations into the biology of *Paulinia acuminata* (De Geer) (Orthoptera: Acrididae) with particular reference to the biological control of *Salvinia auriculata.* M.Phil. Thesis, University of London.

Williams, L. H., 1954. The feeding habits and food preferences of Acrididae and the factors which determine them. *Trans. R. ent. Soc. Lond.* 105: 423-454.

Wint, G. R. W., 1979. The effects of the seasonal accumulation of tannins upon the growth of Lepidoptera larvae. D.Phil. Thesis, Oxford University.

NESTING BEHAVIOUR OF A *LYRODA* PREDATOR (HYMENOPTERA: SPHECIDAE) ON *TRIDACTYLUS* (ORTHOPERA: TRIDACTYLIDAE)

By Howard E. Evans and Allan W. Hook
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Abstract

Lyroda species near *minima* Turner has been found preying upon *Tridactylus mutus* Tindale in south-eastern Queensland. Nests are dug either in firm clay or in sandy soil not far from the muddy margins of pools where the prey occur.

Introduction

Lyroda is a genus of nearly worldwide distribution, regarded by Bohart and Menke (1976) as perhaps the most primitive genus in the large subfamily Larrinae. There is considerable morphological diversity in the genus as well as a certain amount of ethological diversity. The North American *L. subita* (Say) preys on Gryllidae and nests are initiated from the walls of pre-existing cavities in the soil; Kurczewski and Peckham (1982) have recently reviewed what is known of this species. The Asiatic *L. japonica* Iwata uses grouse locusts (Tetrigidae) and also nests in pre-existing holes (Iwata, 1976) or evidently sometimes in burrows dug from the soil surface (Tsuneki and Iida, 1969). *L. formosa* (Smith) and *L. madecassa* Arnold are also reported to prey on Tetrigidae (Bohart and Menke, 1976).

Lyroda is well represented in Australia, although only five or six of the numerous species have been described. We report here on the behaviour of several individuals observed at Blunder Creek, in the southern part of the city of Brisbane, during the summer of 1979-80. This small species (about 6 mm long) cannot be identified with certainty, but is very similar to *minima* Turner, though possibly specifically distinct (A. S. Menke, pers. comm.). Voucher specimens have been placed in the Australian National Insect Collection, Canberra, and at the U.S. National Museum, Washington, U.S.A., in the hope that the species name can be clarified when the genus receives the revisionary studies it deserves.

Results

On 30 December 1979, several *Lyroda* females were seen along a clay bank overlooking a small, stagnant pool. They walked rapidly with the abdomen in constant up and down movement. In mid-morning one female began to dig in slightly sloping soil. The firm clay was loosened with the mandibles, then dragged out in small lumps as she backed from the burrow 3-4 cm, leaving the pellets in a small circle about the entrance. At 1055 h (E.S.T.) she was spending 8-12 seconds in the burrow each time, only 2-3 s outside as she deposited the pellets. At 1150 h she stayed in 15 s, at 1215 h about 18 s, reflecting the increasing depth of the burrow. At 1230 h she made a quick, partial closure of the entrance and walked in irregular circles about the nest and then walked off towards the nearby pool. At 1240 h she returned over the ground with her first prey and entered the nest directly, without putting the prey down. Another prey was brought in at 1315 h, again from the muddy edge of the pool. This time she made short, hopping flights as well as carrying the prey over the ground, holding the prey with her mandibles, slung beneath her body.

At 1400 h this female was seen digging again at the same spot; at 1407 h she stopped, closed the entrance, and walked off. This nest was excavated at 1430 h and found to contain two cells. The burrow was oblique, 8 cm long, reaching a newly prepared cell containing one prey and no egg at a vertical depth of 6 cm. Just beyond, at 7 cm, was a cell that had been closed off, containing three prey, one of them bearing the wasp's egg attached behind the left fore coxa and lying across the sternum, its other end wedged under the right fore coxa. Burrow diameter was 1.5 mm; cells measured about 3 x 3 mm.

This female returned with another prey while the nest was being excavated and was collected. All prey in this nest and in a second similar nest dug the same day proved to be adult *Tridactylus mutus* Tindale (pygmy mole crickets, Tridactylidae). Without exception they were very lightly paralyzed, and in fact several escaped by jumping away when the cell was opened.

On 9-16 March these wasps once again appeared in abundance, evidently members of a second generation. We had recently excavated a *Sphex* nest nearby, and left a flat heap of sand about a meter in diameter. This was adopted as a nesting site by at least ten *Lyroda* females, which made slightly deeper nests in this more friable substrate. These wasps scraped soil from the burrow with their fore legs and left it outside the entrance in a small tumulus measuring about 2 x 3 cm, about 0.2 cm deep in the center. Burrows measured 9-14 cm in length ($\bar{x} = 10.6$, $n = 5$), cells 6-9 cm deep ($\bar{x} = 7.6$, $n = 5$). All prey ($n = 19$) were *Tridactylus mutus*, but at this season all were immature and 4 to 6 were used per cell. Some nests appeared to have more than one cell, but the nests were so close together that it was difficult to be sure which cells belonged with each nest. It appeared that each female made a fresh nest each day, as two nests marked as fresh on 15 March had received final closures the following day. In both cases only the lower third of the burrow had been packed with sand, the upper part being more or less open

Discussion

This species of *Lyroda* is the first of its genus to have been found to use Tridactylidae as prey, although other Larrinae (some of the smaller species of *Tachytes*) use tridactylids. The very light paralysis of the prey has been noted by others who have studied species of *Lyroda* (Iwata, 1976; Kurczewski and Peckham, 1982), and placement of the egg is consistent with what is known of other species. All of the nests we observed were started from the surface of flat or slightly sloping soil. It is interesting to note that this species is able to dig in firm clay or in much more friable sand, employing a different method of removing soil from the burrow in each case. Both nesting sites were within 3 meters of the muddy edge of a pool where pygmy mole crickets occurred in abundance. The mode of prey transport, on foot or in short, hopping flights, doubtless placed restrictions on the distance that could be traversed from the source of prey.

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References

Bohart, R. M. and Menke, A. S., 1976. *Sphecid wasps of the World. A generic revision.* University of California Press. 695 pp.

Iwata, K., 1976. *Evolution of instinct. Comparative Ethology of Hymenoptera.* Amarind Publ. Co. 529 pp.

Kurczewski, F. E. and Peckham, D. F., 1982. Nesting behaviour of *Lyroda subita* Say (Hymenoptera: Sphecidae). *Proc. ent. Soc. Wash.* 84: 149-156.

Tsuneki, K. and Iida, T., 1969. The biology of some species of the Formosan Sphecidae, with descriptions of their larvae (Hymenoptera). *Etizenia, Occ. Publ. Biol. Lab. Fukui Univ.* No. 37: 21 pp.

BOOK REVIEW

Natural History of the South East. Eds M. J. Tyler, C. R. Twidale, J. K. Ling and J. W. Holmes. Published November, 1983. Royal Society of South Australia, Adelaide. Occasional Publication No. 3. xiii, 237 pages, illustr. Price $15, plus $2.50 posted. Available direct from the Society, State Library Blg, North Terrace, Adelaide, S.A. 5000.

This is a text outstanding both for its content and value for money. It is the third in a series that the Society has produced and the most ambitious. The book is an authoritative account of the natural history of the south-eastern portion of South Australia. Thirty-two authors have combined to produce 22 chapters concerning subjects such as geology, climate, vegetation, tribal man, mammals, birds, reptiles, fishes and invertebrates. The invertebrate chapters are: "Spiders, scorpions and other arachnids" by D. C. Lee (3 pp.); "Freshwater and some terrestrial invertebrates" by W. Zeidler (18 pp.); "Myriopods, insects and allied forms" by G. F. Gross (9 pp.); and "Butterflies" by R. H. Fisher (8 pp.). Primary references are provided at the conclusion of each chapter.

Obviously the depth of detail is restricted in a work of this kind but the authors have all achieved a remarkable degree of specificness. For example Lee's chapter mentions over 40 species by name, Zeidler over 60 species and illustrates over 50, Gross over 70 and Fisher over 40 with 29 figs of eggs, larvae, adults and food plants.

I have no hesitation in recommending this book; for those who live in South Australia I consider it a must on the natural history shelf.

M. S. MOULDS

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

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FIELD, Frank

1978. Construction and dismantling of the web of an orb-web spider. *Q.N.C. News* [Newsl. Qd Nat. Club] 105/106: 9.
Aracnida: *Araneus ?heroine*

FITT, G. P.

1981. Ecology of northern Australian Dacinae (Diptera: Tephritidae) II. Seasonal fluctuations in trap catches of *Dacus opiliae* and *D. tenuifascia*, and their relationship to host phenology and climatic factors. *Aust. J. Zool.* 29(6): 885-894, 1 table, text-figs 1-3.

FOSTER, G. G., KITCHING, R. L., VOGT, W. G. and WHITTEN, M. J.

1975. Sheep blowfly and its control in the pastoral ecosystem of Australia. *In* Kikkawa, J. and Nix, H. A. (eds.), Managing terrestrial ecosystems. *Proc. ecol. Soc. Aust.* 9: 213-229, tables 1-3, text-figs 1-5.

GARNETT, S.

1981. The Lockerbie Scrub: A case for Australia's most northerly rainforest. *Habitat* 9(5): 3-5.
Coleoptera: *Mecynognathus daemeli*

GOODING, Charles George Llewellyn

OBITUARY. *Latrobe Valley Nat.* 194: 4.

GOODYER, G.

1976. Wireworms true and false. *Agric. Gaz. N.S.W.* 87(4): 46, illustr.
Coleoptera: Tenebrionidae

GREEN, A.

1981. Golden orb-weaver spiders (*Nephila* sp.) in Tasmania. *Tasmanian Nat.* 67: 12-13.

GREENSLADE, P. J. M.

1979. *A guide to ants of South Australia.* South Australian Museum, Adelaide. Special Educational Bulletin Series. Pp. i-ix, 1-44, illustr.

GREENSLADE, P. J. M. and MOTT, J. J.

1980. Ants of native and sown pastures in the Katherine area, Northern Territory, Australia (Hymenoptera: Formicidae). *Proc. 2nd Australas. Conf. Grassland Invert. Ecol.*: 153-156, tables 1-3, text-figs 1-3.

GROSS, G. F. and MATTHEWS, E. G.

1976. Insects of South Australian homes and gardens. *S. Aust. Year Book* 1976: 11 pages plus 8 pages illustr.
Reprinted as a booklet, 1976, Pp. 1-11, plus 8 pp. illustr.

GUARD, Roger

1981. Butterfly and moth breeding in your own garden. *N. Qd Nat.* 45 (No.178): 8-11.

HADLINGTON, P. W. and JOHNSTON, J. A.

1982. *An introduction to Australian insects.* 4to. New South Wales University Press, Kensington. Pp. i-viii, 1-116, illustr.

HANCOCK, David L.

1983. Classification of the Papilionidae (Lepidoptera): a phylogenetic approach. *Smithersia* 2: 1-48, tables 1-3, text-figs 1-40.
Smithersia is published by The National Museums and Monuments of Zimbabwe.

HARSLETT, Jean

1981. A lesser observed butterfly seen on the Mount Cordeaux day. *Granite Belt Nat.* 123: 6.
Lepidoptera: *Heteronympha mirifica*

HAUGUM, J. and LOW, A. M.

1981. The *Ornithoptera* updated (Lepidoptera: Papilionidae). *Tokurana (Acta Rhopalocera)* 2: 1-29, pls 1-6.

HODGENS, Eugene

1979. Spiders. *Circ. ent. Sect. R. Zool. Soc. N.S.W.* (n.s.)3: 4. [Cyclostyled, foolscap.]

McALPINE, David

1980. The cup moths. *Aust. nat. Hist.* 20(1): 15-18, illustr.

1981. Acalyptrate flies. *In*: H. F. Recher and W. F. Ponder (eds), *Lord Howe Island. A summary of current and projected scientific and environmental activities.* Australian Museum, Sydney. Occasional Rep. Aust. Mus. 1: 21.

1981. Note on the dendrobium beetle. *Orchadian* 6(10): 229.
Coleoptera: *Stethopachys formosus*

1981. Amazing orchids of southern Australia. *Aust. nat. Hist.* 20(6): 181-184, illustr.
Diptera and Hymenoptera

1982. The acalyptrate Diptera with special reference to the Platystomatidae. *In*: J. L. Gressitt (ed.), *Biogeography and ecology of New Guinea.* Vol. 2. (Series Monographiae Biologicae, Vol. 42.) Junk, The Hague. Pp. 659-673, tables 1 & 2, text-figs 1-10.
Reference is made to the Australian fauna.

McLAUGHLIN, J. H. and FRYZ, Ben

1984. Life and death of a cicada. *Geo* 6(1): 104-119.
Homoptera: Cicadidae: populat style notes mentioning several species.

McQUILLAN, P. B.

1981. A review of the Australian moth genus *Thalaina* (Lepidoptera: Geometridae: Ennominae). *Trans. R. Soc. S. Aust.* 105(1): 1-23, 1 table, text-figs 1-63.

MATILE, Loïc

1981. A new Australian genus of Keroplatidae with pectinate antennae (Diptera: Mycetophiloidea). *J. Aust. ent. Soc.* 20(3): 207-212, text-figs 1-9.

NAUMANN, I. D.

1981. A new species and additional records of *Leucospis* Fabricius (Hymenoptera: Leucospidae) from Australia. *J. Aust. ent. Soc.* 20(3): 223-228, text-figs 1-16.

1982. Systematics of the Australian Ambositrinae (Hymenoptera: Diapriidae), with a synopsis on non-Australian genera of the subfamily. *Aust. J. Zool., Suppl. Ser.* 85: 1-239, tables 1 & 2, text-figs 1-535.

NEBOISS, Arturs

1981. *Tasmanian caddis-flies.* Fauna of Tasmania Handbook No. 4. University of Tasmania, Hobart. 8vo. 180 pp., 600 text-figs, 163 maps.

NEW, T. R.

1981. The oak leaf-miner, *Phyllonorycter messaniella* (Zeller) (Lepidoptera: Gracillariidae), in Melbourne. *Aust. J. Zool.* 29(6): 895-905, 1 text-fig., tables 1-4.

1982. A reappraisal of the status of the Stilbopterygidae (Neuroptera: Myrmeliontoidea). *J. Aust. ent. Soc.* 21(1): 71-75, text-figs 1-18.

1982. Lepidoptera from *Uromycladium* galls on *Acacia. Aust. J. Zool.* 30(2): 357-364, tables 1-6.

OTTE, Daniel and ALEXANDER, Richard D.

1983. *The Australian crickets (Orthoptera: Gryllidae).* Acad. Nat. Sci. Philadelphia Mon. 22: 477 pages, 400 text-figs.

PAGEL, Diane

1979. Spider notes . . . number 1. *Darling Downs Nat.* 2(2): 25, illustr.
Aracnida: *Dinopis bicornis*

1979. The hammock-web or crinoline spider (*Stiphidion facetum*). *Darling Downs Nat.* 2(3): 34, illustr.

1980. Animal of the outing Elanda Plains Easter 1980. *Darling Downs Nat.* 3(2): 9-10.
Aracnida: *Phrynarachne* sp., *Hedana Valida, Larinia Phthisica*

1980. Outing to Goombungee–2/8/80. *Darling Downs Nat.* 3(2): 11.
Aracnida: Tent Spider, *Argyrodes* sp.

PAULIAN, Renaud

1977. The Australian Ceratocanthidae (Coleoptera: Scarabaeoidea). *J. Aust. ent. Soc.* 16(3): 261-265, text-figs 1-21.

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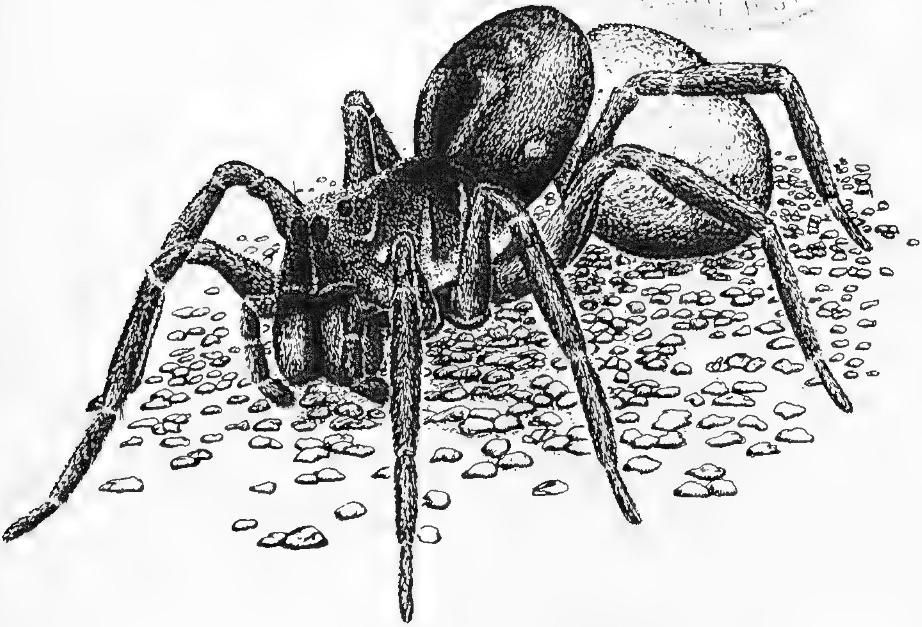

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Depicts a female wolf spider (family Lycosidae). The spider is draging her egg cocoon which is attatched to the spinnerets. When the young emerge they ride on the back of the female for several days, clinging to special club-shaped hairs, until they disperse.

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A REMARKABLE POLYMORPHISM OF MATURE LARVAE OF *ZIZINA LABRADUS* (GODART), COMMON GRASS BLUE BUTTERFLY (LEPIDOPTERA: LYCAENIDAE) FROM THE SYDNEY AREA

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Abstract

Polymorphism in body colour of mature larvae in *Zizina labradus* (Godart) ranging from white to red, green and dark purple became apparent upon rearing larva on an artificial diet. In field populations this polymorphism seems to be largely obscured by the dominant green colour which seems to be derived from the colour of the foodplant. Initial attempts to select for the white, red and green colour of the larvae were unsuccessful. The frequency of the red larvae increased significantly at the expense of the white and other pale-coloured larvae when the larvae were reared under red or green ambient light, whereas yellow and blue ambient lights had no effect. I suggest that the phenotypic decision of red *versus* white in the larval body colour may be made epigenetically, although some genetic predisposition to any body colour is not ruled out.

Introduction

Currently I am using *Zizina labradus* (Godart) [alternatively, *Zizina otis labradus* (Godart)], as experimental material in developmental biology, and rear the larvae on an artificial diet. By so doing I have uncovered extensive polymorphism in the body colour of the mature larvae of this species, which seems to be largely obscured in field populations owing to the intense green colour of the larvae, presumably resulting from chlorophyll in the foodplant. The breeding of this species on the artificial diet is easy. A systematic approach to the phenomenon of colour polymorphism thus revealed may yield valuable information about the nature of larval polymorphism in lycaenid butterflies.

Observations reported in this paper are a research by-product and only preliminary. I do not at the moment intend to pursue the subject further.

Materials and Methods

Butterflies. Local populations in North Ryde, Lindfield, Wahroonga and Seaforth (all Sydney suburbs) were used, with a population at Mount Wilson, Blue Mountains, New South Wales, as additional material.

Artificial diet. This is essentially based on the recipe of Shorey and Hale (1965): mix Solution A containing 25 g lentil flower (*besan* used in Indian and Burmese cooking), 7 g dry yeast, 3.1 g alfalfa meal (optional), 0.7 g ascorbic acid (stored in a deepfreezer), 0.44 g Nipagin M (a fungicide) and 0.22 g sorbic acid in 70 ml water with Solution B containing 2.8 g agar-agar dissolved in 70 ml boiling water, cool to 60°C and then stand in a 60° water bath to prevent solidification. Portions of this mixture are poured into obliquely held, transparent, plastic breeding-jars (6.7 cm inner diameter, 7.8 cm deep) with white or blue, non-transparent screw-lids, wetting one side of the wall and about two-thirds of the bottom; excess liquid may be poured back to the mother mixture. The jars are cooled and dried by standing at room temperature for one hour and the lids replaced. The jars thus prepared can be stored at room temperature for several weeks. Storage in a refrigerator or freezer is not practical because of the heavy condensation. The young larvae usually settle on the dry plastic surface at the edge of the food-layer on the upright side wall and feed. Alternatively, the solutions may be mixed and poured into a tray, loosely covered and left overnight, then shredded, further dried again overnight, and finally stored in jars in a refrigerator (see Morton, 1979). In this way the diet can be kept for up to several months and used in small portions as required.

Breeding. Female butterflies, freshly collected in the field in early afternoon, were brought back to the laboratory and up to 10 insects were put in a transparent, plastic cylinder with metal ends (20 cm diameter and 31.5 cm high; Australian Entomological Supplies) under illumination with eleven 20W fluorescent lamps held vertically in a U-shaped array for a period of 12 hours (0500-1700). Because of the lamps the temperature of the oviposition chamber rose to 29°C in a room at 25-27°; overheating was avoided by appropriately adjusting the distance of the chamber from the lamps. Sucrose solution (5%) in a small beaker holding a fluted filter paper and 3-6 stalked clover leaves (foodplant) in 1-2 watered flask/s were provided. Oviposition (mostly on the underside of the leaves) was very active on the day following capture, yielding up to 35 eggs per female under favourable conditions, but both egg laying and egg viability declined on later days.

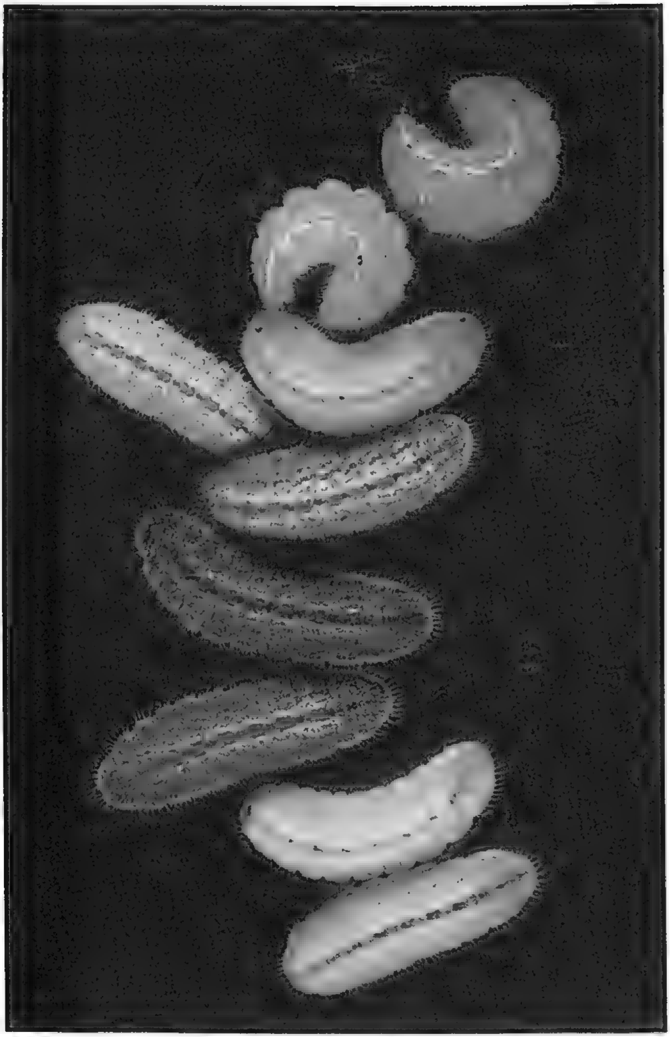

Fig. 1. Selected examples of various body colours in mature larvae of *Zizina labradus* (Godart) from Sydney area (x 4.1).

The eggs were dislodged with a small spatula and collected in small plastic Petri dishes (60 mm). If necessary, they were counted under a dissecting binocular microscope on a section paper fitted to the lid of a Petri dish. Immediately prior to hatching, a fresh clover leaf was placed in the Petri dish, or the dish containing eggs was placed in the lid of the breeding jar standing upside down to let newly hatched larvae crawl up to the food. The procedures seemed to affect only slightly the viability of the egg, which was 86-98% under optimum conditions.

The newly hatched larvae were placed in rearing jars with a very small paint brush at a desired density (20 per jar was adequate) and held at 23°. Cannibalism was reduced at this temperature by keeping the lid loose to lower humidity (Morton, 1979) from the third instar on, and also by reducing the population density to 10, 5 or even less per jar with the growth of the larvae. The young larvae were thus gradually thinned out by transferring to new jars after 1-2 weeks, especially when they moulted on the lid. Alternatively, fresh pieces of shredded diet were attached to the side wall of the jar whenever food became dry or scarce. The egg, larval and pupal stages lasted 5-6, 32 and 8-10 days, respectively, and about 50% of the larvae survived to produce adults. Viability could be increased to above 80% by rearing each larva separately.

Mating. Artificial lights were largely insufficient to elicit mating behaviour with this species. When placed in a wire cage measuring $(60\,\mathrm{cm})^3$, the butterflies mated readily (mostly within 30 minutes) upon exposure to sunlight (usually in the late morning) in the absence of strong draught. Copulation lasted for about 30 minutes. Females started laying eggs on the second day after copulation. I suspect that females prevented from vigorous flying tended to yield less viable eggs.

Results

The young larva was colourless, but started to show the first sign of colour patterns, consisting of the median dorsal and other longitudinal lines, at the second instar. Thereafter the larvae gradually acquired body colour and enhanced patterning. These patterns aside, the body colour of larvae diverged gradually and, at the fifth instar, ranged from an almost pure, even sometimes shiny, white, through light grey-brown, pale red, wine red to dark purple, and also through pale green and green to almost shining emerald or bluish green. Examples are shown in Fig. 1. These colours appear to be largely due to pigmentation of the epidermis, but the emerald green larvae (and pupae; see below) apparently had green haemolymph. The dark-purple colour may be due to a combination of the red epidermis and green haemolymph, but this point was not ascertained. The cuticle did not contribute to the colour. The Blue Mountain population showed a slightly different trend of patterning with many individuals having more pronounced pale areas on both sides of the dorsal median line compared with those from the Sydney population.

The proportion of various colour-forms was roughly stable in the Sydney population, intermediate ones usually predominating. The green and red colours were carried over in early pupal stages. Pupae also varied in the intensity of dark stripes and brown dusty stipples. I have so far not found any correlation between adult sex or phenotype and larval colour type.

Attempts were made to select for white, red, dark purple and green larvae, but the F_1 and F_2 failed to show any effect of selection. Rather the parental phenotypes tended to be reduced in proportion among the progeny.

The possible effect of environmental factors on body colour was therefore tested. First, newly hatched larvae of mixed family lines were placed in coloured plastic containers with translucent lids. A green container yielded all green larvae and a red one yielded all red larvae, while yellow and beige containers gave mixed populations. But the small sample size precluded any definite conclusion. In another experiment, eggs and rearing jars containing larvae were placed inside plastic rearing cylinders with transparent plastic side walls covered with coloured cellophane sheets. Red, yellow, green and blue cellophanes were tested together with a control without cover under illumination of two 40W horizontal fluorescent lamps from 0500 to 1700 (Eastern Standard Time) but with lingering summertime daylight and room lights for night cleaning for several hours more. The results shown in Table 1 apparently indicate that the frequency of red body colour increases at the expense of white and other pale body colours under the influence of red and green ambient lights, but the yellow and blue ambient lights do not share this effect. The green body colour, on the other hand, does not seem to be enhanced by any colour of the ambient light. Of course, these results are only very preliminary and need verification with more carefully and systematically designed experimentation. But generally speaking, the appearance of the body colour seems to be environmentally affected and therefore epigeneticaly regulated, rather than genetically controlled as a first approximation, at least in part.

TABLE 1

Frequency of each different body colour in mature larvae of *Zizina labradus* reared on artificial diet under ambient lights of different colours (frequency shown as a percentage of the total number of larvae).

Colour of larva	Colour of ambient light				
	Control (White)	Red	Yellow	Green	Blue
White	15%	0%	13%	0%	21%
Grey-brown	15	0	13	3	26
Pale green	8	7	13	7	5
Green	15	20	25	7	16
Pale red	15	0	21	0	5
Red	23	60	17	83	26
Dark purple	8	13	0	0	0
Total number of larvae	13	15	24	30	19

For experimental conditions, see text. Test for overall heterogeneity of the sample: $\chi^2 = 54.46$ ($P < 0.01$).

Discussion

Extensive larval polymorphism in a natural population of an Australian lycaenid [*Theclinesthes albocincta* (Waterhouse)] has been reported by Grund and Sibatani (1975). Some polymorphism in natural populations of *Z. labradus* larvae in Australia has also been noted by Common and Waterhouse (1972, 1981) and Fisher (1978), who state that the larvae are of "various shades of green".

In populations of *Z. labradus* larvae feeding on clover, the colour variation appears to be rather limited because they are all green in body colour, with occasional variants of dark coloration presumably corresponding to the wine red or dark purple form found among larvae raised on the artificial diet. A series of research projects, requiring little instrumentation, could be undertaken on the genetic, epigenetic, ecological and biogeographical aspects of the polymorphism. Moreover, such studies could be combined with isozyme analyses now widely used in population genetics. An important point would be to ascertain whether or not the colour polymorphism of the larva as reported here is a "natural" phenomenon that is largely obscured by the chlorophyll of the food plants or a phenomenon actually induced by the artificial diet employed here. A further interesting question would be to determine the selective significance of the polymorphism which is largely obscured or, in the case of green forms, apparently made redundant by the green colour contained in the natural food plant.

The same artificial diet as used here was accepted by all newly hatched larvae of *Candalides absimilis* (Felder) (Lycaenidae) from eggs laid on wisteria in the Sydney area. Only a minority of them survived to emerge as normal adults and so far no larval polymorphism has been detected.

Acknowledgements

I am indebted very much to George Rothschild of CSIRO Division of Entomology for his assistance in the artificial diet regime, to Ian Franklin for statistical analysis, Peter Watt for his technical assistance and Graham Rockwell for improvement of the manuscript.

References

Common, I. F. B. and Waterhouse, D. F., 1972. *Butterflies of Australia.* Angus and Robertson, Sydney, 498 pp.

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Second edition. Angus and Robertson, Sydney, 682 pp.

Fisher, R. H., 1978. *Butterflies of South Australia.* Handbooks Committee on behalf of the South Australian Government, [Adelaide], 272 pp.

Grund, R. and Sibatani, A.,1975. The life history of a hitherto unrecognised lycaenid species: *Theclinesthes albocincta* (Waterhouse) from South Australia. *Aust. ent. Mag.* 2: 99-103.

Morton, A. C., 1979. Rearing butterflies on artificial diets. *J. Res. Lepid.* 18: 221-227.

Shorey, H. H. and Hale, R. L., 1965. Mass-rearing of the larvae of nine noctuid species on a simple artificial medium. *J. econ. Ent.* 58: 522-524.

THE SPECIFIC STATUS OF *TRAPEZITES PRAXEDES* (PLÖTZ) (LEPIDOPTERA: HESPERIIDAE): PREVIOUSLY CONSIDERED TO BE A SUBSPECIES OF *T. MAHETA* (HEWITSON)

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Abstract

Trapezites praxedes (Plötz) is shown to be a species distinct from *T. maheta* (Hewitson) based on morphology of the adults and immature stages. Both species are sympatrically distributed over part of their range in southeastern Queensland and northeastern New South Wales.

Introduction

Two subspecies of *Trapezites maheta* (Hewitson) (Hesperiidae) have previously been recognised from eastern Australia.

Hewitson (1877) described *Hesperia maheta* from Queensland and Plötz (1884) described a similar taxon, *Telesto praxedes,* from Port Jackson (Sydney, New South Wales). Waterhouse (1932) and Evans (1949) considered *praxedes* to be the southern subspecies of *T. maheta,* an arrangement followed by recent authors including Common and Waterhouse (1981).

During the past ten years specimens considered to be *T. maheta* and *T. praxedes* have been collected at the same localities in southeastern Queensland and northeastern New South Wales (Fig. 1). An examination of the morphology of adults and immature stages has revealed that the two taxa represent different species.

One of us (Sands) has examined the male genitalia from the holotypes of *Hesperia maheta* in the British Museum (Natural History) and *Telesto praxedes* in the Zoologisches Museum of the Humboldt University, Berlin, East Germany. These observations confirm that the holotypes of *maheta* and *praxedes* represent distinct species.

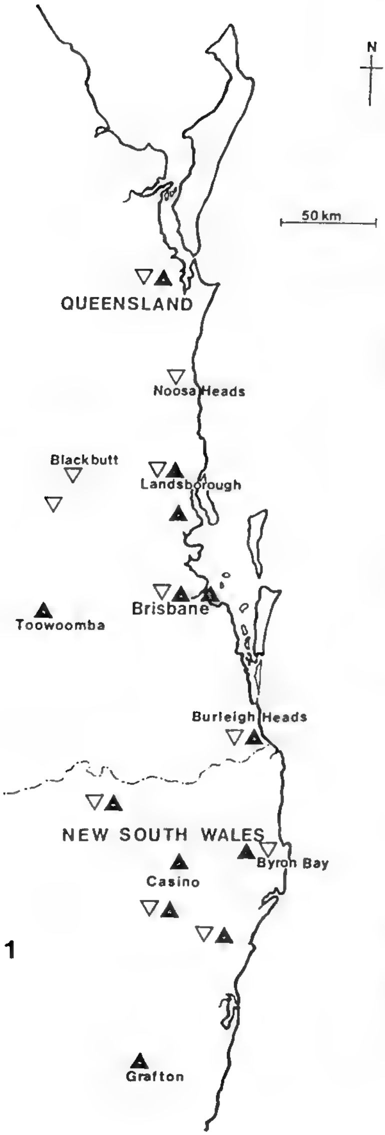
Trapezites maheta (Hewitson)
(Figs 2, 3, 6, 8-19)

Hesperia maheta Hewitson, 1877; p. 80.

Trapezites maheta (Hewitson), Meyrick and Lower 1902, p. 89, Waterhouse 1903, pp. 54-56.

Trapezites maheta maheta (Hewitson), Waterhouse 1932, p. 220; 1937, p. 112; Evans 1949, p. 209; Common and Waterhouse 1981, p. 114.

Type.– *Holotype* ♂ labelled "Queensland" in British Museum (Natural History), London.



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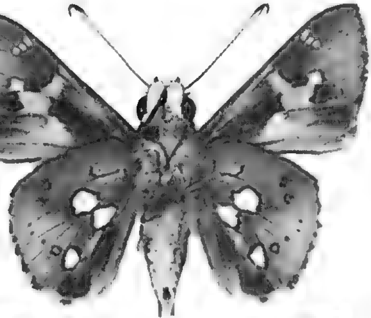

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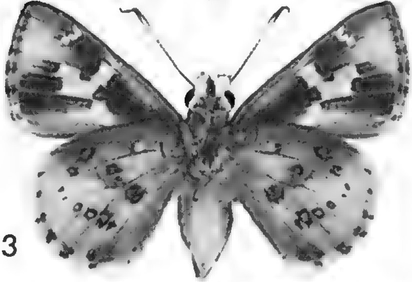

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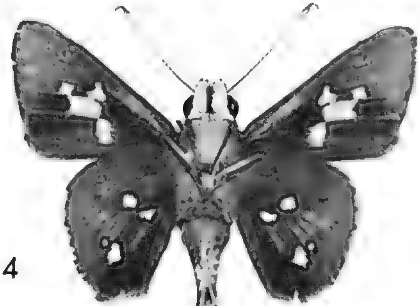

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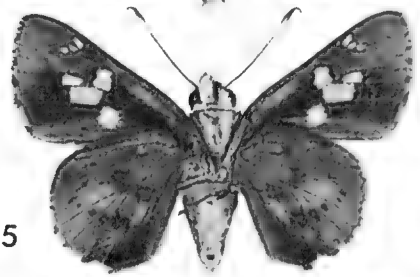

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Fig. 1. Sympatric distribution of two *Trapezites* spp. in eastern Australia; (▲) *T. maheta* (Hewitson), (△) *T. praxedes* (Plötz).

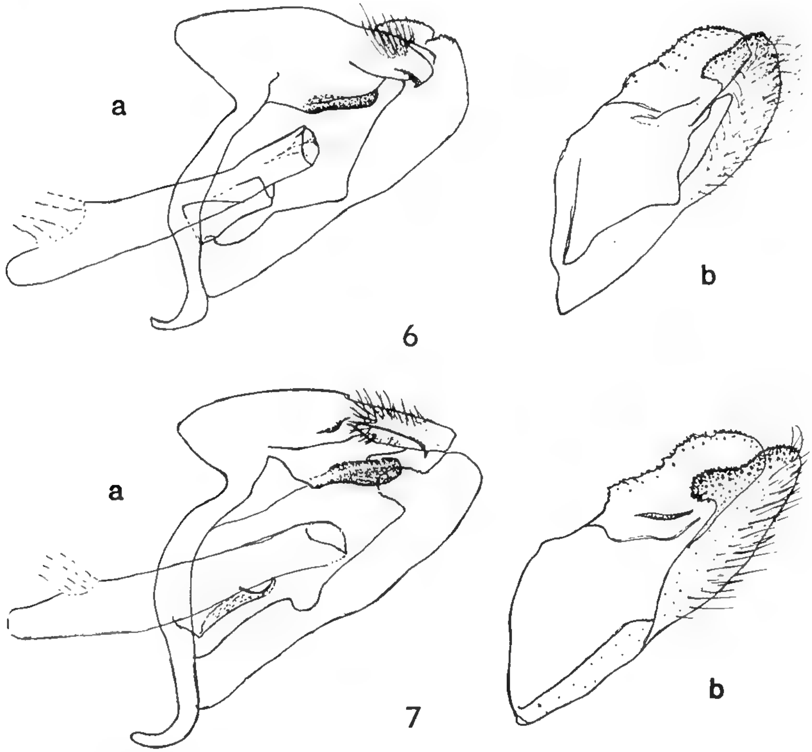
Figs 2-5. *Trapezites* spp. undersides: (2, 3) *T. maheta* (Hewitson), (4, 5) *T. praxedes* (Plötz); (2, 4) males, (3, 5) females.

Trapezites praxedes (Plötz)

(Figs 4, 5, 7, 20-31)

Telesto praxedes Plötz, 1884, p. 378.
Telesto phlaea Plötz, 1884, p. 378: syn. Waterhouse 1903, pp. 54, 55.
Trapezites maheta praxedes (Plötz), Waterhouse 1932, p. 220; 1937, p. 112; Evans 1949, p. 209; Common and Waterhouse 1981, pp. 113, 114.

Type. – *Holotype* ♂ labelled "praxedes Pl type", "praxedes 5065 type", "Port Jackson Leach" in the Zoologisches Museum, Humboldt University, Berlin.



Figs 6-7. Male genitalia: (6) *T. maheta* (Hewitson), holotype; (7) *T. praxedes* (Plötz). (a) with near valva removed. (b) valva, slide mounted.

Distinguishing characters

Adult males of the two species differ in size, *T. praxedes* being usually larger than *T. maheta* (Table 1). However, *T. praxedes* specimens from southern New South Wales are not as large as northern populations and these do not differ significantly in size from *T. maheta.* The colour of the upper side of the two species is somewhat variable, but beneath both sexes of *T. maheta* (Figs 2, 3) are paler than *T. praxedes* (Figs 4, 5). Beneath, the apex of the fore wing and the ground colour of the hind wing differs in both sexes of the two species: in *T. praxedes* these areas are uniform purple-brown whereas in *T. maheta* they are variegated grey-brown. Moreover, the costal area beneath is darker than the subterminal area in *T. maheta* but is the same colour in *T. praxedes.* On the hind wing of males of *T. maheta* an area corresponding to the orange median band above is distinctly grey-orange whereas this is only slightly paler than the ground colour of *T. praxedes.* A useful character which enables separation of males of the two species is the size and position of the two median spots on the hind wing beneath. The anterior spot in *T. maheta* is larger and rounded, averaging 1.72 mm (n = 10) whereas in *T. praxedes,* it is often crescentic and averages 1.11 mm (n = 10) when measured between the base and termen. The two median silvery spots are more basally located in *T. maheta* than in *T. praxedes,* and with their size differences these constitute the best characters for separating worn specimens. The row of hind wing postmedian spots, which diminish in size towards the apex, tends to be better developed in *T. maheta* than in *T. praxedes,* and two ringed subapical spots, present in male specimens of *T. maheta,* are often small or absent in *T. praxedes.*

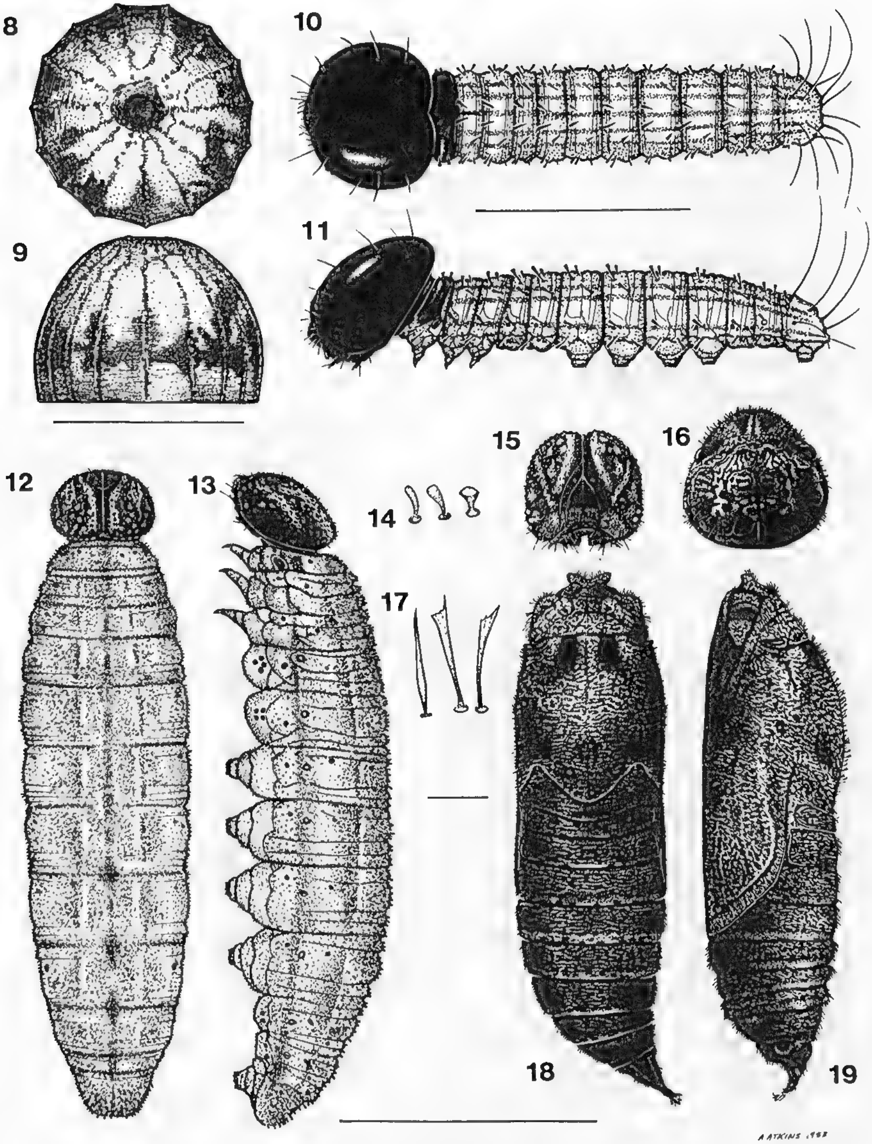
TABLE 1

Fore wing lengths and ratio of measurements of valvae from the genitalia of male *Trapezites* spp. from southeastern Queensland (n = 10 each sp.)

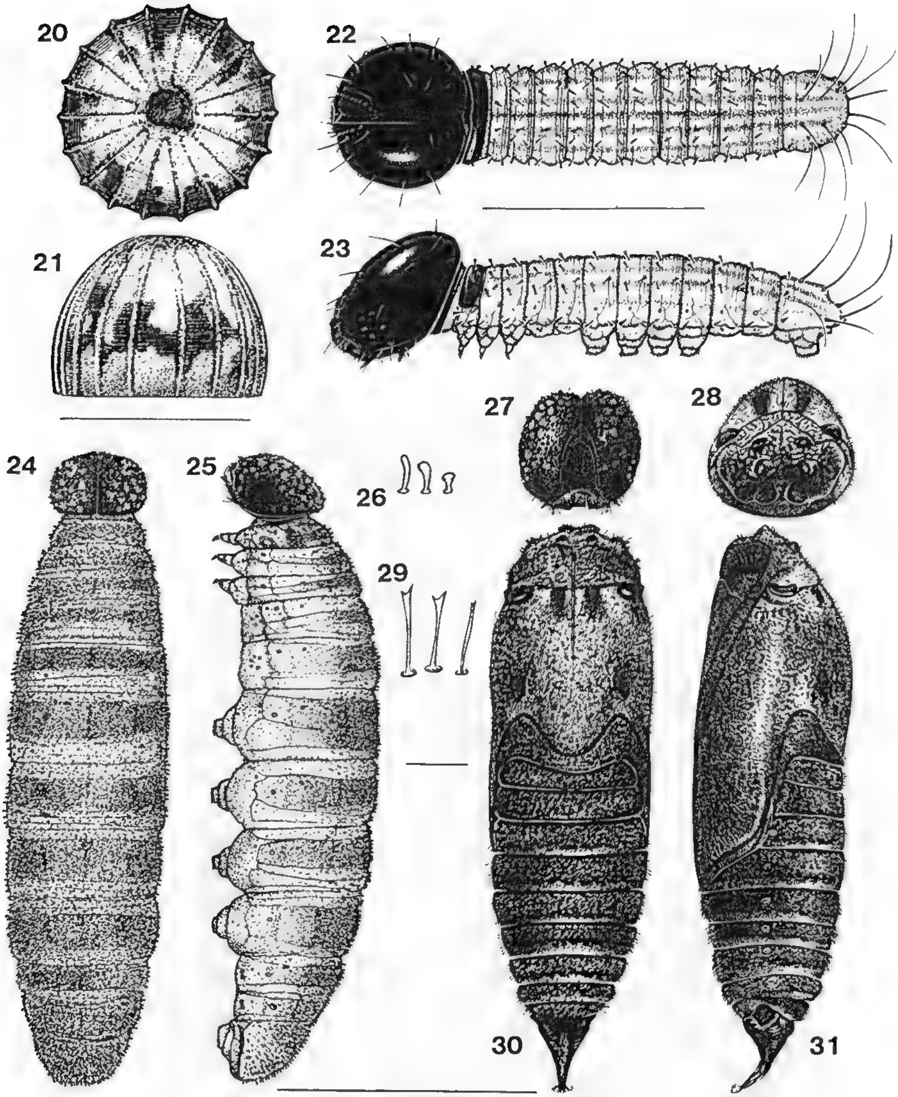
	Fore wing length (mm)			Valva ratio width/length		
	Mean	Range	± S.E.	Mean	Range	± S.E.
T. praxedes	16.9	15.8-19.2	0.137	0.376	0.360-0.390	0.005
T. maheta	14.9	13.9-15.6	0.209	0.428	0.403-0.447	0.008

The valvae of the male genitalia differ considerably in their relative widths (Table 1) and in shape (Figs 6, 7). In *T. praxedes* the inner ventral fold, or harpe is developed with an upturned, subapical rounded lobe, whereas in *T. maheta* the dorsal edge of the harpe is not produced and the proximal edge is subtriangular, not rounded. Both species have the gnathos typically developed as two, broad ridges covered in granulation. However, in *T. praxedes* they are apically swollen and rounded whereas in *T. maheta* they are weakly convex. No differences in the female genitalia of the two species were observed.

There are also differences between immature stages of the two species: the eggs of *T. maheta* have an average of 15 vertical ribs (Figs 8, 9) while in *T. praxedes* there are an average of 19 (Figs 20, 21). First instar larvae of



Figs 8-19. Immature stages of *Trapezites maheta* (Hewitson) from Casino, N.S.W.: (8, 9) egg, dorsal and lateral; (10, 11) first instar larva, dorsal and lateral (12, 13) mature larva, dorsal and lateral; (14) setae of mature larva; (15) head of final instar larva; (16) pupal cap; (17) setae of pupa; (18, 19) pupa, dorsal and lateral.



Figs 20-31. Immature stages of *Trapezites praxedes* (Plötz) from Casino, N.S.W.: (20, 21) egg, dorsal and lateral; (22, 23) first instar larva, dorsal and lateral (24, 25) mature larva, dorsal and lateral; (26) setae of mature larva; (27) head of final instar larva; (28) pupal cap; (29) setae of pupa; (30, 31) pupa, dorsal and lateral.

both species (Figs 10, 11, 22, 23) are pale green with 3 dorsal, longitudinal stripes, but areas of pale brown are present at the base of the setae in *T. praxedes.* The second to fifth instar larvae are pinkish-grey to olive green with prominent brown dorsal stripes in *T. maheta* (Figs 12, 13), but are uniform reddish-brown with inconspicuous stripes in *T. praxedes* (Figs 24, 25). The head possesses light brown stripes in *T. maheta* (Fig. 15) but in *T. praxedes* (Fig. 27) the head is dark brown with lighter brown dorsal spots.

The cremaster of the pupa is shorter and blunter and the pupal cap is more developed in *T. maheta* (Figs 16, 18, 19) than in *T. praxedes* (Figs 28, 30, 31). Both the setae of the mature larvae and the pupae differ in shape between the two species (Figs 14, 17, 26, 29).

Distribution

Both species occur sympatrically from Cooloola, southeastern Queensland to Grafton in northern New South Wales. *T. praxedes* extends its range to eastern Victoria and *T. maheta* to Kuranda and the Atherton Tablelands (Common and Waterhouse, 1981).

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References

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia,* Revised edition. Angus and Robertson, Sydney. 682 pp.

Evans, W. H., 1949. *A catalogue of Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History).* xix + 502 pp., 53 pls. British Museum (Natural History), London.

Hewitson, W. C., 1877. Description of twenty-five new species of Hesperidae. *Ann. Mag. nat. Hist.* (4) 19: 76-85.

Meyrick, E. and Lower, O. B., 1902. Revision of the Australian Hesperidae. *Trans. Proc. Rep. R. Soc. S. Aust.* 26(2): 38-129.

Plötz, C., 1884. Die Hesperiinen-Gattung *Telesto* Bsd. und ihre Arten. *Stettin. ent. Ztg* 45(10-12): 376-384.

Waterhouse, G. A., 1903. Descriptions and notes of Australian Hesperidae, chiefly Victorian. *Victorian Nat.* 20(4): 52-57.

Waterhouse, G. A., 1932. Australian Hesperiidae. II. Notes and descriptions of new forms. *Proc. Linn. Soc. N.S.W.* 57(3-4): 218-238.

Waterhouse, G. A., 1937. Australian Hesperiidae. VII. Notes on the types and type localities. *Proc. Linn. Soc. N.S.W.* 62(3-4): 107-125.

FIRST RECORDED BREEDING BY THE TROPICAL MIGRATORY LOCUST, *LOCUSTA MIGRATORIA MIGRATORIOIDES* R. & F., IN THE AUSTRALIAN CAPITAL TERRITORY

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Abstract

The discovery of a nymph of the tropical migratory locust (*Locusta migratoria migratorioides* R.&.F.) in Australian Capital Territory is the first recorded instance of breeding by this species in the Southern Tablelands.

Observations

Grasshopper nymphs, principally of yellow-winged locust [*Gastrimargus musicus* (F.)], were sampled from pasture at 'Glenloch' (149°4'E 35°16'S, altitude 620 m) 2.5 km WSW of Black Mountain, Canberra, on 23 April 1981. The sample contained a single third-instar female tropical migratory locust, *Locusta migratoria migratorioides* R. & F. (Farrow & Colless 1980) [= *Locusta migratoria* L. (Key 1938)] which moulted to an adult on 13 May 1981. Although occasional adult migratory locusts have been reported in the Australian Capital Territory (Farrow 1978), this is the first time successful breeding by this species has been confirmed for the Southern Tablelands. The record also represents the most southerly confirmation of breeding in Australia, although occasional adults have been observed to 35°50'S along coastal New South Wales in areas where breeding is assumed to occur (Farrow 1978). This multivoltine species normally overwinters in the egg stage in temperate inland Australia but the non-diapause eggs do not survive the low winter temperatures encountered on the Tablelands (Farrow 1978 and unpub. data): the parent(s) of this nymph would have to have emigrated from quasi-permanent breeding populations to the north-west earlier in the 1980/81 season. Such immigrations into the A.C.T. were last observed in April 1976 during the first recorded plague of this species in Australia (Farrow 1978), but these arrivals were too late in the season to have successfully bred before the onset of winter.

The implied immigration into the A.C.T. in 1981 was unexpected because of the rarity of the migratory locust in potential source areas during the 1980/81 season: a single female was collected from Trangie in central western New South Wales on 20 September 1980, while sampling in this region in February 1981 yielded fewer than a dozen individuals (densities locally not more than 10 h^{-1}), mostly in the foothills of the Warrumbungle Ranges some 400 km north of the A.C.T.

There are few examples of the extent of nocturnal migration of the solitary phase of this locust in Australia and this record confirms that long range migration may also occur during recessions (when populations are at extremely low densities) as it does elsewhere in the tropics (Farrow 1974). The existence of such migrations also helps explain the occasional sightings of this species in other areas unsuitable for permanent breeding such as far western New South Wales (Farrow 1978).

References

Farrow, R. A., 1974. Comparative plague dynamics of the tropical *Locusta*. *Bull. ent. Res.* 64: 401-411.

Farrow, R. A., 1978. Causes of recent changes in the distribution and abundance of the migratory locust (*Locusta migratoria* L.) in Australia in relation to plagues. *Commonw. Scient. ind. Res. Org., Div. Ent. Rep.* No. 9: 1-32.

Farrow, R. A. and Colless, D. H., 1980. Analysis of the interrelationship of geographical races of *Locusta migratoria* (Linnaeus) (Orthoptera: Acrididae), by numerical taxonomy, with special reference to subspeciation in the tropics and affinities of the Australian race. *Acrida* 9: 77-99.

Key, K. H. L., 1938. The regional and seasonal incidence of grasshopper plagues in Australia. *Bull. Coun. scient. ind. Res., Melb.* 117: 1-87.

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PTINOSPHAERUS, A NEW GENUS OF PTINIDAE (COLEOPTERA) FROM NORTHERN QUEENSLAND

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Abstract

A new genus *Ptinosphaerus*, with a single new species *P. marginicollis*, is described from northern Queensland and compared with *Pitnus* and other genera of Ptinidae.

Introduction

The Australian ptinid fauna consists of about 70 species, including 18 autochthonous *Ptinus*, 43 Ectrephinae, *Pitnus australiae* Lea, and several introduced species in the genera *Ptinus, Niptus, Trigonogenius, Mezium*, and *Gibbium* (Hinton, 1941; Lawrence and Reichardt, 1969; Lea, 1917, 1923). The present paper describes a remarkable new species from Cape Ynrk Peninsula, which appears to be related to *Pitnus australiae* but differs from this and all other species of Ptinidae by having sharp lateral edges on the pronotum (compare Figs 2 and 3).

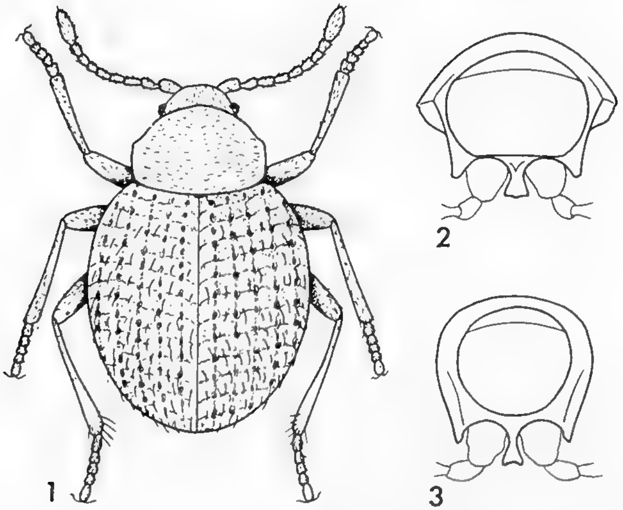
Ptinosphaerus gen. n.

Type-species.–*Ptinosphaerus marginicollis* sp. n.

Eyes small, oval, convex. Antennae 9-segmented, more or less filiform, with last segment elongate and club-like; insertions moderately widely separated, with a flat, even space between them. Maxillary and labial palps with last segment subacuminate. Prothorax strongly transverse; anterior edge strongly rounded; sides subparallel, with distinct, acute, lateral edges (Fig. 2); posterior edge weakly rounded; disc moderately convex, finely punctate. Scutellum not visible. Elytra slightly longer than wide; sides strongly rounded; disc strongly convex, with seriate punctation. Hindwings absent. Procoxae (Fig. 2) narrowly but distinctly separated by sternal process, which extends ventrally almost to coxal apices. Mesocoxae widely separated, the distance between them about 1.5 times as long as greatest coxal diameter. Metasternum strongly transverse; metacoxae slightly more widely separated than mesocoxae. Legs fairly slender, with femora slightly thickened at distal end; all tarsi 5-segmented in both sexes. Visible portion of abdomen about 0.8 times as long as basal width, strongly and abruptly narrowed at apical third; sternite 6 (4th visible sternite) much shorter than the others, its lateral portions produced posteriorly and partly enclosing base of sternite 7.

Ptinosphaerus marginicollis sp. n.
(Figs 1-2, 4-5)

Types.–Holotype, Grindle (?) Beach, south of Portland Roads, near Iron Range (12°42′S 143°18′E), QUEENSLAND, 16.x.1968, on beach, probably among seaweed (D. D. Giuliani) (ANIC No. 82). *Paratypes*, 2, same data as holotype (ANIC, X. Bellés Collection).



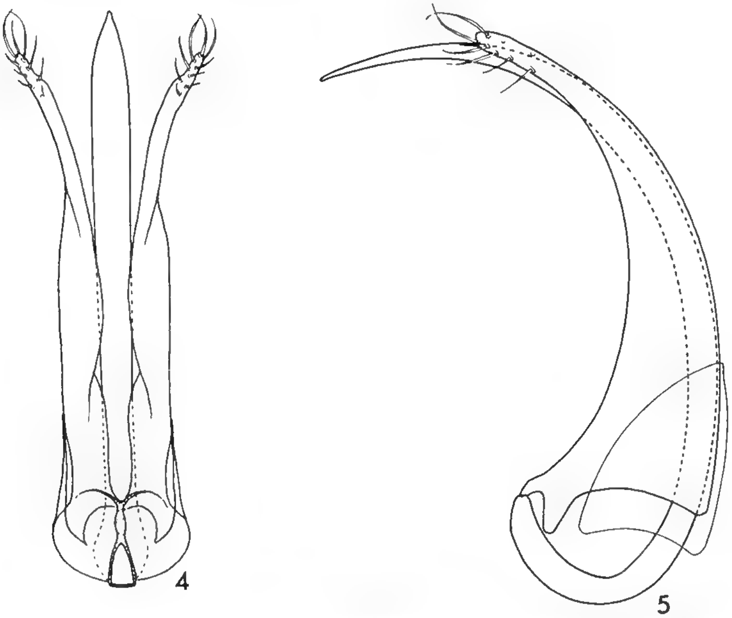
Figs 1-3. (1) *Ptinosphaerus marginicollis* sp. n., male, dorsal view; (2) same, cross-section of prothorax; (3) *Pitnus australiae* Lea, cross-section of prothorax.

Black. Surface more or less shining. Vestiture consisting of moderately sparse and evenly distributed, fine, suberect, curved, yellow hairs. Antennae relatively short, less than half as long as body; segments longer than wide, progressively shorter from 1 to 8; segment 9 longer than preceding two combined; antennae separated by distance 1.5 times as great as the length of antennal segment 1, the space between them flat and even. Pronotum about 0.7 times as long as greatest width; punctation fine and moderately sparse; interspaces smooth. Elytra about 1.1 times as long as greatest combined width and 2.1 times as long as pronotum; elytral punctation coarse, the punctures forming regular rows, usually joined by transverse impressions; fine sculpturing consisting of irregular, minute, scratch-like markings. Aedeagus with median lobe, as seen from side (Fig. 5) forming broad curve and acutely pointed at apex; parameres (Fig. 4) abruptly narrowed at apical third, subacute at apex, which bears several setae.

Length 1.0 - 1.1 mm.

Discussion

Ptinosphaerus appears to belong to the *Sphaericus* group of genera (*Sphaericus, Niptus, Wollastonella, Pitnus*), as defined by Bellés (1982), but it is easily distinguished by the short and broad prothorax with sharp lateral edges, a feature unique in the Ptinidae (compare Figs 2 and 3). It resembles *Pitnus* and differs from other members of the group in having the abdomen sharply narrowed posteriorly and in the structure of the aedeagus. It differs from *Pitnus* species, not only in the sharp lateral pronotal edges, but in having



Figs 4, 5. *Ptinosphaerus marginicollis*, aedeagus, (4) dorsal view; (5) lateral view.

a much shorter and broader prothorax, which is about two-thirds as wide as the combined elytral width, and a vestiture of much finer hairs. *Pitnus australiae* is further distinguished from *Ptinosphaerus* by the 8-segmented antennae (9-segmented in New World species). Although the collector (*in litt.*) said that specimens of *P. marginicollis* may have been associated with dead seaweed, it is also possible that they occurred among dune vegetation; Lea (1923) reported that *Pitnus australiae* was found on saltbushes (*Atriplex*) near beaches in Western Australia and South Australia.

References

Bellés, X., 1982. Idees sobre la classificació supragenèrica de la família Ptinidae (Coleoptera). *I Sessió Conjunta d'Entomologia, Institució Catalana d'Historia Natural, Societat Catalana de Lepidopterologia, Barcelona, 1981*, pp. 61-65.

Bellés, X., 1982. Datos para una revisión del tribu Sphaericini. Los generós *Niptus* J. du Val y *Wollastonella* Lucas (Col., Ptinidae). *Eos.* 58: 23-28.

Hinton, H. E., 1941. The Ptinidae of economic importance. *Bull. ent. Res.* 31: 331-381.

Lawrence, J. F. and Reichardt, H., 1969. The myrmecophilous Ptinidae (Coleoptera) with a key to Australian species. *Bull. Mus. comp. Zool. Harv.* 138(1): 1-28.

Lea, A. M., 1917. Notes on some miscellaneous Coleoptera, with descriptions of new species.–Part III. *Trans. Proc. R. Soc. S. Aust.* 41: 121-322, pls. 12-15.

Lea, A. M., 1923. The flora and fauna of Nuyts Archipelago and the Investigator Group. No. 11–The Coleoptera of Pearson Island. *Trans. Proc. R. Soc. S. Aust.* 47: 355-360, pl. 31.

NOTES ON A SLEEPING AGGREGATION OF *PRIONYX GLOBOSUS* (F. SMITH) (HYMENOPTERA: SPHECIDAE)

By E. McC. Callan
13 Gellibrand Street, Campbell, Canberra, A.C.T. 2601

Abstract

A sleeping aggregation is reported for the first time in Australia of the sphecine wasp *Prionyx globosus* (F. Smith).

Some solitary bees and wasps occasionally spend the night, and periods of inclement weather, in sheltered situations or on vegetation in small, loose sleeping aggregations; and a few congregate in large, compact sleeping clusters. Gregarious sleeping may involve both sexes or only males. Its function remains obscure, but aggregations may provide some protection from predators. Rayment (1935), in discussing clustering of solitary bees in Australia, concluded that their temperature was increased.

Gregarious sleeping in both sexes of the sphecine wasp *Prionyx* has been described in North America (Linsley, 1962) and in Europe (Carayon, 1967). A sleeping aggregation is now reported for the first time in *Prionyx globosus* (F. Smith), which is endemic to and occurs commonly throughout Australia.

The biology of *P. globosus* was discussed by Chandler (1928), and Evans *et al.* (1982) recorded 5 species of acridid grasshoppers as prey. I have often seen this wasp in suburban gardens in Canberra, Australian Capital Territory, individuals flying low over bare ground, males being more active and apparently outnumbering females.

On 10 February 1981 I observed a sleeping aggregation of *P. globosus*, which had evidently just settled down for the night, in a garden at Kambah, a South Canberra suburb. The wasps were seen as the light was fading at about 1830 hours. Most of them were already immobile, but a few still moved restlessly seeking a roosting place.

About 20 or more wasps were loosely clustered, relatively close to each other but not in actual contact, on a small dead shrub of *Grevillea brevicuspis* Meissner (Proteaceae) at about 0.5 m from the ground. They were disposed up and down several vertical stems, which they grasped firmly with their legs, but not with their mandibles. Their sleeping postures agreed closely with descriptions and illustrations of other species of *Prionyx* elsewhere. The quiescent wasps were inconspicuous against the brownish stems and finely-divided dead leaves of the plant. An adjacent living shrub of *G. glabrata* (Lindley) Meissner bore no sleeping wasps.

Ten wasps were captured, 6 being males and 4 females. The males ranged in length from 8.0 to 11.2 mm, and the females from 11.7 to 13.0 mm. In *P. globosus* the sexes differ markedly in size; the males are much smaller than the females, the smallest male I have seen being 7.0 mm and the largest female 16.0 mm long.

In northern hemisphere species of *Prionyx* sleeping aggregations have been recorded congregating in the same place night after night. I do not know whether at the site I observed at Kambah the wasps returned to roost on successive nights.

Acknowledgement

Dr I. D. Naumann confirmed the identity of *P. globosus* and kindly measured the specimens, which are in the Australian National Insect Collection, CSIRO, Canberra.

References

Carayon, J., 1967. Un "dortoir" d'Hymenopteres en Provence. *Annls Soc. ent. Fr.* (N.S.) 3: 743-755.

Chandler, L. G., 1928. Notes on two grasshopper-wasps. *Victorian Nat.* 45: 176-181.

Evans, H. E., Hook, A. W. and Matthews, R. W., 1982. Nesting behaviour of Australian wasps of the genus *Sphex* (Hymenoptera, Sphecidae). *J. nat. Hist.* 16: 219-225.

Linsley, E. G., 1962. Sleeping aggregations of aculeate Hymenoptera. *Ann. ent. Soc. Am.* 55: 148-164.

Rayment, T., 1935. *A cluster of bees.* Endeavour Press, Sydney. 752 pp.

BOOK REVIEWS

How to write and publish a scientific paper by Robert A. Day. Second edition, 1983. 8vo. xv, 181 pp. Institute for Scientific Information, 3501 Market St, Philadelphia, PA 19104, U.S.A. Price: paperback US$11.95, clothbound US$17.95.

For all scientists, students, and science writers who have ever struggled with any aspect of writing–or getting into print–a scientific paper, this book means relief. It's a beautifully organised cookbook that literally tells you how to meet the sometimes mysterious demands of scientific publication. And the book does so in a refreshingly readable, humorous, and direct manner.

The second edition promises to be as popular as the first (sales of the first edition exceeded 60,000 copies). The general outline and flavour of the original have been preserved, but much new material has been added. What has been most judiciously retained is Day's sense of humour, his congenial view of some of the vagaries of science writing, and the practice of science. Comments such as the following are liberally sprinkled throughout this well organised book making it a pleasure to read and consult: "$33^1/_3$% of the mice used in this experiment were cured by the test drug; $33^1/_3$% of the test population were unaffected by the drug and remained in a moribund condition; the third mouse got away." (from Ch. 8, How to write the Results) and "I once edited a manuscript containing the sentence: 'A large mass of literature has accumulated on the cell walls of staphylococci.' "

I have only two minor criticisms. Prices quoted for colour printing "typically $1,500 to $2,000 for a color plate" are grossly exaggerated–today modern offset printing techniques have drastically reduced the cost of colour from the not so long ago days of letterpress and blocks. In future editions I think it would be useful to enlarge upon the very brief paragraph concerning pen-and-ink illustrations. Mention could be made of apparatus such as a camera lucida, squared graticules and pens. Often biologists, especially entomologists, find that they have no alternative but to draw their own map, simple wing figure or genitalia section, etc.

Definitely buy this book if your budget allows–I'm sure you won't regret it.

Plant resistance to insects. (American Chemical Society Symposium Series, 208). Edited by Paul A. Hedin. 1983. 8vo. 375 pp., illustr., case bound. Based on a symposium sponsored by the A.C.S., Division of Chemistry, at the 183rd Meeting of the A.C.S. American Chemical Society, 1155 Sixteenth St., N.W. Washington, D.C. 20036, U.S.A. Price US$53.95.

This twenty-chapter volume explores recent findings of foremost researchers. The book is divided into four sections, each of five chapters: Ecological and Histochemical Aspects, Biochemical and Physiological Mechanisms, Insect Feeding Mechanisms and Roles of Plant Constituents. Examples of chapters within these sections are Physiological constraints on plant chemical defenses, Natural inducers of plant resistance to insects, Chemical basis for host plant selection and Multiple factors in cotton contributing to resistance to the tobacco budworm, *Heliothis virescens* F. A comprehensive index is appended.

The papers are of a high standard summarizing results of international significance. The text, while of general interest, is essential reading for entomologists, plant breeders and geneticists, genetic engeneers, research planners for crop protections, and agricultural economists, because it covers the most recent views on plant/insect interactions.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

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STEINAMNN, H.

1981. A revision of the Indo-Australian *Gonolabis* Burr, 1900 species (Dermaptera: Carcinophoridae). *Folia ent. hung.* 42(2): 187-195.

STEWART, D. J.

1981. Travelling in 'wait-a-while' country. *Victorian Ent.* 11(4): 41-46.
Lepid.: many butterfly spp. mentioned; extends dist. of *Taglades japetus janetta*

STEWART, William E.

1982. An analysis of geographic variation of the adults of the Australian genus *Diphlebia* Selys (Odonata: Amphipterygidae). *Aust. J. Zool.* 30(3): 435-460, tables 1-8, text-figs 1-14.

SYMMONS, P. M. and LUARD, Elizabeth J.

1982. The simulated distribution of night-flying insects in a wind convergence. *Aust. J. Zool.* 30(2): 187-198, text-figs 1-7.
Orthoptera: *Chortoicetes terminifera*

THEISCHINGER, G.

1982. A revision of the Australian genera *Austroaeschna* Selys and *Notoaeschna* Tillyard (Odonata: Aeshnidae: Brachytroninae). *Aust. J. Zool., Suppl. Ser.* 87: 1-67, text-figs 1-188.

THOMSON, J. A., JACKSON, M. J. and BOCK, I. R.

1982. Contrasting resource utilisation in two Australian species of *Drosophila* Fallen (Diptera) feeding on the bracken fern *Pteridium* Scopoli. *J. Aust. ent. Soc.* 21(1): 29-30, text-figs 1-3.

TIMMS, B. V.

1982. A note on the warm ponds, Lakes Entrance, Victoria. *Victorian Nat.* 99(2): 71-75, tables 1-3, text-fig. 1.
ODONATA (no spp. ident.), HEMIPTERA (*Naucoris congrex*), TRICHOPTERA (*Oecetis* sp.), DIPTERA (*Cheronomus* sp.), COLEOPTERA (*Antiporus femoralis*)

TURNER, Sue

1982. Processionary caterpillars. *QNC News* (News Letter Qd Nat. Club) 131: 8.
Lepidoptera: *Orchogaster contraria*

VALENTINE, P. S.

1978. Conservation and national parks in the Townsville region. *In* Hopley, David: Geographical studies of the Townsville area. *Mon. Ser. Geog. Dept. James Cook Univ.* Occasional Paper No. 2: 83-93.

1980. Cape Cleveland butterflies. *Brolga* 10(3); pages unnumbered.
Brolga is the news bulletin of Wildlife Preservation Society of Queensland, Townsville Branch.

1981. In search of *Zetona. Brolga* 11(5): 3-4, illustr.
Lepidoptera: records the butterfly *Zetona delospila* from Hughenden Gorge. *Brolga* is the news bulletin of Wildlife Preservation Society of Queensland, Townsville Branch.

Van BEURDEN, E. K.

1980. Mosquitoes [*Mimomyia elegans* (Taylor)] feeding on the introduced toad *Bufo marinus* (Linnaeus): implications for control of a toad pest. *Aust. Zool.* 20(3): 501-504.

VICKERS, R. A.

1982. Some aspects of reproduction in *Pectinophora scutigera* (Holdaway) (Lepidoptera: Gelechiidae). *J. Aust. ent. Soc.* 21(1): 63-68, text-figs 1-3.

1982. Rates of development of the immature stages of *Pectinophora scutigera* (Holdaway) (Lepidoptera: Gelechiidae) with data on the head-capsule widths of field and laboratory reared larvae. *J. Aust. ent. Soc.* 21(1): 69-70, table 1, text-fig. 1.

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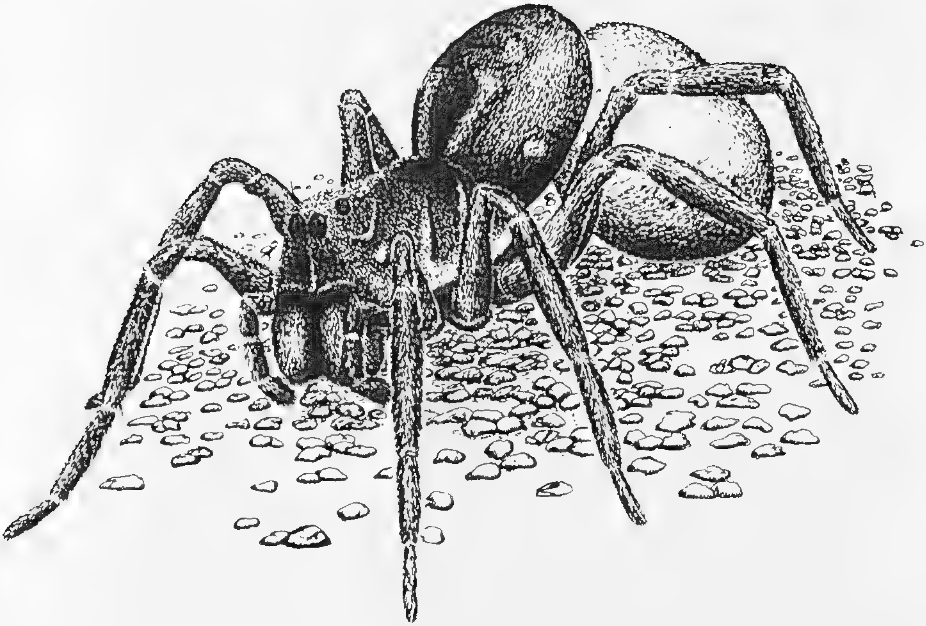

Edited by M. S. Moulds

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COVER

Illustrated by Warren Reilly

Depicts a female wolf spider (family Lycosidae). The spider is draging her egg cocoon which is attatched to the spinnerets. When the young emerge they ride on the back of the female for several days, clinging to special club-shaped hairs, until they disperse.

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THE LIFE HISTORY OF *ELYMNIAS AGONDAS AUSTRALIANA* FRUHSTORFER (LEPIDOPTERA: NYMPHALIDAE)

By G. A. Wood
P.O. Box 122, Atherton, Qld 4883

Abstract). Box 184

The life history of the Australian butterfly *Elymnias agondas australiana* Fruhstorfer is described and the food plant reported for the first time.

Introduction

The palmfly, *Elymnias agondas australiana* Fruhstorfer, is found in rainforest areas from Cape York to Silver Plains (Common and Waterhouse 1981). While examining lawyer vines at Iron Range a pupa was found on *Calamus caryotoides* Mart. (Arecaceae). A male emerged from this and oviposition by females proved *Calamus caryotoides* to be the food plant.

Life history

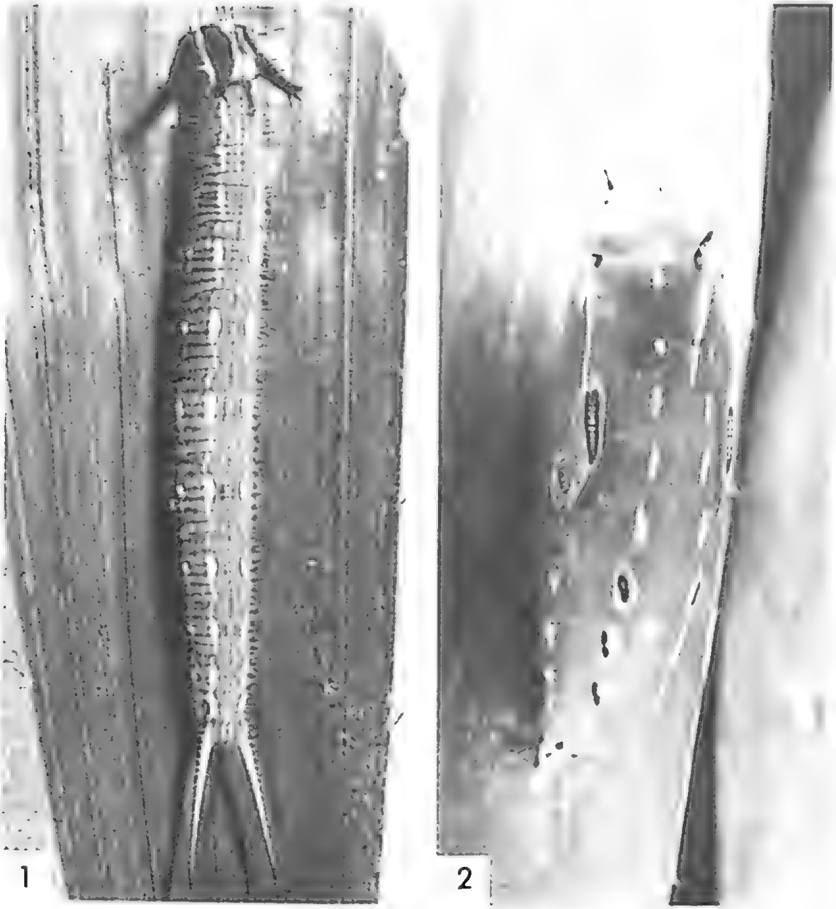
Ovum. Nearly spherical, smooth, whitish and translucent, 1.4 mm diameter. Deposited singly on the underside of leaves of the food plant.

First instar larva. Head brown, with a pair of long horns. Body white, posterior end bearing a pair of long processes. Body segments with long lateral and subdorsal hairs, interspersed with finer hairs. Length (excluding posterior processes) 4 mm, processes 1 mm.

Third instar larva. Head brown, with two black, vertical lines meeting the two black, spined horns. Body green, with two pairs of yellow longitudinal lines dorsally, inner pair indistinct, outer pair incorporating yellow spots. Body covered with raised granules. Posterior processes yellow. Length (excluding processes) 16 mm, processes 3 mm.

Fifth instar larva (Fig. 1). Head, as in third instar but with white and yellow areas. Body with an additional pair of yellow, indistinct lines laterally, dorsally with blue areas between the pairs of yellow spots. Posterior processes orange. Length (excluding processes) 37 mm, processes 6 mm.

Larvae shelter beneath leaves of the food plant and feed during daylight hours.



Figs 1, 2. *Elymnias agondas australiana*: (1) fifth instar larva with cast of 4th instar partly visible between posterior processes; (2) pupa.

Pupa (Fig. 2). Green, with a pair of black and white processes anteriorly. Thoracic ridge yellow with a black and pink area at its apex. Tornus with two patches of black and pink. Thorax and abdomen with three series of yellow spots dorsally. Pupa suspended by a cremaster beneath a leaf of the food plant. Length 23 mm.

The duration of a life cycle commencing early June was 49 days. Ova hatch in 5 days, larval stage was 34 days, pupal stage 10 days.

Reference

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Second edition. Angus and Robertson, Sydney. 682 pp.

NEW RECORDS OF CARABIDAE (COLEOPTERA) FROM KING ISLAND, TASMANIA

By John Nunn
14 Hicks Close Whitby, New Zealand

Abstract

Species of Carabidae collected by the author on King Island are listed together with others previously recorded. The total number of carab species now known to occur on the island is 51.

Introduction

Little has been published on the Carabidae of King Island. The main source of information is a paper by Lea (1908) which lists 28 species. One further species was recorded by Sloane (1920) in his work on the Tasmanian Carabidae. The present author was able to carry out some collecting on King Island in 1981 and the list of Carabidae can now be extended to a total of 51 species.

List of species collected

Newly recorded species are indicated by an (*)

SCARITINAE
* 1. *Clivina dilutipes* Putz.
2. *Scaraphites rotundipennis* (Dejean)

BROSCINAE
* 3. *Promecoderus brunnicornis* Dejean
4. *P. bassi* Cast.

BEMBIDIINAE
* 5. *Bembidion blackburni* Csiki
6. *Tachys semistriatus* Blackb.

TRECHINAE
* 7. *Trechobembix baldiensis* (Blackb.)
* 8. *Cyphotrechodes gibbipennis* (Blackb.)

PSYDRINAE
* 9. *Mecyclothorax punctipennis* (Macl.) (Possibly previously recorded from King Island as *M. ambiguus* Erichs.)
*10. *M. lophoides* (Chaud.)
11. *Amblytelus curtus* (F.)
12. *A. placidus* (Lea)

HARPALINAE
*13. *Gnathaphanus melbournensis* (Cast.)
*14. *Hypharpax australasiae* (Dej.)
*15. *H. moestus* (Dej.)
*16. *H. ranula* (Cast.)
*17. *Anisotarsus edwardsi* (Cast.)
18. *Euthenarus promptus* (Erichs.)
*19. *Egadroma picea* (Guér.)
20. *Lecanomerus verticalis* (Erichs.)

*21. *Thenarotes obtusa* (Sloane)
*22. *Amblystomus parvus* (Blackb.)
*23. *A. niger* (Blackb.)
*24. *Acupalpus* sp.

PTEROSTICHINAE
25. *Notonomus chalybeus* (Dejean)
26. *N. sphodroides* (Dejean)
27. *Simodontus aeneipennis* Chaud.
*28. *Prosopogmus monochrous* (Chaud.)
29. *P. chalybeipennis* (Chaud.)
30. *Pseudocenus sollicitus* (Erichs.)

AGONINAE
31. *Notagonum marginellum* (Erichs.)
*32. *Homothes elegans* Newm.
33. *H. sericeus* (Erichs.)

TETRAGONODERINAE
34. *Sarothrocrepis calida* (Newm.)
*35. *S. inquinata* (Erichs.)
36. *S. benefica* (Newm.)

LEBIINAE
37. *Agonochila curtula* (Erichs.)
*38. *A. biguttata* Chaud.
39. *Trigonothops vittipennis* Sloane

PENTAGONICINAE
40. *Scopodes boops* Erichs.

Species not collected by the author but listed by Lea are:
41. *Calosoma schayeri* Erichs., Carabinae
42. *Promecoderus cordicollis* Sloane, Broscinae
43. *Mecyclothorax ambiguus* (Erichs.), Psydrinae. (See note against 10 above)
44. *Hypharpax inornatus* (Germ.), Harpalinae
45. *Chlaenioidius prolixus* (Erichs.), Pterostichinae
46. *Chlaenius australis* Dejean, Chlaeniinae
47. *Sarothrocrepis civica* (Newm.), Tetragonoderinae
48. *Agonochila binotata* (White), Lebiinae
49. *Scopodes flavipes* Blackb., Pentagonicinae. (=*S. lineatus* Lea)
50. *Adelotopus politus* Cast., Pseudomorphinae

The one remaining species recorded by Sloane but not dealt with in Lea's paper is:
51. *Scopodes flavipes* Blackb. Pentagonicinae

Acknowledgement

The writer gratefully acknowledges the help of Dr B. P. Moore who not only identified many of the species listed but also provided the encouragement to write this paper.

References

Lea, A. M., 1908. The Coleoptera of King Island, Bass Strait. *Proc. R. Soc. Victoria* (n.s.) 20(2): 143-207.

Sloane, T. G., 1920. The Carabidae of Tasmania. *Proc. Linn. Soc. N.S.W.* 45: 113-178.

A NEW GENUS *ANTIPODIA* (LEPIDOPTERA: HESPERIIDAE: TRAPEZITINAE) WITH COMMENTS ON ITS BIOLOGY AND RELATIONSHIPS

By Andrew Atkins
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Abstract

Antipodia **gen. n.** is proposed to include two Australian Hesperiidae, *Telesto chaostola* Meyrick and *Hesperilla atralba* Tepper. The adults, genitalia and immature stages of these species are figured, and the distribution and biology are given. The closely related *Croitana* Waterhouse and *Proeidosa* Atkins are compared with *Antipodia*, and a key to these genera is presented. The relationship of the new genus to *Hesperilla* Hewitson and *Motasingha* Watson is discussed.

Introduction

Telesto chaostola Meyrick, 1888 was assigned by Waterhouse in 1903 to the genus *Hesperilla* Hewitson, 1868. The characteristics of *Hesperilla* were given by Waterhouse and Lyell (1914) as 'clubs abruptly bent before the middle, and with tips sharply pointed ... Palpi with third joint moderate and porrect'. These authors (1914) also transferred *Hesperilla atralba* Tepper 1882 to the genus *Motasingha* Watson, 1893, and they characterized the genus by 'clubs abruptly bent before the middle and with tips blunt ... Palpi with third joint short and blunt'. In the descriptions of the life history of these two species, Waterhouse (1932a, 1933b) observed that both skippers pupated in a head-downward position within shelters on their foodplant. Other species assigned to *Hesperilla* and *Motasingha* were known to pupate in an upright position.

Hesperilla chaostola and *Motasingha atralba* (here considered congeneric) differ in many important respects from the type species of *Hesperilla*, *H. ornata* (Leach) and the type species of *Motasingha*, *M. dirphia* (Hewitson). They are considered to be more closely related to *Croitana* Waterhouse, 1932a, and *Proeidosa* Atkins, 1973. *Antipodia* and these allied genera are referred to here as the *Proeidosa* group.

The *Proeidosa* group is proposed to contain those genera in which the male genitalia have distally constricted valvae and the sacculus and harpe narrow and curved. The female genitalia have a broad sinus vaginalis, lack a sclerotized lamella antevaginalis, and the corpus bursae lacks or has only a weakly developed accessory pouch. The structure of the larvae and pupae, where known, are midway between *Mesodina* Meyrick and *Hesperilla* Hewitson.

Specimens examined in the following collections are abbreviated thus: AM, Australian Museum; ANIC, Australian National Insect Collection; BMNH, British Museum (Natural History); SAM, South Australian Museum; TM, Tasmanian Museum.

Key to the *Proeidosa* group of species

1. Hind tibia with 2 pairs of spurs 2
   Hind tibia with 1 pair of spurs .... *Croitana* Waterhouse
2. Hindwing upperside with central patch of light scales, male forewing with linear sex mark .... *Antipodia* **gen. n.**
   Hindwing upperside without central patch of light scales, male forewing without sex mark .... *Proeidosa* Atkins

Genus *Antipodia** gen. n.

Type species: *Telesto chaostola* Meyrick, 1888, p. 830.

Diagnosis: *Adult*: labial palpus with second segment very long, hind tibia with two pairs of spurs. Male forewing with sex mark; male genitalia with harpe short and blunt and with a well developed dorsal process. Female genitalia with corpus bursae constricted midway along its length to produce a weakly developed accessory pouch.

Adult: *Head* with antenna (Figs 7, 22) $\frac{1}{2}$, or slightly more than $\frac{1}{2}$, length of costa, club medium to broad, bent moderately before middle, apiculus slightly tapered to blunt, nudum 16–19, shaft with light segmental bands. Labial palpus (Figs 6, 21) with second segment long and slender and extending beyond frons, third segment porrect, moderately long and blunt.

Wings (Figs 1–5, 16–20) forewing with inner margin longer than termen, costa either concave or convex but not straight, 1A+2A bowed strongly between median and postmedian areas, origin of CuA$_2$ and CuA$_1$ distally placed $\frac{2}{3}$ and $\frac{4}{5}$ along cubitus, Sc reaching costa approximate to end of cell, areas of pale scales in apical area between R$_3$, R$_4$, R$_5$, and M$_1$, in postmedian area of cell, between M$_3$ and CuA$_1$ (sometimes in males between CuA$_1$ and CuA$_2$), and in subterminal areas between M$_1$, M$_2$, and M$_3$; male forewing with sex mark; female with additional pale spots on forewing in median–postmedian areas between CuA$_1$, CuA$_2$, a 1A+2A; underside of both sexes as for upperside but

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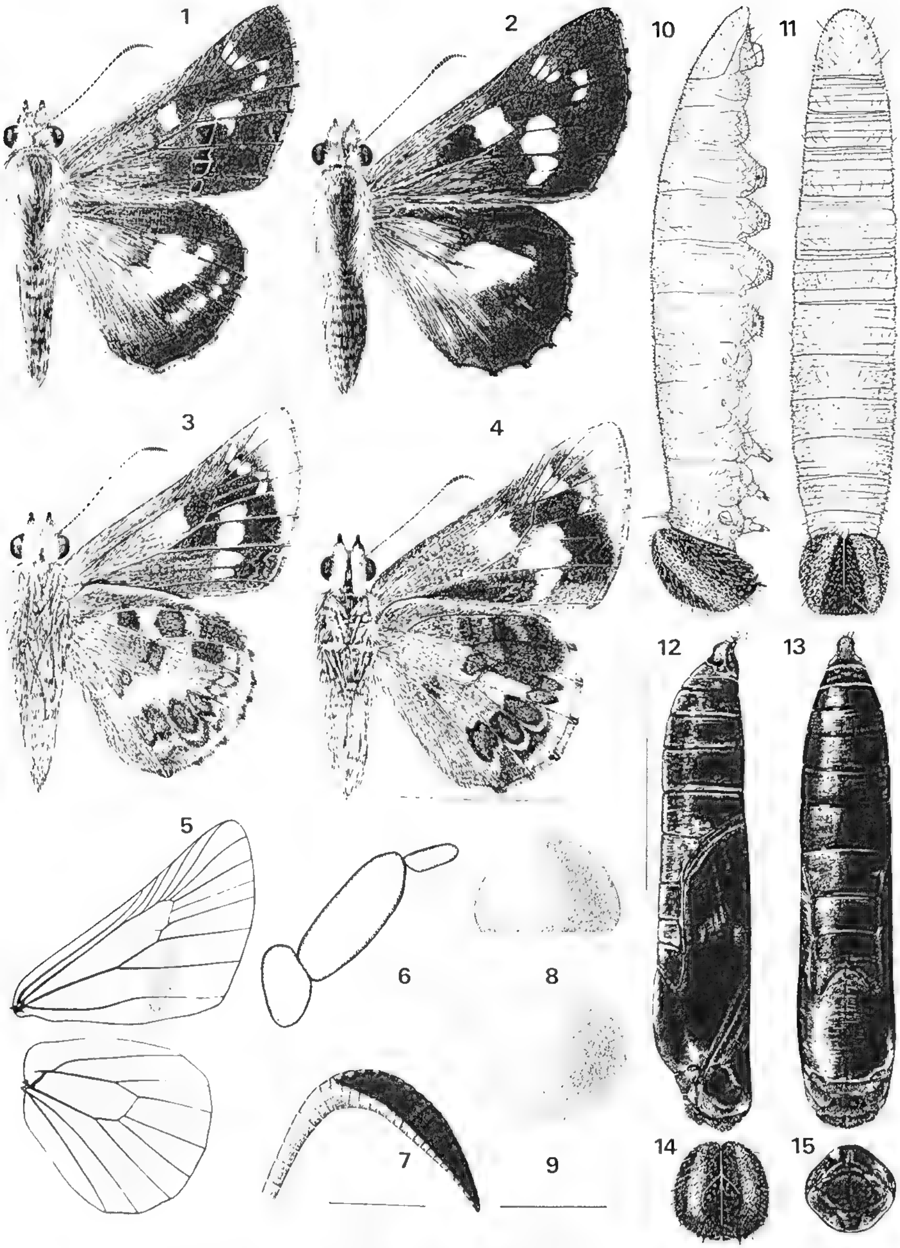
*Feminine; the generic name refers to the species' unique 'up-side-down' method of pupation, and their endemic Australian distribution.



Figs 1-15. Adult and early stages of *Antipodia chaostola* (Meyrick) from Victoria: (1) male upperside; (2) female upperside; (3) male underside; (4) female underside; (5) male wing venation; (6) labial palpus; (7) antennal club; (8) and (9) egg; (10) and (11) final instar larva; (12) and (13) pupa; (14) frons of final instar larval head; (15) head of pupa. Scale lines: Figs 1-5, 10-15 = 10 mm; Figs 6-9 = 1 mm.

with grey scales covering apical and terminal areas. Hindwing with costa longer than inner margin, cubitus between CuA_1 and M_3 angled towards disocellulars; upperside with pale yellow to orange scales at distal edge of cell and in subterminal and terminal sector between M_1, M_2, and M_3; long pale scales from base to tornal area; underside grey with series of darker mottling in subbasal and submedian areas, and series of dark markings arranged in rings in subterminal area approximately parallel to termen.

Hind tibia with two pairs of spurs.

Male genitalia (Figs 31, 34) with combined tegumen and uncus shorter than valva, distally blunt with short lateral lobes; gnathos well developed, extending ventrally and posteriorly, divided distally by two heavily sclerotized ridges; valva broad, curved dorsally and constricted posteriorly to short sclerotized process, harpe moderately broad and short, curved dorsally, a long curving sclerotized process along inner edge; saccus well developed; aedeagus long, broadened posteriorly.

Female genitalia (Figs 32, 33) papilla analis long, concave; sclerotized lobes covered with long setae; broad, bifid, distally placed sterigma plates, slightly concave and centrally depressed; caudal chamber of sinus vaginalis very broad, without extended sclerotized lamella antevaginalis plate; corpus bursae broad, ovoid, elongate, and slightly constricted distally toward weakly developed accessory pouch.

Antipodia chaostola (Meyrick)

(Figs 1–15)

Antipodia chaostola chaostola (Meyrick) **comb. n.**

Telesto chaostola Meyrick, 1888, p. 830; Miskin 1891, p. 80; Meyrick & Lower 1902, p. 65.

Hesperilla chaostola (Meyrick); Waterhouse 1903, p. 42; Lower 1911, p. 132; Waterhouse & Lyell 1914, p. 187, figs 690, 691, 700; Seitz 1927, p. 1057;

Hesperilla chaostola chaostola (Meyrick); Waterhouse 1932a, p. 200; Waterhouse 1932b, p. 239, pl. 32 Waterhouse, 1933a, p. 54; Waterhouse 1933b, p. 462; Evans 1949, pp. 219–20, genit. pl. 27; Common 1964, p. 22, figs 63, 64; McCubbin 1971, p. 166; Common & Waterhouse 1972, p. 119; Common & Waterhouse 1981, p. 167.

Type. NEW SOUTH WALES: *Holotype* ♂ labelled 'Blackheath, 1814' in BMNH examined by author.

Distribution. NEW SOUTH WALES: Blue Mountains (Katoomba to Lithgow, above 1000 m).

Foodplant. Gahnia filifolia Kuek. (Cyperacae).

Antipodia chaostola chares (Waterhouse) comb. n.

Hesperilla chaostola chares Waterhouse, 1933b: p. 462; Evans 1949: p. 220; Common 1964: p. 22; McCubbin 1971: p. 166, fig. 4; Common & Waterhouse 1972: p. 119, pl. 7, fig. 1; Common & Waterhouse 1981: p. 166, pl. 4, fig. 1, larva pl. 3, fig. 6.

Types. VICTORIA: *Holotype* ♂, *Allotype* ♀, seven *paratype* ♂♂ and two *paratype* ♀♀ all labelled 'Beaconsfield, Vic.' in AM examined by author.

Distribution. VICTORIA: central to western Victoria from Moondarra to Victoria Valley.

Foodplant. Gahnia radula (R. Br.) Benth., *G. sieberana* Kunth, *G. microstachya* Benth. and *G. grandis* (Labill.) S.T. Blake.

Antipodia chaostola leucophaea (Couchman) comb. n.

Hesperilla chaostola leucophaea Couchman, 1946: p. 51; Evans 1949: p. 220; Common 1964: p. 22; McCubbin 1971: p. 166; Common & Waterhouse 1972: p. 120; Couchman & Couchman 1978: p. 70, pl.; Common & Waterhouse 1981: p. 167.

Types. TASMANIA: *Holotype* ♂ labelled 'Kingston, Tas. 5th Nov. 1945. J.R. Cunningham' in TM; *Allotype* ♀ labelled with same data in TM; four *paratype* ♂♂ labelled 'Kingston, Tasm. 10.xi.45. L.E. Couchman' and 'Hobart, Tasm. 7.xi.42. L.E. Couchman' in L.E. Couchman collection; three *paratype* ♀♀ labelled 'Kingston, Tasm. 10.xi.45. L.E. Couchman' in L.E. Couchman collection; one *paratype* ♂ labelled 'Kingston, Tasm. 10.xi.45. L.E. Couchman' in AM. These specimens not examined by author.

Distribution. TASMANIA: Eastern coast (Hobart, Kingston, Huonville, Bicheno).

Foodplant. Gahnia radula (R. Br.) Benth.

Biology

This is a temperate climate species found in habitats below the winter snow-fall zones of the Dividing Range in eastern Australia at altitudes of 400–1000 m, and also near sea-level in Victoria and Tasmania. This species is generally very scarce and local, seemingly dependent on very specialized habitats near sheltered headwaters and marshlands within stringy-bark and peppermint dry sclerophyll woodlands and sandy heaths. The adults are rarely observed and fly during a few weeks in October, November and early December. they visit flowering herbs or rest close to the ground. Males have occasionally been observed flying near ridge-tops. Females appear to favour small young plants or regrowth following bushfires for oviposition. The illustration of an egg (Figs 8, 9) was reconstructed from a hatched egg that I found in the Grampian Mountains, western Victoria. This egg was on the underside of a *Gahnia* leaf near a larval shelter of this species. Five other species of skippers whose larvae feed on *Gahnia* spp. occur in this area but none have eggs with the combined characters of large size, smooth shell and oval shape.

Young larvae are easily recognized by their pale, striped head, bright red prothorax and their habit of resting head-downwards in shelters made from tightly bound leaftips. Mature larvae construct strong conical or 'tent-like' shelters near the base of the plant. Pupation occurs in a head-downward position within these shelters. The unusual life cycle, occupying two years, was described by Waterhouse (1933b) and by Common and Waterhouse (1972, 1981).

Comments

This species is easily distinguished from *A. atralba* by its orange-brown colour and differs from hesperilline and trapezitine skippers by the presence of scattered orange hindwing maculation and in behaviour by a more open-winged pose when resting in sunshine. The underside of the apical area of the forewing and of the hindwing is distinctively silver-grey, tinged purple.

In Victoria I have collected both pupae and young larvae in spring in consecutive years, indicating that *A. chaostola* flies each year. No constant differences between specimens in odd and even years have been discerned. The species is rare and much of its habitat has been cleared.

Antipodia atralba (Tepper)

(Figs 16–30)

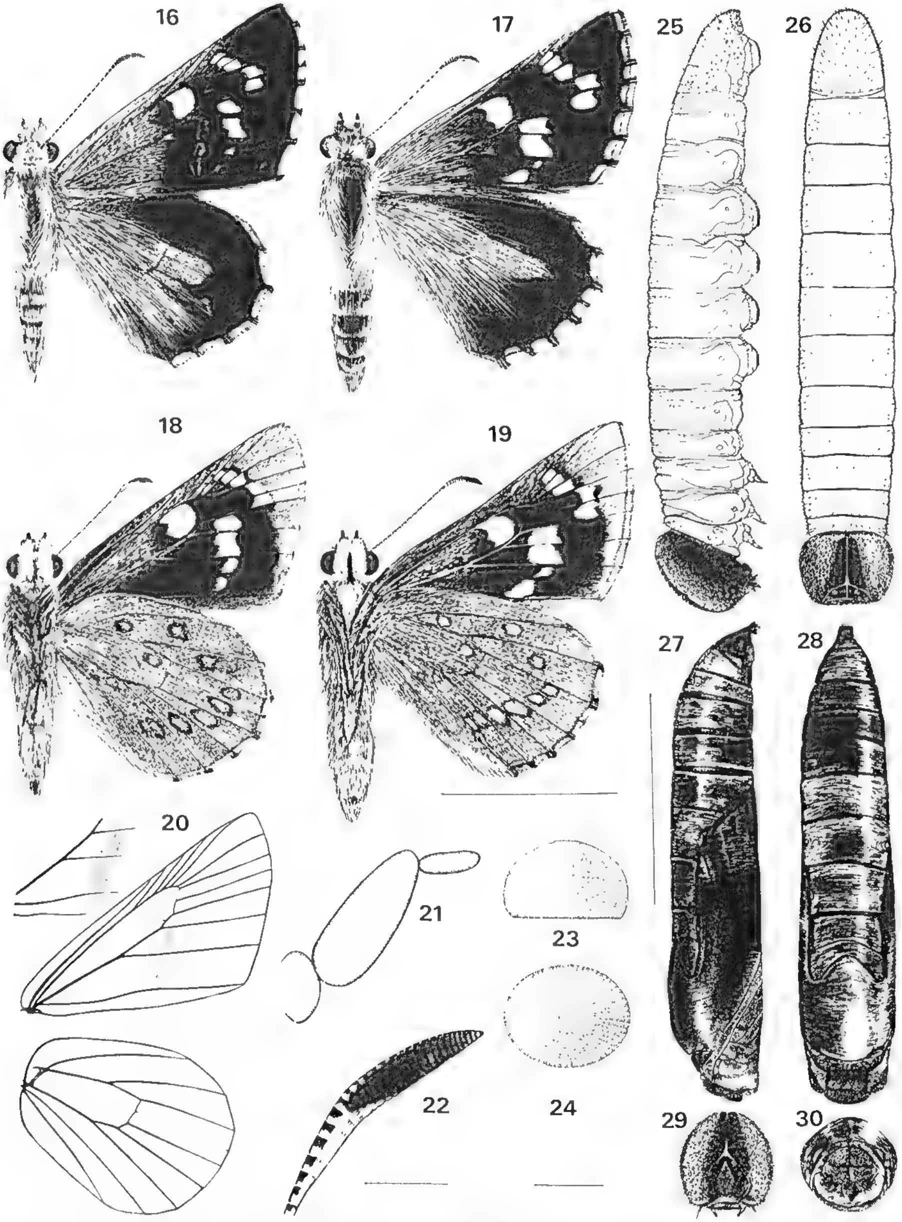
Antipodia atralba atralba (Tepper) **comb. n.**

Hesperilla atralba Tepper, 1882: p. 33, pl. 2; Miskin 1891: p. 81; Lower 1893: p. 13; Waterhouse 1903: p. 43; Lower 1911: p. 132.

Telesto atralba (Tepper) Meyrick & Lower 1902: p. 71.

Motasingha atralba (Tepper) Waterhouse & Lyell 1914: p. 195, fig. 649; Seitz 1927: p. 1056; Waterhouse 1932a: p. 200; Waterhouse 1932b: p. 233, fig. 17; Waterhouse 1932c: p. 223; Waterhouse 1933a: p. 57; Waterhouse 1937a: p. 33; Waterhouse 1937b: p. 119; Evans 1949: p. 223, pl. 28; Common 1964: p. 26, fig. 84; McCubbin 1971: p. 168, fig. 3; Common & Waterhouse 1972: p. 129, pl. 5, fig. 17; Fisher, 1978: p. 103; Common & Waterhouse 1981: p. 179, pl. 3, fig. 17.

Type. NEW SOUTH WALES: *Lectotype* ♀ labelled 'Adrossan' in SAM (examined by the author). Tepper did not designate a holotype, nor did he indicate the number of specimens that he based the species on. Waterhouse and Lyell (1914) indicate that the 'type' came from Ardrossan. This is here taken as a valid designation of a lectotype of



Figs 16-30. Adult and early stages of *Antipodia atralba* (Tepper) from South Australia: (16) male upperside; (17) female upperside; (18) male underside; (19) female underside; (20) male wing venation [inset, sex mark of male from Western Australia]; (21) labial palpus; (22) antennal club; (23) and (24) egg; (25) and (26) final instar larva; (27) and (28) pupa; (29) frons of final instar larval head; (30) head of pupa. Scale lines: Figs 16-20, 25-30 = 10 mm; Figs 21-24 = 1 mm.

the specimen so labelled in the South Australian Museum. The specimen consists of two forewings.

Distribution. VICTORIA: Hattah Lakes, Big Desert. SOUTH AUSTRALIA: Murray Mallee, Upper South-East, southern Mount Lofty Ranges, Port Noarlunga, Moonta, Ardrossan, Point Pierce, Ceduna (Common and Waterhouse 1981, Fisher 1978, Atkins unpublished records).

Foodplant. Gahnia lanigera (R. Br.) Benth. and *Gahnia ancistrophylla* (F. v. M.) Benth. (Cyperaceae).

Antipodia atralba dactyliota **(Meyrick) comb. n.**

Telesto atralba dactyliota Meyrick, 1888: p. 831.
Hesperilla atralba dactyliota (Meyrick), Miskin 1891: p. 81; Lower 1893: p. 13.
Motasingha atralba dactyliota (Meyrick), Waterhouse & Lyell 1914: p. 196, figs 648*, 773*; Seitz 1927: p. 1056; Waterhouse 1932b: p. 234, fig. 18*; Waterhouse 1932c: p. 224; Waterhouse 1933a: p. 57; Waterhouse 1937a: p. 33; Waterhouse 1937b: p. 119; Evans 1949: p. 224; Common 1964: p. 26; McCubbin 1971: p. 168; Common & Waterhouse 1972: p. 130; Common & Waterhouse 1981: p. 181.

Type. WESTERN AUSTRALIA: *Lectotype* ♂ labelled 'Geraldton' in BMNH (examined by the author). Subspecies *dactyliota* was described by Meyrick from two males and a female from Geraldton and a female from Port Lincoln (Waterhouse 1937a). Waterhouse (1937b) states 'holotype male from Geraldton in Meyrick's collection'. This specimen cannot be regarded as a holotype, but is here regarded as a valid designation of a lectotype.

Distribution. WESTERN AUSTRALIA: Geraldton area.

Foodplant. Gahnia lanigera (R. Br.) Benth. (Cyperaceae) (R. Grund, personal communication).

Antipodia atralba nila **(Waterhouse) comb. n.**

Motasingha atralba nila Waterhouse, 1932c: p. 224; Waterhouse 1937a: p. 33; Waterhouse 1937b; p. 119; Evans 1949: p. 224; Common 1964: p. 26; McCubbin 1971: p. 168; Common & Waterhouse 1972: p. 130; Common & Waterhouse 1981: p. 181.

Type. WESTERN AUSTRALIA: *Lectotype* ♂ labelled 'Dirk Hartog Is., W.A.' in AM (examined by the author). Subspecies *nila* was described by Waterhouse (1932c) from a series of specimens and although 'types' was mentioned, no single specimen was indicated in the original description. However, in 1937b, he stated 'holotype male

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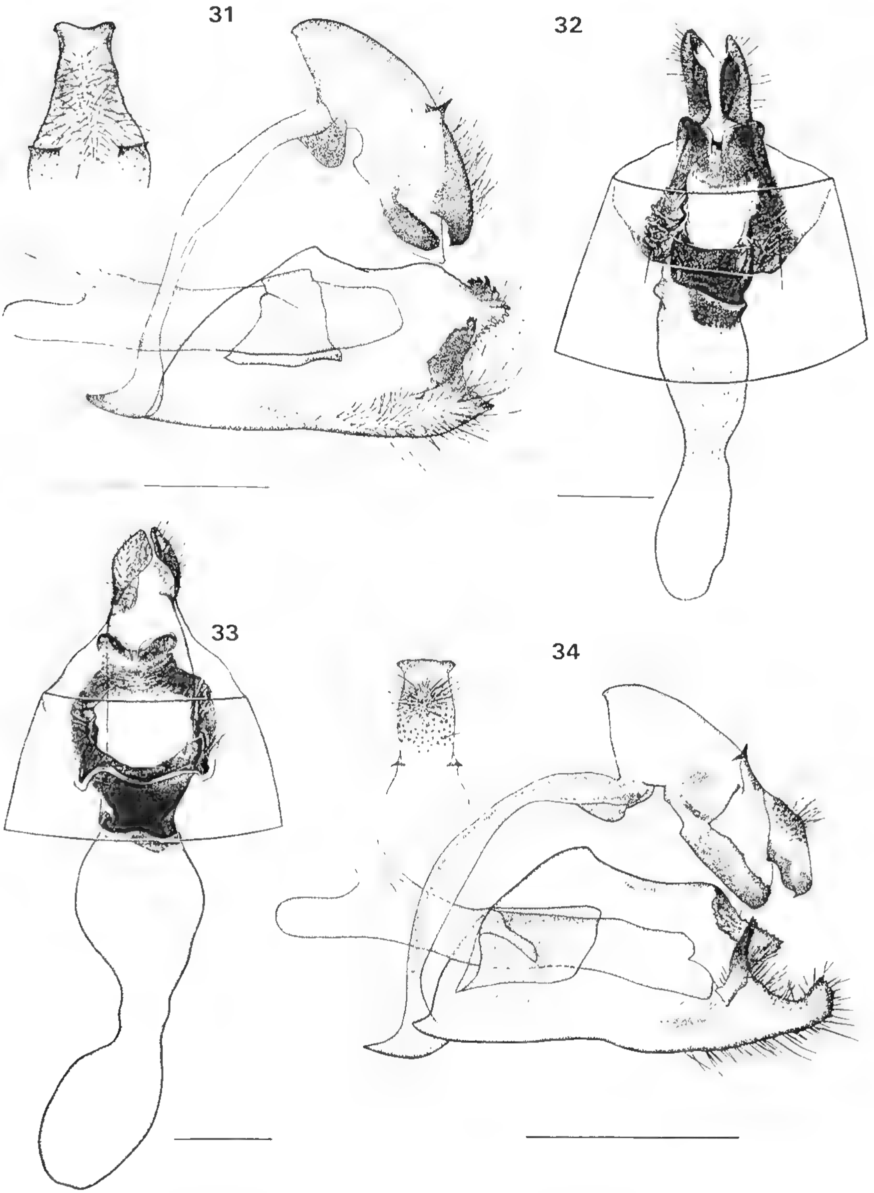
*These figures are considered to be subspecies *anaces.*



Figs 31-34. Genitalia of *Antipodia* spp.: (31) male *A. chaostola* lateral view [inset, uncus dorsal view]; (32) female *A. chaostola* ventral view; (33) female *A. atralba* ventral view; (34) male *A. atralba* lateral view [inset, uncus dorsal view]. Scale lines = 1 mm.

from Dirk Hartog Is. at Sydney'. The specimen labelled holotype in the Waterhouse collection is here regarded as the lectotype and was designated by Waterhouse (1937b).

Distribution. WESTERN AUSTRALIA: Dirk Hartog Island.

Foodplant. Unrecorded.

Antipodia atralba anaces (Waterhouse) comb. n.

Motasingha atralba anaces Waterhouse, 1937a: p. 33; Waterhouse 1937b: p. 119; Evans 1949: p. 224; Common 1964: p. 26; McCubbin 1971: p. 168; Common & Waterhouse 1972: p. 130, pl. 5, fig. 18; Common & Waterhouse 1981: p. 180, pl. 3, fig. 18.

Type. WESTERN AUSTRALIA: *Lectotype* ♂ labelled 'Hamel, W.A.' in AM (examined by the author). Subspecies *anaces* was described by Waterhouse (1937a) from a series of specimens, but no single specimen was indicated as the type in the original description. In Waterhouse (1937b), however, he states that the holotype male from Hamel is at the Sydney Museum. This specimen cannot be regarded as a holotype, but is regarded as a valid designation of a lectotype.

Distribution. WESTERN AUSTRALIA: south from Perth, including National Park, Lesmurdie, Waroona, Hamel.

Foodplant. Unrecorded.

Antipodia atralba anapus (Waterhouse) comb. n.

Motasingha atralba anapus Waterhouse 1937a: p. 33; Waterhouse 1937b: p. 119; Evans 1949: p. 224; Common 1964: p. 26; McCubbin 1971: p. 168; Common & Waterhouse 1972: p. 130; Common & Waterhouse 1981: p. 180.

Type. WESTERN AUSTRALIA: *Holotype* ♂, two *paratype* ♀♀ labelled 'Stirling Ranges, W.A.' in AM.

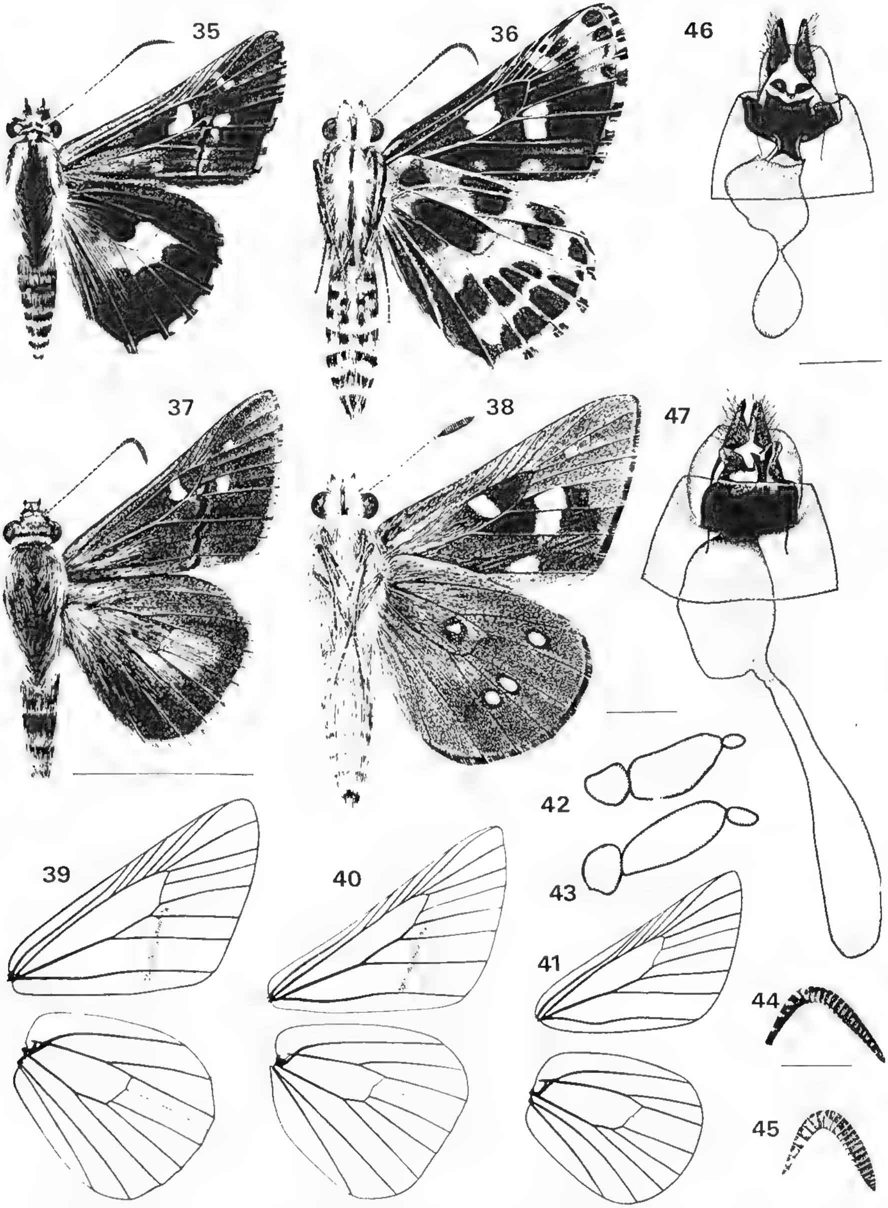
Distribution. WESTERN AUSTRALIA: Cocklebiddy to Stirling Range and southern coast.

Foodplant. *Gahnia lanigera* (R. Br.) Benth. (Cyperaceae).

Biology

The habitats of *Antipodia atralba* include mallee woodland, subdesert heath, coastal dunes and dry sclerophyll forests. Where known, the larvae of *A. atralba* feed on *Gahnia lanigera*, but *G. anistrophylla* has been recorded as an alternative foodplant.

The eggs are laid singly on the involuted leaf-blades of the foodplant and the larvae make twisted conical shelters from several



Figs 35-47. Adult Trapezitinae: (35) male *Hesperilla ornata* upperside; (36) female *H. ornata* underside; (37) male *Motasingha dirphia* upperside; (38) female *M. dirphia* underside; (39) male *Hesperilla donnysa* wing venation; (40) male *M. dirphia* wing venation; (41) male *Croitana croites* wing venation; (42) *H. ornata* labial palpus; (43) *M. dirphia* labial palpus; (44) *H. ornata* antennal club; (45) *M. dirphia* antennal club; (46) female *H. ornata* genitalia; (47) female *M. dirphia* genitalia. Scale lines: Figs 35-41 = 10 mm; Figs 42-47 = 1 mm.

leaves bound together with silk. The larvae and pupae are found within the shelters in a head-downward position. The rate of development of the larvae is variable and the life cycle may last from three to twelve months (Common and Waterhouse 1981).

The adult skippers are locally common and fly usually in spring and autumn. Their flight is moderately fast and close to the ground. Both sexes frequently visit flowers in bright sunshine and males occupy 'territories' where they rest on sand and leaf litter in smaller clearings or on low ridges and dunes.

The subspecies from Western Australia are small and dull, and the males have a broad, wedge-shaped sex mark that extends between CuA_1 and the inner margin of the forewing (inset, Fig. 20). Their early stages and adult morphology closely resemble those of the typical subspecies from South Australia and the small, bright subspecies from western Victoria.

Discussion

The species assigned to *Antipodia* cannot be distinguished by the larval and pupal characters to trapezitine, mesodine or hesperilline groups as proposed by Waterhouse (1932b). The typical hesperilline genera, *Hesperilla* and *Motasingha* are characterized by their elongate, semi-transparent larvae and long cylindrical pupae in which the pupal caps are strongly protruding and heavily sclerotized. The abdominal segments are covered with stiff bristles, apparently an adaption to support the pupae in an upright position within the foodplant shelter. In contrast, the larvae of *Antipodia* (Figs 10, 11, 25, 26) are tapered posteriorly and covered with setae; the pupae are also tapered posteriorly and lack stiff abdominal bristles. The pupal caps are rounded and only lightly sclerotized and both larvae and pupae are found inverted, head downwards, in twisted cone-shaped shelters.

Adult *A. chaostola* and *A. atralba* differ from species in the genera *Hesperilla* and *Motasingha* by the following combination of characters: antennal club moderately short and blunt (Figs 7, 22, 44, 45); third segment of labial palpus long (Figs 6, 21, 42, 43); subterminal spots present on forewing, males with sex mark restricted between CuA_1 and the inner margin of the forewing (Figs 5, 20, 39, 40); male genitalia (Figs 31, 34) with valvae distally constricted; female genitalia (Figs 32, 33, 46, 47) with accessory pouch to the corpus bursae weakly developed and lamella antevaginalis absent.

The genus *Motasingha* is apparently closely allied to *Hesperilla*. The male sex mark (Fig. 40) and male and female genitalia (Fig. 47) of *Motasingha dirphia* (Hewitson) are comparable to those of *Hesperilla donnysa* Hewitson, *Hesperilla flavescens* Waterhouse, *Hesperilla idothea* (Miskin), and *Hesperilla mastersi* Waterhouse, but the antennal club is unusually constricted and blunt (Fig. 45).

The morphology of *Antipodia* is similar to *Proeidosa* and *Croitana* (see Atkins 1973 and Edwards 1979) with characters somewhat midway between *Hesperilla* and *Mesodina* Meyrick. *Antipodia* differs from *Croitana* by an evenly curved and more pointed antennal club, the presence of a medium pair of spurs on the hind tibia, a sex mark on the male forewing and by details of the wing venation (Fig. 41). The egg of *Croitana croites* (Hewitson) was described by Common and Waterhouse (1981) and the first instar larva is similar to that of *Proeidosa* (unpublished observation) but other life history details are unknown. *Antipodia* differs from *Proeidosa* by the longer labial palpus and by the presence of a sex mark on the forewing of the male. Both sexes have patches of pale coloured scales on the upperside of the hindwing and the larval foodplant of *Antipodia* is *Gahnia*. The life history of *Proeidosa* is similar to that of *Antipodia* but the egg has 22–23 well defined vertical ribs and the larval foodplant is *Triodia* (Family Poaceae).

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References

Atkins, A.F., 1973. A new genus *Proeidosa* for an Australian skipper, *Pasma polysema* (Lower) (Lepidoptera : Hesperiidae, Trapezitinae). *J. Aust. ent. Soc.* 12: 253–260.

Common, I.F.B., 1964. *Australian Butterflies.* Jacaranda Press, Brisbane.

Common, I.F.B. and Waterhouse, D.F., 1972. *Butterflies of Australia.* Angus and Robertson, Sydney.

Common, I.F.B. and Waterhouse, D.F., 1981. *Butterflies of Australia.* Revised edition. Angus and Robertson, Sydney.

Couchman, L.E., 1946. Notes on the Lepidoptera–Rhopalocera of Tasmania. *Pap. Proc. R. Soc. Tasm.* 1945: 49–53.

Couchman, L.E., and Couchman, R., 1978. The butterflies of Tasmania. *In*: *Tasmanian Year Book* No. 11, 1977. Pp. 66–96, 6 pls.

Edwards, E.D., 1979. Two new species of *Croitana* Waterhouse (Lepidoptera: Hesperiidae) from central Australia. *Aust. ent. Mag.* 6(2): 29–38.

Evans, W.H., 1949. *A catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History)*. British Museum (Natural History), London.

Fisher, R.H., 1978. *Butterflies of South Australia (Lepidoptera : Hesperioidea, Papilionoidea)*. Woolman, Govt Printer, South Australia.

Hewitson, W.C., 1868. *Descriptions of one hundred new species of Hesperidae* Part II, pp. 25–56. John van Voorst, London.

Lower, O.B., 1893. List of South Australian Rhopalocera. *Trans. R. Soc. S. Aust.* 17(1): 1–12.

Lower, O.B., 1911. Revision of the Australian Hesperiadae. *Trans. R. Soc. S. Aust.* 35: 112–172.

McCubbin, C.W., 1971. *Australian Butterflies*. Nelson, Melbourne.

Meyrick, E., 1888. Description of new Australian Rhopalocera. *Proc. Linn. Soc. N.S.W.* (2)2(4): 827–834.

Meyrick, E. and Lower, O.B., 1902. Revision of the Australian Hesperidae. *Trans. R. Soc. S. Aust.* 26(2): 38–129.

Miskin, W.H., 1891. A synonymical catalogue of the Lepidoptera Rhopalocera (butterflies) of Australia with full bibliographical reference: including descriptions of some new species. *Ann. Qd Mus.* 1: i–xx; 1–93; i–ix.

Seitz, A., 1927. *The Macrolepidoptera of the world*. Vol. 9: 1057–1064. (The Indo-Australian Rhopalocera). Alfred Kernen, Stuttgart.

Tepper, J.G.O., 1882. The Papilionidae of South Australia. *Trans. Proc. Rep. R. Soc. S. Aust.* 4: 25–36.

Waterhouse, G.A., 1900. Descriptions of new species of Australian Rhopalocera. *Proc. Linn. Soc. N.S.W.* 25(1): 52–57.

Waterhouse, G.A., 1903. A catalogue of the Rhopalocera of Australia. *Mem. N.S.W. Nat. Club* 1: 1–49.

Waterhouse, G.A., 1927. Australian Hesperiidae. Part I. Notes and descriptions of new forms. *Proc. Linn. Soc. N.S.W.* 52(3): 275–283.

Waterhouse, G.A., 1932a. New genera of Australian Hesperiidae and a new subspecies. *Aust. Zool.* 7(3): 198–201.

Waterhouse, G.A., 1932b. *What butterfly is that?*. Angus and Robertson, Sydney.

Waterhouse, G.A., 1932c. Australian Hesperiidae. II. Notes and descriptions of new forms. *Proc. Linn. Soc. N.S.W.* 57(3–4): 218–238.

Waterhouse, G.A., 1933a. Notes on the type specimens of Hesperiidae (Lepidoptera) in the museums in Australia, with speciall reference to those in the South Australian Museum. *Rec. S. Aust. Mus.* 5(1): 49–62.

Waterhouse, G.A., 1933b. Australian Hesperiidae. IV. Notes and descriptions of new forms. *Proc. Linn. Soc. N.S.W.* 58(5–6): 461–466.

Waterhouse, G.A., 1937a. Australian Hesperiidae VI. Descriptions of new subspecies. *Proc. Linn. Soc. N.S.W.* 62(1–2):32–34.

Waterhouse, G.A., 1937b. Australian Hesperiidae. VII. Notes on the types and type localities. *Proc. Linn. Soc. N.S.W.* 62(3–4): 107–125.

Waterhouse, G.A. and Lyell, G., 1914. *The butterflies of Australia. A monograph of Australian Rhopalocera*. Angus and Robertson, Sydney.

Watson, E.Y., 1893. A proposed classification of the Hesperiidae, with a revision of the genera. *Proc. zool. Soc. Lond.* 1893(1): 3–132, pls I–III.

NEW DISTRIBUTION RECORDS FOR SOME QUEENSLAND AND NEW SOUTH WALES BUTTERFLIES

By W. J. Wilson
276 President Avenue, Gymea, N.S.W. 2227

Abstract

Distribution records extending the known range of the butterflies *Netrocoryne repanda expansa* Waterhouse, *Anisynta tillyardi* Waterhouse and Lyell, and *Toxidia rietmanni parasema* (Lower) are recorded and locality records of special note given for *Anisynta dominula draco* Waterhouse, *Toxidia andersoni* (Kirby) and *Theclinesthes scintillata* (T. P. Lucas).

Introduction

During field work between 1969 and 1981, I took six species of butterflies from localities extending or consolidating their known distributions. The records are detailed below. Summaries of previously published distributions for these species are taken from Common and Waterhouse (1981).

Hesperiidae

Netrocoryne repanda expansa Waterhouse. Several specimens of this subspecies were taken in rainforest near Mission Beach, Queensland, during September 1981. All specimens were male. Previously, it has been recorded as far south as Herberton. The only specimens taken on the coast were from Cooktown.

Anisynta tillyardi Waterhouse and Lyell. In New South Wales, this species was taken near Dorrigo in March 1970 and also at Mt. Allyn, south of Barrington Tops, in January 1977 and 1978. These sites are, respectively, some 35 km further east and 15 km further south than previously recorded.

Anisynta dominula draco Waterhouse. This subspecies was taken in New South Wales at Wongwibinda (between Ebor and Guyra) in February 1971, Clarence in February, 1974 and March, 1975 and Mongarlowe in March 1975 and February 1979, the last site being at an altitude of approximately 600 metres. These localities are additional to those previously recorded.

Toxidia rietmanni parasema (Lower). This subspecies has been recorded at Kuranda and Herberton, both on the Atherton Tableland. Several male specimens were taken in early October 1981 in rainforest near Mission Beach, Queensland. All were caught within 15-20 minutes of one another.

Toxidia andersoni (Kirby). Described as fairly common at New England National Park and rare at a number of other localities in New South Wales, I took this species at Mount Allyn in January 1977 and 1978 where it was fairly common. All specimens taken were males, suggesting that they were hilltopping.

Lycaenidae

Theclinesthes scintillata (T. P. Lucas). This species has been recorded in New South Wales as far south as Grafton, with isolated records from Menangle and Ebor. I took a female at Port Macquarie in April 1969 and another at North Haven in May 1981. The latter specimen was flying around the larval food plant, *Cupaniopsis anarcardioides*. A further specimen was sighted at North Haven, but was not taken.

Reference

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Revised edition. Angus and Robertson, Sydney. 682 pp.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

HAWKESWOOD, T. J.

1981. Insect pollination of *Angophora woodsiana* F.M. Bail. (Myrtaceae) at Burbank, south-east Queensland. *Victorian Nat.* 98(3): 120-129, tables 1-3.
Coleoptera: Scarabaeidae, 4 spp.; Cerambycidae, 6 spp.; Cleridae, *Scrobiger* sp.; Cantharidae, *Chauliognathus* sp.
Hymenoptera: Apidae, *Apis mellifera*

1982. Notes on insect pollination of two species of *Eucalyptus* (Myrtaceae) from south-west Western Australia. *Victorian Nat.* 99(1): 28-37, text-figs 1-6.
Coleoptera: Scarabaeidae, 2 spp.; Buprestidae, 7 spp.; Cleridae, 1 sp.
Hymenoptera: Scoliidae, *Campsomeris anthracina*

KIKKAWA, J., MONTEITH, G. B. and INGRAM, G.

1981. Cape York Peninsula: major region of faunal interchange. *In*: Keast, A. (ed.), *Ecological biogeography of Australia.* Junk, The Hague, Boston, London. Pp. 1697-1742, tables 1-5, text-figs 1- 9.

KITCHING, R. L.

1981. The geography of the Australian Papilionoidea. *In*: Keast, A. (ed.), *Ecological biogeography of Australia.* Junk, The Hague, Boston, London. Pp. 979-1005, tables 1-9, text-fig. 1, pls 1 & 2.

LEE, D. J., HICKS, M. M., GRIFFITHS, M., RUSSELL, R. C. and MARKS, E. N.

1980. *The Culicidae of the Australasian Region.* Vol. 1. Pp. lxix, 248. Entomology Monograph No. 2, Commonwealth Institute of Health, Sydney. Australian Government Publishing Service, Canberra.

LEWIS, D. J. and DYCE, A. L.

1982. The subgenus *Australophlebotomus* Theodor of *Phlebotomus* Rondani and Berté (Diptera: Psychodidae). *J. Aust. ent. Soc.* 21(1): 37-54, text-figs 1-54, 1 table.

WELLS, A.

1981. The genera *Oxyethira* Eaton, *Gnathotrichia* Ulmer and *Stenoxyethira* Kimmins (Trichoptera: Hydroptilidae) in Australia. *Aust. J. Zool.* 29(1): 103-118, text-figs 1-37.

1982. *Tricholeiochiton* Kloet & Kincks and new genera in the Australian Hydroptilidae (Trichoptera). *Aust. J. Zool.* 30(2): 251-270, text-figs 1-57.

WHELAN, R. J., LANGEDYK, W. and PASHBY, A. S.

1980. The effects of wildfire on arthropod populations in Jarrah-*Banksia* woodland. *West. Aust. Nat.* 14(8): 214-220, tables 1-7.

WHITE, M. J. D.

1981. Karyotypes and meiosis of the morabine grasshoppers III. The genus *Hastella. Aust. J. Zool.* 29(3): 461-470, text-figs 1-6.

WILLIAMS, D. G. and McDONALD, G.

1982. The duration and number of the immature stages of codling moth *Cydia pomonella* (L.) (Tortricidae: Lepidoptera). *J. Aust. ent. Soc.* 21(1): 1-4, table 1, text-fig. 1.

WILLIAMS, Geoff

1979. Some interesting beetle mimics. *Circ. ent. Sect. R. Zool. Soc. N.S.W.* (n.s.) 3: 4-5. [Cyclostyled, foolscap]

WILSON, C. G., SWINCER, D. E. and WALDEN, K. J.

1982. The introduction of *Trioxys complanatus* Quilis (Hymenoptera: Aphidiidae), an internal parasite of the spotted alfalfa aphid, into South Australia. *J. Aust. ent. Soc.* 21(1): 13-27, tables 1-5, text-figs 1-6.

ZALUCKI, M. P., KITCHING, R. L., ABEL, D. and PEARSON, J.

1980. A novel device for tracking butterflies in the field. *Ann. ent. Soc. Am.* 73: 262-265, text-figs 1-4.
Lepidoptera: *Euploea core*

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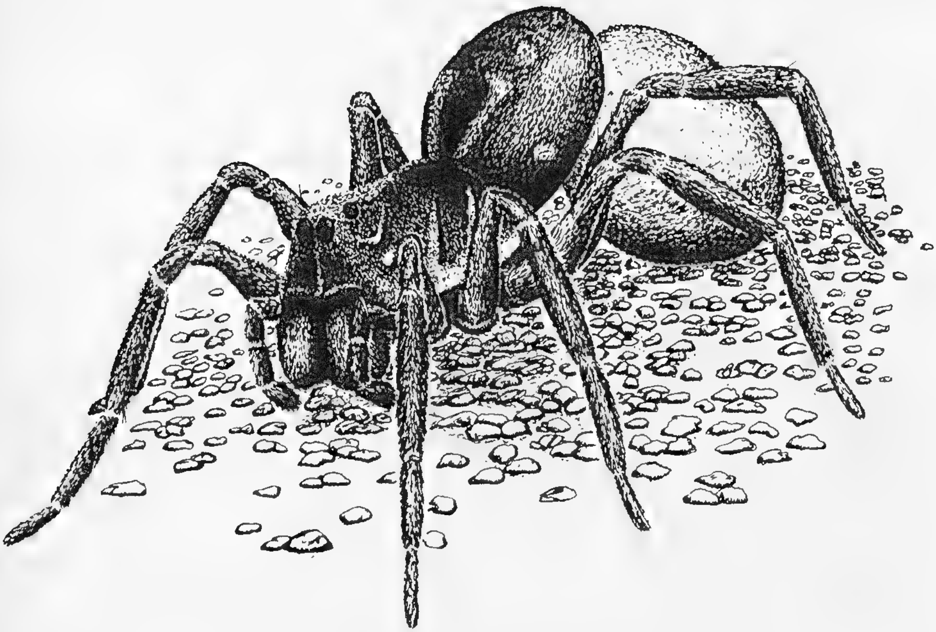

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Illustrated by Warren Reilly

Depicts a female wolf spider (family Lycosidae). The spider is draging her egg cocoon which is attatched to the spinnerets. When the young emerge they ride on the back of the female for several days, clinging to special club-shaped hairs, until they disperse.

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THE NEUROPTERA OF BARROW AND NEARBY ISLANDS OFF THE WEST COAST OF WESTERN AUSTRALIA

By C. N. Smithers
The Australian Museum, College St., Sydney

Abstract

Sixteen species of Neuroptera are listed from Barrow and Montebello Islands off the northwest coast of Western Australia. These include two coniopterygids, one of which is named, one new genus and species of berothid and seven species of chrysopids, of which two are new records for the area.

Five myrmeleontids are listed, of which two are probably new species, two are new records for the islands and the fifth probably a synomym of one of the new records from Barrow Island. The single species of ascalaphid is a new species.

Introduction

This paper deals with Neuroptera mainly collected by W. H. Butler and the author between 1st and 18th May, 1982 and by W. H. Butler and H. Heatwole in February, 1977 on Barrow and nearby smaller islands and on the Montebellos and Lowendals. These islands lie off the northwest coast of Western Australia between 20° and 21°S and 115° and 116°E. Descriptions of these arid islands, especially Barrow, which is by far the largest, can be found in Serventy and Marshall (1964), Butler (1970, 1975, 1975a) and Burbidge and Main (1971). The Montebellos have been described by Montague (1914). Recent detailed vegetation studies have been carried out on Barrow by Buckley (in press). There appear to be no records of Neuroptera from these islands other than a few records of Myrmeleontidae and Chrysopidae by Kimmins (1955) and records of Chrysopidae by New (1980). The material includes several new species and most of the additional material of described species represents significant new distribution records. These are marked with an asterisk (*). The material will be deposited in the Western Australian Museum.

Coniopterygidae

Only two specimens of coniopterygids were collected, both beaten from *Acacia coriacea* DC. One is a described species (*Heteroconis nigripennis* Meinander) and the other, named here, was described and illustrated by Meinander (1972) but not formally named. The present material is the first from Barrow Island and represents a considerable extension of known range for the two species.

Cryptoscenea evansorum sp.n.

Cryptoscenea sp. 1. Meinander 1975. *Acta. zool. fenn.* 136: 105, fig. 54.

TYPES. WESTERN AUSTRALIA: 1 ♀ (holotype), Barrow Island, 12.v.1982, C. N. Smithers (in Western Australian Museum). 1 ♀ (paratype), south west Australia, x.1966, J. W. and F. Evans. The latter specimen is that described and illustrated and referred to as "*Cryptoscenea* sp. 1" in Meinander (1972), (now in Australian Museum, Sydney).

FEMALE

Coloration (in alcohol): Head dark brown except for a paler area across front of head behind antennae, but in front of occupital region, which is extended forward between antennae to about half way to labrum, narrowing anteriorly. Eyes black. Scape, pedicel and about nine most distal flagellar segments dark brown; remaining flagellar segments pale brown. Four basal maxillary palp segments dark brown on outer side, pale on inner; fifth segment mostly pale. Legs brown, femora slightly darker than tibiae. Fore wings (Meinander 1972, fig. 54B) greyish, darker in marginal cells of which the veins are pale-bordered. Contrast between colour of these cells and rest of wing greater than suggested in Meinander's figure (in both known specimens). Hind wings paler than fore wings. Abdomen pale.

Morphology: Antennae 29-31 segmented. Scape widest three-quarters from base. Flagellar segments somewhat longer towards distal end of antennae than nearer base. Antennae about 1.6 mm. Fore wings with all longitudinal veins and branches setose for most of length. Hind wing veins glabrous except for a few setae near distal end of Sc, Sc_2 and R_{2+3}. Marginal setae strongly developed, especially on hind wing. Genitalia simple, gonapophyses laterales fairly large (Meinander 1972, fig. 54A). Bursa copulatrix strongly curved, dorso-posteriorly wide and narrowing anteriorly into a downwardly, then upwardly, curved elongation.

DISCUSSION

Meinander (1972) described but did not name a female from southwest Australia, referring to it as "*Cryptoscenea* sp. 1". The female described here from Barrow Island is clearly conspecific with it. This is the only species of *Cryptoscenea* Enderlein in which the longitudinal veins and their branches in the fore wing are setose for their whole length. The other species, of which there are three recorded from Australia and one from New Guinea, have fewer setae. In none of them are the wings as dark as in *C. evansorum* nor the cells near the wing margins so markedly darker than the rest of the wing.

In *C. evansorum* the fifth segment of the maxillary palp is conspicuously and characteristically paler than in the other species. The Barrow Island specimen represents a considerable northward extension of known range.

**Heteroconis nigripennis* Meinander

1 ♀, ex *Acacia coriacea*, Barrow Island, 12.v.1982, C. N. Smithers.

Described from "South west Australia", this species has been recorded from Nedlands (Western Australia), Brisbane and Roma (Queensland), 16 km E Bathurst and Earlwood (New South Wales) and Bright, Tallangatta and Tynong (Victoria) (Meinander 1972). The Barrow Island material represents a considerable extension of known range in the west.

Berothidae

Only one specimen of this family was collected. It represents an interesting and remarkable new genus related to *Stenobiella* Tillyard.

Barrowiella gen. nov.

Belonging to the Berothidae with wings elongate and narrow as in *Stenobiella.* Hind wing with two crossveins behind R_1, one of which meets R_{2+3} and the other R_2 after separation from R_3. A distinct gradate series of six veins in distal half of hind wing. Hind wing lacks all crossveins in basal half except for a somewhat evanescent one between stem of Rs and M.

Type species: *Barrowiella butleri* sp. n.

In general appearance *Barrowiella* is similar to *Stenobiella*, owing to the remarkably elongated, narrow wings. The fore wing venation differs in that in *Barrowiella* the two anterior crossveins of the gradate series are opposite each other, basad of the separation of R_2 and R_3. The venation of the hind wings is quite distinctive in that there is a complete series of gradate veins in the distal half of the wing. In *Stenobiella* there are at most four and these are not arranged in a definite gradate series. In *Barrowiella* all crossveins in the basal half are lacking except for that between Rs and M and even this is somewhat evanescent. In *S. pulla* Kimmins there are at least two and in *S. gallardi* Tillyard and *S. hirsutissima* Tillyard at least three such crossveins. On the other hand there is a second well developed crossvein between R_1 and R_{2+3} which is absent from all known species of *Stenobiella.*

Barrowiella butleri sp.n.

(Figs 1-6)

TYPE. WESTERN AUSTRALIA: 1 ♂ (holotype), Barrow Island, 4.v.1982, W. H. Butler (in Western Australian Museum).

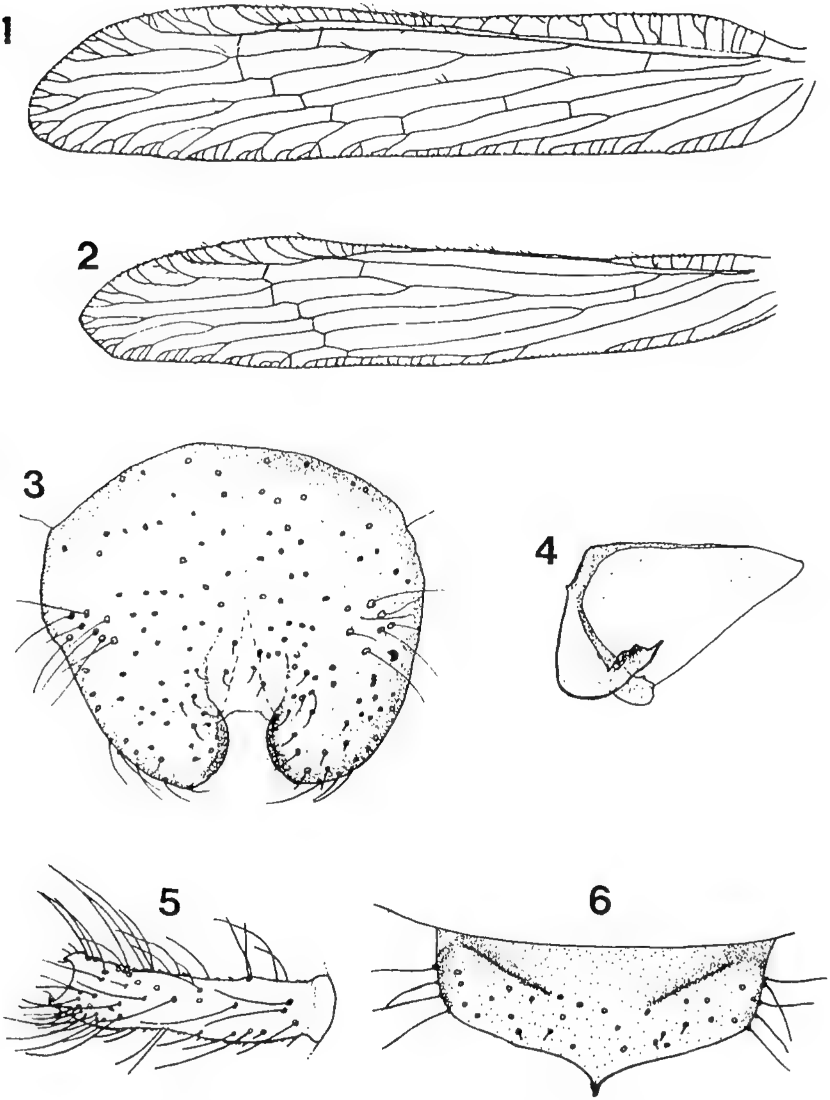
MALE

Coloration (in alcohol): Head dorsally with a trilobed grey mark between the temporal sutures, the middle lobe on the median suture reaching as far forward as half way to the level of the antenna bases. Elsewhere top of head pale brown, speckled with grey, dorsally laterad of the temporal sutures mottled grey. Head creamy yellow on sides behind eyes and ventrally. Antennae (incomplete) brown. Eyes grey. Prothoracic notum brown, a little darker around margin. Mesonotum creamy yellow, brown along sutures, with irregular grey patches near wing bases and a few small brown alveolar spots in cream areas. Scutellum grey with reddish suffusion. Metanotum as mesonotum but smaller. Meso- and metathoracic pleura reddish brown with a transverse creamy yellow crescentic mark. Coxae and femora dark reddish brown. Tibiae very pale brown, speckled brown. Tarsal segments pale, each apically brown giving a banded appearance to the tarsi. Fore wings (Fig. 1) hyaline, faintly tinted with brown. Abdomen reddish brown with creamy yellow, irregular areas.

Morphology: Length of body: 5.5 mm. Tubercles on head roughly triangular with about twelve stout setae. Median suture evanescent about half way to antenna bases. Temporal sutures evanescent between tubercles and compound eyes. Scape (Fig. 5) very long, a little wider at distal end than at proximal end; strongly setose. Pedicel and flagellar segments with distinct whorls of setae.

Fore wings (Fig. 1) very narrow, with anterior and posterior margins almost parallel for much of their lengths. Trichosors present around margin. Costal cell broadened near base; several costal crossveins branched. Sc curves towards R_1 at distal end and almost reaches it but is joined to R_1 by a minute crossvein before curving towards costa. Crossveins in pterostigmal area mostly branched. R_2 and R_3 separate opposite pterostigma distal to the minute Sc-R_1 crossvein. Two crossveins between R_1 and R_{2+3}, that belonging to the gradate series just basad of the separation of R_2 from R_3 and the other about a third of distance between separation of R_{2+3} from R_4 and the separation of R_2 from R_3. Crossvein between R_{2+3} and R_4 (second in the gradate series) opposite that between R_1 and R_{2+3}. Six crossveins in the gradate series. A crossvein between R and M near wing base (basad of origin of Rs), one in addition to that of the gradate series between M and Cu_1 and one between Cua and Cu_2. No crossveins near wing base between Cu_2 and 1A.

Hind wings (Fig. 2) elongate. Trichosors present. Sc thickened and approaching R_1 very closely towards distal end but not fusing with it. Gradate series as in fore wing but distal vein between R_1 and branches of Rs is distal to separation of R_2 from R_3 and so does not join the stem of R_{2+3} but joins R_2 separated from crossvein between R_3 and R_4 by basal part of cell R_2. As in fore wing, a second more basal crossvein occurs between R_1 and R_{2+3}. Crossvein between R and M near wing base arises from Rs not stem of R owing to more basal origin of Rs. Basal half of wing lacks other crossveins.



Figs 1-6. *Barrowiella butleri* gen. et sp. n. ♂: (1) fore wing; (2) hind wing; (3) ninth and tenth tergites; (4) genital sclerites; (5) scape; (6) ninth sternite.

Abdominal sternites heavily sclerotized, tergites basad of eighth less so. Ninth and tenth tergites (Fig. 3, dorsal) in form of a broad sclerotized plate with medially emarginate posterior border. Inner edges and ventral side of lobes rugose. Ninth sternite (Fig. 6) transverse with hind margin bearing a small, median, posteriorly directed well sclerotized projection. Ninth and tenth tergites and ninth sternite clothed with microtrichia in addition to setae indicated in figures. Setae easily lost in alsohol so that in many cases the positions are indicated only by alveolae. Genital sclerites with strongly sclerotized tenth sternite and apically free, and lightly sclerotized spinasternum (Fig. 4, left lateral). Coxopodites (terminology of Acker 1960) in form of two narrow elongate sclerites, each lying above and parallel with a lobe like paramere, and joined in midline by thin membrane. Spinasternum and parameres strongly laterally compressed so as to form thin, dorsoventral plates.

Barrowiella butleri is the only berothid so far known from Barrow Island.

Chrysopidae

Kimmins (1955) recorded three species of chrysopids from the Montebellos and New (1980), in a revision of the Australian Chrysopidae, recorded four species from Barrow Island and the Montebellos. The two recent collections include five species of which two have not previously been recorded from these islands. Six identifiable species are now known from the two island groups; a summary of the records is presented here.

Species represented in the recent collections:—

**Italochrysa insignis* (Walker)

1 ♂, Barrow Island, 12.v.1982, W. H. Butler.

This is a large common species, widespread in Australia. There are a few records in New (1980) from mainland Western Australia. New (in press) has described the egg and first instar larva of this species which he suspects lives in ants' nests.

Chrysopa ramburi Schneider

1 ♀, Barrow Island, 12.v.1982, W. H. Butler.

New (1980) repeats Kimmins' (1955) record of this species from Hermite (Montebellos) and records it from Barrow Island. It is a very widespread species in Australia and occurs in Malaysia, Timor and much of Micronesia.

Chrysopa singata Schneider

1 specimen, ex *Eucalyptus* sp., Barrow Island, 3.ii.1977, H. Heatwole and W. H. Butler.

New (1980) has already recorded this species from Barrow Island. It is common and widespread in Australia.

**Chrysopa otalatis* Banks

1 ♂, 2 ♀, Barrow Island, 8.v.1982, C. N. Smithers.

C. otalatis has been recorded only from a few localities in Queensland. Its occurrence on Barrow Island suggests that it may have a wider distribution.

Chrysopa sp.

1 specimen, ex *Eucalyptus* sp., Barrow Island, 19.ii.1977, H. Heatwole and W. H. Butler.

The specimen is too damaged for determination but is of a fairly small species.

Species not represented in present material:—

Chrysopa eremita Kimmins

This species is still known only from the type series, which came from Hermite Island, Montebellos.

Calochrysa extranea (Esben-Petersen)

New (1980) repeats Kimmins' (1955) record of this species from the Montebellos (on upper deck of "Campania"). It is a widespread species but has not yet been taken on Barrow Island.

Myrmeleontidae

The available material includes four species, two of which are undescribed. As Dr T. R. New is currently reviewing the Australian members of this family and the Ascalaphidae, the material has been submitted to him for inclusion in the revision. I am grateful to him for permission to include his identifications in these families in this paper.

Bandidus sp.n. near *pulchellus* Esben-Petersen

2 specimens, ex *Triodia pungens*, Barrow Island, 10.ii.1977, H. Heatwole and W. H. Butler. 2 specimens, same locality, no date, H. Heatwole and W. H. Butler.

Bandidus sp.

1 specimen, Boodie Island, 6.v.1981, W H. Butler.

**Heoclisis fulvifusa* Kimmins

2 specimens, in building, Wapet Camp, Barrow Island, 12.ii.1977, H. Heatwole and W. H. Butler. 1 specimen, same locality, 8.ii.1977, H. Heatwole and W. H. Butler.

Eophanes falcata Kimmins

This species was described by Kimmins (1955) from Hermite and Trimouille in the Montebellos. New (pers. comm.) has pointed out that this species is probably a synomym of *Formicaleon distinctus* Banks, recorded below from Barrow Island.

**Formicaleon distinctus* Banks

1 specimen, Barrow Island, W. H. Butler. 3 specimens, flying under rock overhang with sandy floor, Barrow Island, 8.iv.1982, C. N. Smithers.

This species was very common under rock overhangs. At least twenty specimens were present, flying during the day under the overhang where the three specimens were collected. The net clearly disturbed the others which retreated into the innermost, low part of the cavity below the overhang.

Ascalaphidae

Only one species of this family has been collected from the isalnds but it appears to be fairly common.

Suhpalacsa sp.

4 specimens, Barrow Island, ii.1977, H. Heatwole and W. H. Butler. 1 specimen, Barrow Island, 12.ii.1977, H. Heatwole and W. H. Butler. 2 specimens, Barrow Island, 6.v.1982, C. N. Smithers.

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I would like to thank the Western Australian Petroleum Co. Ltd. for providing transport between Perth and the islands and accommodation, transport and laboratory facilities on Barrow Island, Western Australian Wildlife Authority and the Department of Fisheries and Wildlife for permission to work on Barrow, Mr W. H. Butler for his valuable assistance in the field and Dr H. Heatwole and Mr Butler for the opportunity to study their material. Dr T. R. New kindly provided identifications of Myrmeleontidae and Ascalaphidae for inclusion in this paper. Dr T. Houston kindly allowed me to see the collections of the Western Australian Museum in connection with the study of the Barrow Island material.

References

Acker, T. S., 1960. The comparative morphology of the male terminalia of Neuroptera (Insecta). *Microentomology* 24: 25-84.

Buckley, R. C. (in press). The vegetation of Barrow Island W.A. *J. R. Soc. W.A.*

Burbidge, A. A. and Main, A. R., 1971. Report on a visit of inspection to Barrow Island, November 1969. *W. Aust. Dep. Fish and Fauna Rep.* 8: 1-26.

Butler, W. H., 1970. A summary of the vertebrate fauna of Barrow Island, W.A. *West. Aust. Nat.* 11(7): 149-160.

Butler, W. H., 1975. Additions to the fauna of Barrow Island, W.A. *West. Aust. Nat.* 13(4): 78-80.

Butler, W. H., 1975a. *Barrow Island.* Western Australian Petroleum Co. Ltd., Perth.

Kimmins, D. E., 1955. Neuroptera from the Monte Bello Islands, 1952. *Proc. Linn. Soc. Lond.* 165(2): 128-131, 2 figs.

Meinander, M., 1969. The genus *Heteroconis* Enderlein 1905 (Neuroptera, Coniopterygidae). *Notulae Ent.* 49: 49-68, 70 figs.

Meinander, M., 1972. A revision of the family Coniopterygidae (Planipennia). *Acta zool. fenn.* 136: 1-357, 223 figs.

Montague, P. D., 1914. A report on the fauna of the Monte Bello Islands. *Proc. Zool. Soc. Lond.* 1914(3): 625-675, pls. 1-IV.

New, T. R., 1980. A revision of the Australian Chrysopidae (Insecta: Neuroptera). *Aust. J. Zool. suppl. ser.* 77: 1-143, 552 figs.

New, T. R. (in press). The egg and first instar larva of *Italochrysa insignis* (Neuroptera, Chrysopidae). *Aust. ent. Mag.*

Serventy, D. L. and Marshall, A. J., 1964. A natural history reconnaissance of Barrow and Monte Bello Islands, 1958. *C.S.I.R.O. Tech. Pap. Div. Wildl. Res.*

THE IMMATURE STAGES OF *PSYLLA ACACIAEPYCNANTHAE* FROGGATT AND *PSYLLA UNCATOIDES* FERRIS AND KLYVER (HEMIPTERA: PSYLLOIDEA)

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Abstract

The immature stages of *Psylla acaciaepycnanthae* Froggatt and *Psylla uncatoides* Ferris and Klyver are described and illustrated.

Introduction

Psylla acaciaepycnanthae Froggatt and *Psylla uncatoides* Ferris and Klyver are two of the several species of psyllids that are found on *Acacia pycnantha* Bentham (Mimosaceae). *P. acaciaepycnanthae* is specific to *A. pycnantha* while *P. uncatoides* also utilizes other species of *Acacia* and *Albizia*. The adults of both species have previously been described (Ferris and Klyver 1932; Froggatt 1901) and *P. acaciaepycnanthae* redescribed (Yen 1977).

The immature stages of both species have not been previously described or illustrated.

Materials and methods

The descriptions are based on material collected from *A. pycnantha* on the grounds of La Trobe University and reared in the laboratory. All material examined is slide-mounted, and measurements are given as mm + S.E. (number of measurements). Measurements of eggs are length and width, and those of nymphs are body length and width of head including the eyes.

Representative material will be deposited at the Museum of Victoria.

Results

Egg development

The eggs of both psyllid species are attached to the host plant tissue by the pedicel, and eggs on host tissue deprived of water shrivelled within two days. Eggs of both species are pale yellow when laid and darken to a deep golden yellow prior to eclosion. The exochorion is heavily pitted when viewed under high magnification. A red mycetome appears at the basal end of the egg, and two days before eclosion a pair of red eyes become visible through the exochorion. The head is at the distal end of the egg and the abdomen at the basal end.

Nymphs

The nymphs of both species are naked in that they are not enclosed in a gall, under a lerp, or covered by woolly, waxy or flocculent material.

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Nymphs produce honeydew, and psyllid aggregations are sometimes covered by sooty mould.

In the following descriptions, the first instar is fully described and only differences are outlined for later instars.

Psylla acaciaepycnanthae Froggatt

P. acaciaepycnanthae Froggatt, 1901: 243-245, pl. xiv, fig. 5.

Egg

Oval, slightly pointed distally and blunt basally. Length 0.30 + 0.003 (16); width 0.13 + 0.003 (16). Eggs are usually laid singly, but are sometimes arranged in a semi-circular pattern.

Instar I (Fig. 1)

Yellow, sclerites of head, thorax and abdomen light grey-brown. Body flat. Length 0.37 + 0.007 (20), width 0.17 + 0.005 (20). Head and abdomen of equal width with thoracic region narrower. Head tapered anteriorly. Eyes not projecting beyond contour of head. Antennae two-segmented with two rhinaria on segment 2. Head not clearly differentiated from thorax. Wing pads not developed. Legs two-jointed with one or two setae. Tarsi not differentiated. Abdomen with 14 marginal setae and with six setae around anal region.

Instar II (Fig. 2)

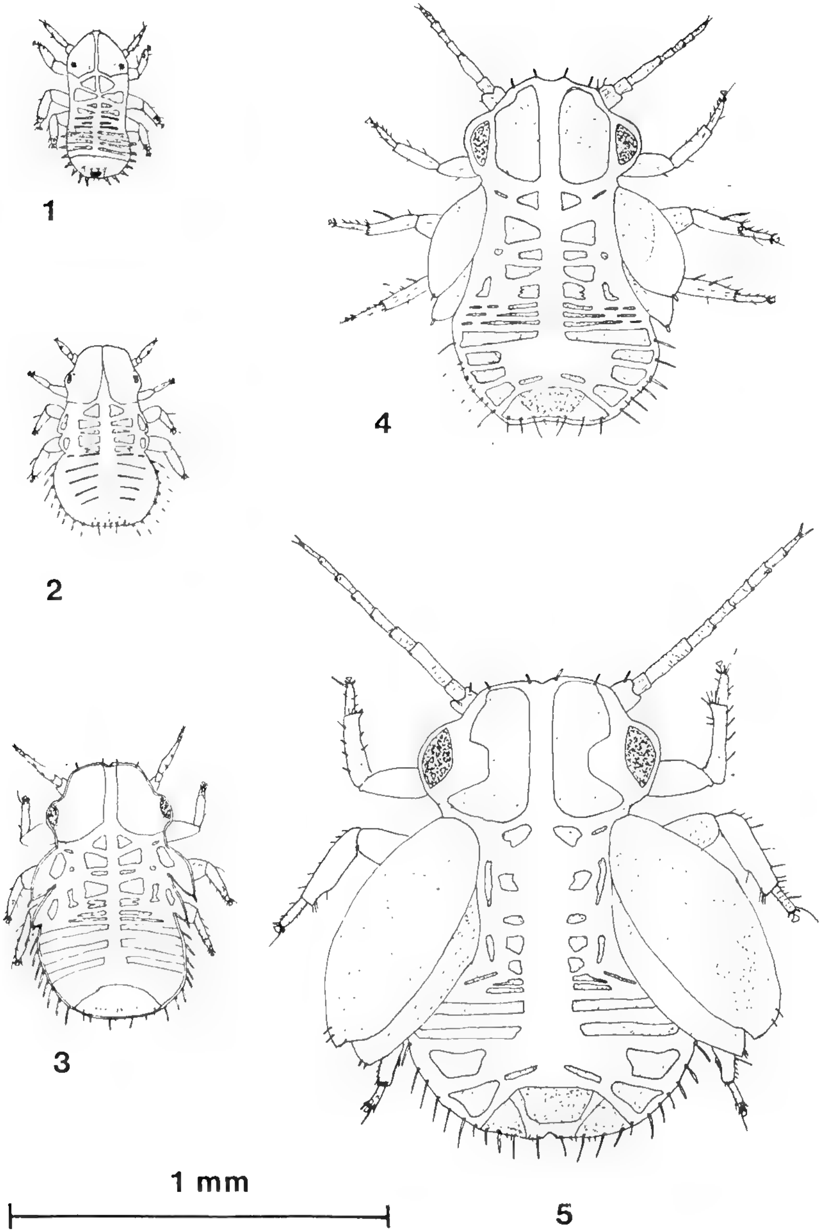
Abdomen wider than head. Length 0.49 + .011 (20), width 0.24 + .005 (20). Head tapering anteriorly to truncate apex. Eyes project beyond contour of head. Head clearly differentiated from thorax. Antennae three-segmented. Fore and hind wing pads small, rectangular and non-overlapping. Wing pads projecting slightly beyond contour of body. Abdomen rounded posteriorly to truncate apex. Abdomen with 16 marginal setae.

Instar III (Fig. 3)

Sclerites dark brown. Apical two antennal segments brown. Traces of red on body. Body flat anteriorly and enlarged posteriorly. Length 0.68 + 0.016 (20), width 0.33 + 0.003 (20). Head with four marginal setae. Antennae five-segmented with rhinaria on segments 3, 4 and 5. Wing pads rectangular and pointed at apex. Legs with 3-6 setae and five metatibial spines. Abdomen with 16 marginal setae and 6-10 setae around anal region.

Instar IV (Fig. 4)

Sclerites very dark brown. Apical three antennal segments brown. Median indentation on anterior of head and posterior of abdomen. Length 0.95 + 0.018 (20), width 0.47 + 0.007 (20). Antennae seven-segmented with rhinaria on segments 3, 5, 6, 7 and basal seta on segment 1. Forewing pads overlap hind wing pads. Each pad with one marginal apical seta. Legs three-jointed, tarsi unsegmented, and 5-7 setae. Abdomen with 12-16 marginal setae and 8-12 setae around anal region.



Figs 1-5. *Psylla acaciaepycnanthae*: (1) instar I; (2) instar II; (3) instar III; (4) instar IV; (5) instar V.

Instar V (Fig. 5)

Apical four antennal segments brown. Length 1.38 + 0.032 (20), width 0.63 + 0.007 (20). Antennae nine-segmented with rhinaria on segments 3, 4, 6, 7, 8, 9. Wing pads each with two marginal setae. Legs each with six setae. Abdomen with 16 setae around anal region.

Notes

P. acaciaepycnanthae prefers the underside of older phyllodes of *A. pycnantha.* It has overlapping generations, and all stages can be found together.

Psylla uncatoides Ferris and Klyver

P. uncatoides Ferris and Klyver, 1932: pp. 53-54, pl. 13, Fig. D.

Egg

Oval, slightly pointed distally and blunt basally. Length 0.29 + 0.005 (19); width 0.13 + 0.005 (19). Eggs are usually laid singly, although sometimes they are deposited in a mass.

Instar I (Fig. 6)

Yellow with light grey-brown sclerites on head. Apical antennal segment brown. Body flat. Length 0.30 + 0.007 (30), width 0.17 + 0.006 (30). Head slightly wider than abdomen. No setae on dorsal side of body. Head rounded anteriorly and slightly differentiated from thorax. Eyes project slightly beyond contour of head. Antennae two-segmented with two rhinaria on segment 2. Wing pads not developed. Legs with two joints, tarsi undifferentiated, and with two setae. Abdomen with rounded posterior margin, 14 marginal setae and six setae around anal region.

Instar II (Fig. 7)

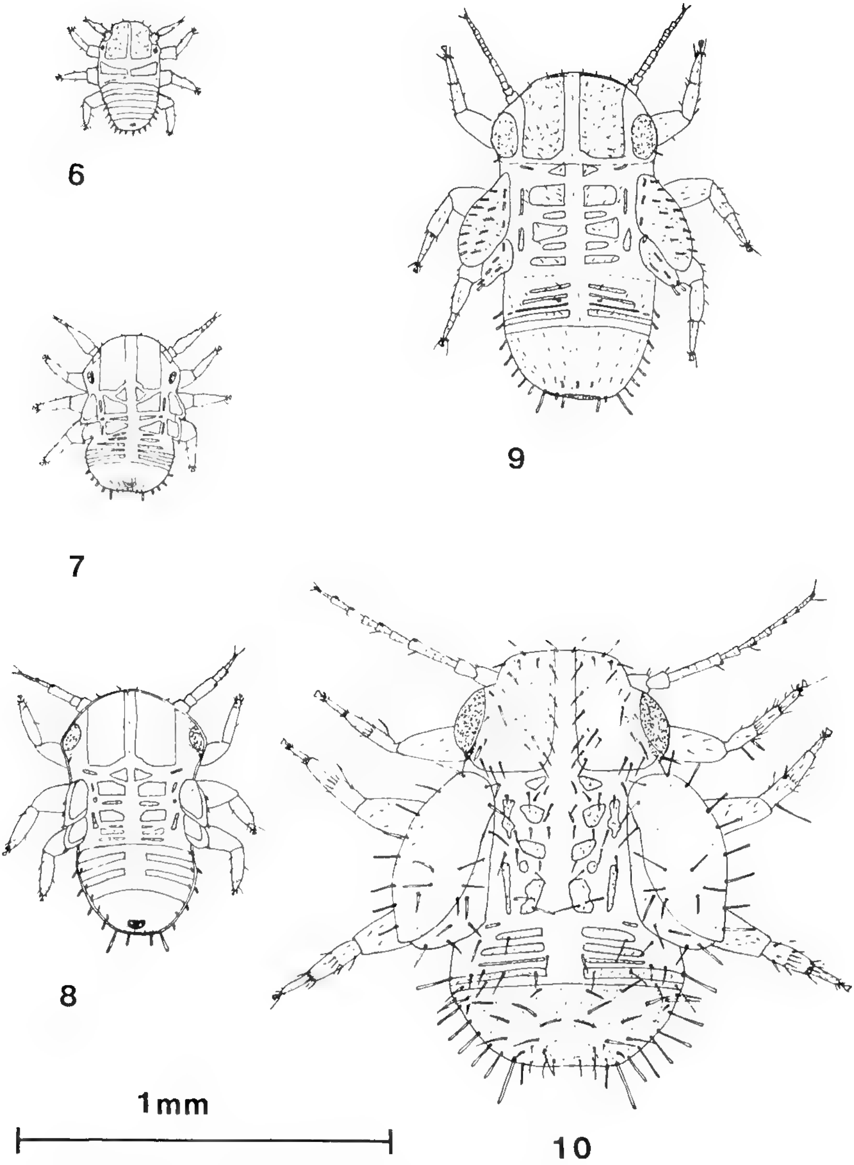
Sclerites on thorax and abdomen light grey-brown. Length 0.42 + 0.007 (20), width 0.24 + 0.007 (20). Head clearly differentiated from thorax. Antennae three-segmented with rhinaria on segment 3. Wing pads separate with fore and hindwing pads projecting beyond contour of body. Forewing pad triangular and hindwing pad rectangular, each with one apical marginal seta. Abdomen rounded to truncate posterior margin.

Instar III (Fig. 8)

Sclerites and apical one and a half antennal segments brown. Body enlarged posteriorly. Length 0.66 + 0.007 (20), width 0.35 + 0.007 (20). Antennae five-segmented with rhinaria on segments 3, 4, 5. Wing pads triangular and projecting beyond contour of body. Forewing pad with three marginal setae and hindwing pad with one marginal seta.

Instar IV (Fig. 9)

Sclerites dark brown. Apical three and basal two antennal segments brown. Length 0.83 + 0.021 (20), width 0.44 + 0.009 (20). Numerous short setae scattered on sclerites of head, thorax, abdomen and wing pads. Head



Figs 6-10. *Psylla uncatoides*: (6) instar I; (7) instar II; (8) instar III; (9) instar IV; (10) instar V.

rounded to truncate anterior margin, with six marginal setae. Antennae seven-segmented with rhinaria on segments 3, 5, 6, 7. Wing pads projecting beyond contour of body. Forewing pads overlap hindwing pads. Each forewing pad with 16 setae and each hindwing pad with six. Legs with three joints, tarsi unsegmented, and 4-6 apical tibial setae. Abdomen with 16 marginal setae and six setae around anal region.

Instar V (Fig. 10)

Apical four and a half and basal two antennal segments brown. Abdomen wider than head. Larger setae on sclerites on head, thorax, abdomen and wing pads, and some in the non-scleritized areas of thorax and abdomen. Length 1.40 + 0.037 (20), width 0.61 + 0.009 (20). Head with six marginal setae. Antennae nine-segmented with rhinaria on segments 3, 5, 7, 8, 9 and setae on segments 1, 2, 3. Legs with two groups of five setae, one located apically and the other medially on tibia. Abdomen with 16 marginal setae and 6-8 setae around anal region.

Notes

P. uncatoides prefers the young growing tips and the stems of *A. pycnantha* although young phyllodes are also used when the population density is high. It has overlapping generations, and all stages can be found together. *P. uncatoides* is most abundant in spring.

Discussion

Variability in body length and head width for immature psyllids can be large. Solomon (1936) found that body length, head width and wing pad length of *Glycaspis occidentalis* Solomon nymphs gradually increased in size during each instar. Size differences in *Acizzia russellae* Webb and Moran can be attributed to density, temperature and host plant factors (Webb and Moran 1974). Each instar of *P. acaciaepycnanthae* and *P. uncatoides* can be determined by head width, but is best confirmed by the number of antennal segments.

Acknowledgements

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References

Ferris, G. F. and Klyver, F. D., 1932. Report upon a collection of Chermidae (Homoptera) from New Zealand. *Trans. Proc. N.Z. Inst.* 63: 34-61.

Froggatt, W. W., 1901. Australian Psyllidae. Part II. *Proc. Linn. Soc. N.S.W.* 26: 242-298.

Solomon, M. E., 1936. Description and life history of a new Western Australian psyllid. *J. Proc. R. Soc. West. Aust.* 22: 41-48.

Webb, J. W. and Moran, V. C., 1974. A new species of *Acizzia* (Homoptera: Psyllidae) from *Acacia karroo* in southern Africa. *J. ent. Soc. Sth Afr.* 37: 117-124.

Yen, A. L., 1977. Redescription of the species of *Psylla geoffroy* (Hemiptera: Psyllidae) originally described by Froggatt. *J. Aust. ent. Soc.* 16: 7-20.

FURTHER OBSERVATIONS ON THE LIFE HISTORY OF *ARGYREUS HYPERBIUS INCONSTANS* BUTLER (LEPIDOPTERA: NYMPHALIDAE) IN CAPTIVITY

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Abstract

Observations on the life history of *Argyreus hyperbius inconstans* Butler are recorded from material collected at Condong, northern New South Wales, and bred in captivity near Brisbane. The larval food plant is *Viola betonicifolia*, although other species of *Viola* may be acceptable. In captivity the ratio of males to females differs markedly from that previously published for wild populations.

Introduction

The Australian Fritillary, *Argyreus hyperbius inconstans* Butler, is distributed along the east coast of Australia from Gympie to Urunga (Common and Waterhouse 1981).

We collected a female specimen on 1 December 1981, a hot overcast day following recent rains, near Condong, New South Wales. She was netted while flying slowly across an area of *Viola betonicifolia* near cane fields and transferred to Birkdale near Brisbane in order to rear her progeny in captivity. Our subsequent observations are reported in this article and complement the life history notes published by Lambkin and Lambkin (1977) who bred the species from specimens collected near Gympie, south-eastern Queensland.

Observations

Egg laying

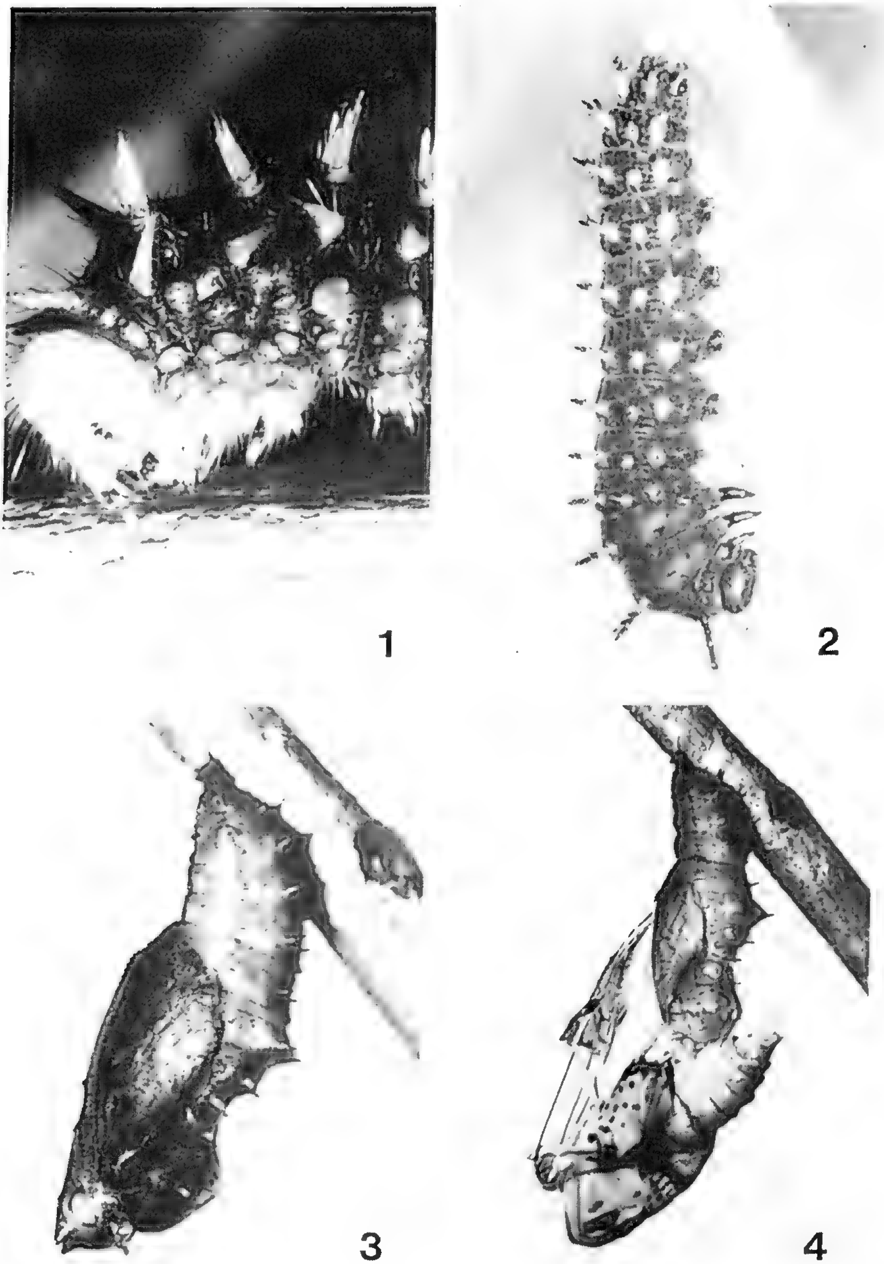
After capture, the butterfly was transferred to a plastic bag containing a small clump of food plant. Almost immediately, she began ovipositing on the leaves and stems. Egg laying continued for five days during which time she was fed twice daily on a honey-water solution supplemented with a minute amount of Sanatogen® protein food additive.

Biology of larvae

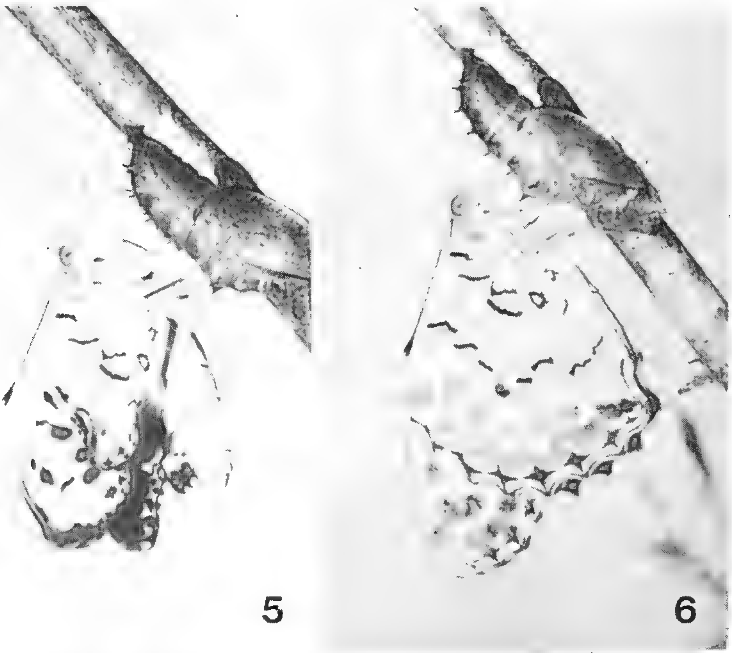
On 6 December the first larvae hatched and were placed directly onto food plant and surrounded with a fine nylon net sleeve. These were placed outdoors, in good light, with a northerly aspect, but not in direct sun. We were fortunate to have access to a friend's garden, containing *V. betonicifolia.*

On 10 December some larvae were in the second instar and by 25 December most of the larvae were in the final instar. Fig. 1 shows the anterior end of a fourth instar larva. It was observed that all larvae in captivity left the food plant at sunset, and at night apparently rested at the top of the sleeve. On one occasion two larvae remained on the food plant, these being in ecdysis. At sunrise the larvae returned to the food plant and fed throughout the daylight hours.

Four final instar larvae were placed on plants of *V. hederacea* and the common garden violet, *V. odorata* L. Small amounts of both plants were eaten before the larvae pupated. This fact, together with the observation that



Figs 1-4. *Argyreus hyperbius inconstans*: (1) anterior end of fourth instar larva, lateral view; (2) prepupa; (3) pupa, lateral view; (4) emerging imago.



Figs 5-6. *Argyreus hyperbius inconstans*: (5) teneral adult; (6) adult with wings fully expanded.

V. hederacea was eaten in earlier instars when presented accidentally, leads us to believe that it may be possible to use at least *V. hederacea* and possibly *V. odorata*, as substitute or supplementary food plants.

Pupation

On 26 December a final instar larva was noticed to become darker in colour, the dorsal longitudinal orange stripe fading and the pinkish-red spines darkening. It also appeared to have contracted slightly from its unstretched length of 45 mm. The larva was moving about in an agitated manner which was interpreted as a search for a suitable place to pupate. A pot of *Viola* was placed along with the larva in a small net emergence cage (300 x 300 x 500 mm high). The larva immediately ascended to the top of a twig placed upright in the pot, turned around and climbed down again. The twig was then angled at 45° whereupon the larva climbed to the top once more, spun a silken pad on the underside, and within thirty minutes was hanging suspended (Fig. 2).

On 29 December a complete pupation was witnessed. At 2.25 pm (Eastern Standard Time) four pairs of silver spines were showing through the corresponding larval spines of a prepupa. At 2.51 pm the prepupa had darkened, but there was no movement. At 3.18 pm violent contractions commenced, the twisting and lurching movements becoming continuous by 3.22 pm. At 3.23 pm the larval cuticle split over the thorax and the pupa worked the cuticle upwards until it was bunched up against the silken pad.

The cremaster was then withdrawn from the cuticle and with several violent twists, was securely hooked into the silken pad, while the larval cuticle was shed. At 3.27 pm pupation was complete except for further hardening (Fig. 3).

By 29 December most of the larvae had pupated after having consumed large clumps of food plant to within 3 cm of ground level. Those which pupated on food plants in the net chose sites furthest from the light source, some even pupating under the edge of the dark green tray on which the pots stood in the darkest situation available to them.

Emergence of the adult

On 3 January, 1982 the first pupae showed signs of emergence. At 8.20 am the colour of the wings showed clearly through the pupal skin, and three males emerged by 10.45 am. Next day three males emerged, on 5 January a further six males, and on 6 January the first females began to emerge (Figs 4-6). Adults continued to emerge until 15 January with the ratio of males to females being very close to 1: 1; This differs from previous observations in the field, where the male to female ratio was 10: 1 (Lambkin & Lambkin 1977). All butterflies emerged from the pupae during the morning.

Pairing attempts

One pair of reared adults was placed in a pairing cage (400 x 400 x 500 mm) in afternoon sunshine. In the cage was a honey pad, nectar flowers of *Pentas* and *Lantana*, and a plant of *V. betonicifolia.* The male was three days old, the female newly emerged. The male immediately attempted copulation, but the female was totally unreceptive. Another female was introduced to the cage, but again no copulation occurred.

During the next few days several eggs were laid but these were infertile, suggesting no mating had taken place. Several pairs were then introduced into an insectary, 4.8 x 4.8 x 2.4 m. Both males and females flew in the cage, and fed at the flowers of *Lantana, Pentas* and *Pseuderanthemum.* One male attempted copulation, but without success.

Conclusion

On 8 January, 1982, two reared pairs were reintroduced to the locality at Condong from which the original female had been taken. The area had recently been sprayed with herbicide. Drains around the cane fields had been cleared and the *Viola* plants destroyed. It is to be hoped that, having been rediscovered at this locality, the fritillaries will continue to maintain their colony.

Acknowledgements

We are grateful to Mr G. Sankowsky who supplied information on the locality; Mr and Mrs E. Yearn who generously made a continuous supply of *Viola betonicifolia* available; and Mr W. C. T. Major, Mr D. N. Reeves and Dr R. L. Kitching for reading the draft manuscript and making helpful comments.

References

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Second edition. Angus and Robertson, Sydney. 682 pp.

Lambkin, T. A. and Lambkin, K. J., 1977. Observations of the life history of *Argynnis hyperbius inconstans* Butler (Lepidoptera: Nymphalidae). *Aust. ent. Mag.* 4(1): 13-16.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

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CARLBERG, Ulf

1982. The timing of ecdyses in *Extatosoma tiaratum*. *Bull. amat. ent. Soc.* 41(No. 335): 92-94.

CARNE, P.B., CRAWFORD, L.D., FLETCHER, M.J., GALLOWAY, I.D. and HIGHLEY, E.

1980. *Scientific and common names of insects and allied forms occurring in Australia.* 4to. Commonwealth Scientific and Industrial Research Organization, Melbourne. Pp. i-iii, 1-95.

A revised edition of *Bull. Commonw. scient. Ind. Res. Org.* 287 (1973), previously issued as Bulltetin Nos 285 (1966) and 275 (1955).

CARNE, P. B.

1981. *Cryptoryctes minchami* sp.n. and notes on other *Cryptoryctes* spp. (Coleoptera: Scarabaeidae: Dynastinae). *J. Aust. ent. Soc.* 20(3): 249-252, text-figs 1-6.

1981. Three new species of *Anoplognathus* Leach, and new distribution records for poorly known species (Coleoptera: Scarabaeidae: Rutelinae). *J. Aust. ent. Soc.* 20(4): 289-294, text-figs 1-9.

COLEMAN, Norman Clyde

OBITUARY. *N. Qd Nat.* 45(No.179): 8-9.

COMMON, I. F. B. and EDWARDS, E. D.

1981. Tne life history and early stages of *Synemon magnifica* Strand (Lepidoptera: Castniidae). *J. Aust. ent. Soc.* 20(4): 295-302, text-figs 1-16.

De BAAR, M.

1982. An aberrant Wanderer butterfly. *News Bull. ent. Soc. Qd* 10(2): 25-26, text-figs 1-3.

The sequence of pages 23 and 26 of this issue are reversed so that page 26 does not follow page 25.

DEITZ, Lewis L. and TOCKER, Margaret F.

1980. W. M. Maskell's Homoptera: species-group names and type-material. *New Zealand DSIR Inform. Ser.* 146: 1-76.

DREW, R. A. I. and HOOPER, G. H. S.

1981. The responses of fruit fly species (Diptera: Tephritidae) in Australia to various attractants. *J. Aust. ent. Soc.* 20(3): 201-205, tables 1-6.

DUFFELS, J. P.

1977. A revision of the genus *Diceropyga* Stål, 1870 (Homoptera, Cicadidae). *Mon. Ned. Ent. Ver.* 8: 1-227, text-figs 1-265.

EVANS, Faith

1981. The Tartessinae of Australia, New Guinea and some adjacent islands (Homoptera: Cicadellidae). *Pacific Insects* 23(1-2): 112-188, text-figs 1-42.

EVANS, H. E.

1982. The *Anxius* group of the genus *Rhabdepyris* Kieffer (Hymenoptera: Bethylidae: Epyrinae). *J. Aust. ent. Soc.* 21(1): 55-61, text-figs 1-11.

1982. The "*collaris*" complex of Australian mimetic Pompilidae (Hymenoptera). *Pacif. Insects* 24(2): 151-155, text-figs 1-4.

EVANS, J. W.

1981. The patterns of distribution of some Hemiptera (Insecta). *In* H. F. Recher and W. F. Ponder (eds), *Lord Howe Island. A summary of current and projected scientific and environmental activities.* Australian Museum, Sydney. Page 21.

FISHER, R. H.

1980. A new distribution record for *Trapezites sciron*. *Victorian Ent.* 10(6): 64.
Lepidoptera: Hesperiidae

McALPINE, David K. and KENT, Deborah S.

1982. Systematics of *Tapeigaster* (Diptera: Heleomyzidae) with notes on biology and larval morphology. *Proc. Linn. Soc. N.S.W.* 106(1): 33-58, table, text-figs 1-32.

MAJER, J. D. and KOCH, L. E.

1982. Seasonal activity of hexapods in woodland and forest leaf litter in the south-west of Western Australia. *J. R. Soc. West. Aust.* 65(2): 37-45, tables 1-6, text-fig. 1.
Many species

MALIPATIL, M. B.

1981. Revision of Australian Cleradini (Heteroptera: Lygaeidae). *Aust. J. Zool.* 29 (5): 773-819, text-figs 1-108.

MONTEITH, G. B.

1982. Biogeography of the New Guinea Aradidae (Heteroptera). *Monographiae Biologicae* 42: 645-657, table 1, text-figs 1-8.

MORTON, D. E. A. and FISH, A. J.

1981. Report on the butterflies, moths and beetles of the region north of Licola, Gippsland. *Victorian Ent.* 11(3): 32-35.
Lepidoptera: butterflies 22 spp.; moths, *Agrotis infusa*
Coleoptera: no sp. identified

MUCHMORE, William B.

1982. The genus *Anagarypus* (Pseudoscorpionida: Garypidae). *Pacif. Insects* 24(2): 159-163, text-figs 1-7.

MULDER, R. H.

1983. Beetle collecting in the vicinity of Dubbo. *Circ. ent. Sect. R. zool. Soc. N.S.W.* 25: 15-17.

1984. Beetles frequenting grass trees (*Xanthorrhoea* spp.). *Circ. ent. Sect. R. zool. Soc. N.S.W.* 29: 16-18.

NEBOISS, A.

1981. Distribution of Trichoptera families in Australia with comments on the composition of fauna in the south-west. (Proc. 3rd Int. Symp. on Trichoptera, ed. by G. P. Moretti) *Series Entomologica* 20: 265-272, text-figs 1-2.

1984. Distribution of Trichoptera in the SW Pacific area. *Victorian Ent.* 14(2): 14-17.

NEW, T. R.

1980. A revision of the Australian Chrysopidae (Insecta: Neuroptera). *Aust. J. Zool., Suppl. Ser.* 77: 1-143, text-figs 1-552.

1981. A revision of the Australian Nymphidae (Insecta: Neuroptera). *Aust. J. Zool.* 29(5): 707-750, text-figs 1-188.

NIKITIN, M. I.

1979. Buprestidae collected in the County of Cumberland 1957-1960. *Circ. ent. Sect. R. zool. Soc. N.S.W.* 3: 5-6. [Cyclostyled, foolscap.]

NOYCE, John

1980. Real dishy. *QNC News* [Qd Nat. Club Newsl.] 120: 9.
Hemiptera: *Abricta curvicosta* being eaten by a bird.

SHORT, J. R. T.

1981. The final-instar larvae of two Anomaloninae (Hymenoptera: Ichneumonidae) from Australia. *Proc. Linn. Soc. N.S.W.* 105(3): 237-240, text-figs 1 & 2.

SMITH, J. A.

1981. Two Tasmanian species of *Sclerocyphon* Blackburn (Coleoptera: Psephenidae) with notes on their life history and distribution. *J. Aust. ent. Soc.* 20(4): 277-288, text-figs 1-23.

SPENCE, Kenneth Kinross

BIOGRAPHY. *Circ. ent. Sect. R. zool. Soc. N.S.W.* 21: 4-5.

WOODBURN, T. L., VOGT, W. G. and KITCHING, R. L.

1978. Estimation of age of females in field populations of *Lucilia cuprina* (Wiedemann) (Diptera: Calliphoridae) using ambient temperature and solar radiation. *Bull. ent. Res.* 68: 251-261, tables I-V.

YENDALL, David

1982. Some observations on Australian insect life. *Bull. amat. ent. Soc.* 41 (336): 141-147, illustr.
Many species mentioned.

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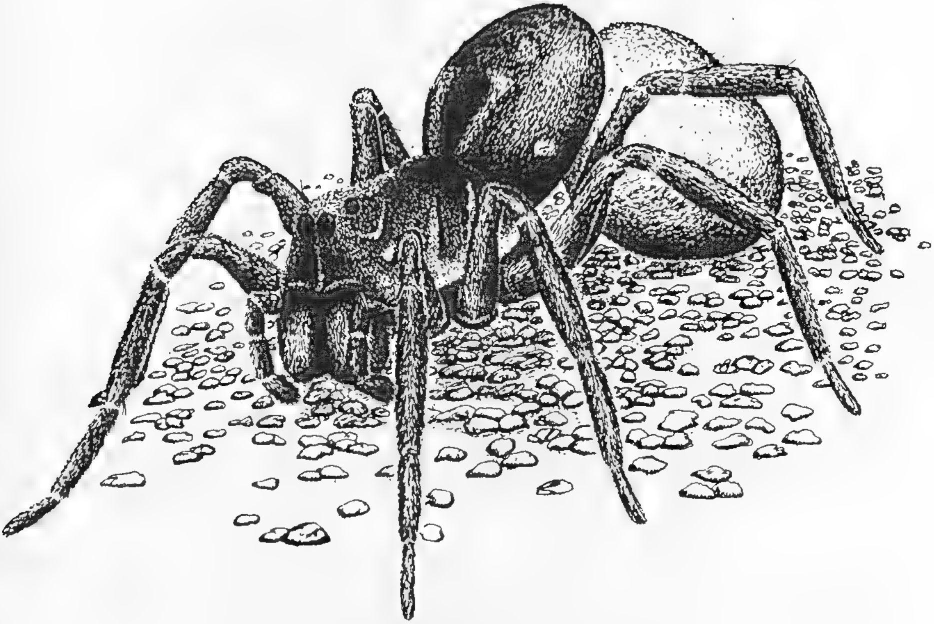

Edited by M. S. Moulds

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COVER

Illustrated by Warren Reilly

Depicts a female wolf spider (family Lycosidae). The spider is draging her egg cocoon which is attatched to the spinnerets. When the young emerge they ride on the back of the female for several days, clinging to special club-shaped hairs, until they disperse.

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TAXONOMIC NOTES ON THE GENUS *ZALE* McALPINE (DIPTERA: CANACIDAE)

By David K. McAlpine
The Australian Museum, 6-8 College St. Sydney, N.S.W. 2000

Abstract

Zalea is a new replacement name for *Zale* McAlpine 1982. *Zale horningi* is a new combination for *Tethina horningi* Harrison 1976, which is thus transferred from Tethinidae to the Canacidae.

Introduction

The genus *Zale* was recently described (McAlpine 1982) to include two species of intertidal flies from New South Wales. The name has proved to be a junior homonym, and also suspicions that a third species from the Snares Islands, New Zealand, may belong in the genus have been confirmed.

Subfamily Zaleinae nom. nov.

Zalinae McAlpine 1982: 116.

Because the type genus of Zalinae is a junior homonym, the name of the subfamily must be altered to one based on the replacement name of that genus.

Mathis (1982) has recently defined two subfamilies, Canacinae and Nocticanacinae, within the Canacidae. These taxa are of a lower order than Zaleinae. Thus, if the subfamily Zaleinae is to be included in the Canacidae, or, if the family Canacidae is to be expanded to include the closely related Tethinidae, Mathis's taxa should be placed as subordinate taxa of the subfamily Canacinae.

Genus *Zalea* nom. nov.

Zale McAlpine 1982: 108-110, not *Zale* Hübner, 1818: 11 (Lepidoptera).

Zalea minor (McAlpine) n. comb.

Zale minor McAlpine 1982: 110-112.

Zalea major (McAlpine) n. comb.

Zale major McAlpine 1982: 112.

Zalea horningi (Harrison) n. comb.

Tethina horningi Harrison 1976: 143, fig. 3.

As first suspected from Harrison's diagram of the wing venation, this species proves on examination of paratypes, to be close to *Z. minor*, the type-species of *Zalea*. *Z. horningi* resembles *Z. minor* and differs from *Z. major* in having tergite 6 of the female abdomen not at all sinuate, though weakly sclerotized, medially on the posterior margin. The size is also closer to that of *Z. minor* than *Z. major*, particularly in the width of the male genital segment, which measures 0.24-0.25 mm in the available dried material.

Z. horningi differs from *Z. minor* in its generally somewhat darker colouring. In particular the anterior margin of the postfrons is not broadly yellowish over its entire width, but has only a little yellowish coloration mainly towards the lateral angle; the pigmentation of the hypofacial is much more distinct; antennal segment 3 is more definitely suffused with greyish brown. The vibrissal angle of the head is less narrowly produced in profile than in *Z. minor*.

Dr Horning informs me that the type material of this species was collected on a rocky shore, apparently in a somewhat similar habitat to that of the other species of the genus. It is only known from the Snares Islands, New Zealand. Available data seem to indicate that *Zalea* will be found to have an extensive distribution.

Acknowledgements

I am indebted to Dr Bryan Cantrell and Prof. W. L. Brown Jr for information on the homonymy of *Zale*. Drs B. A. Holloway of D.S.I.R., Auckland, and R. A. Harrison of Lincoln College, Canterbury, enabled me to examine paratypes of *Z. horningi*.

References

Harrison, R. A. 1976. The Arthropoda of the southern islands of New Zealand (9) Diptera. *J. R. Soc. N. Zealand* 6: 107-152.

Hübner, J. 1818. *Zuträge zur Sammlung exotischer Schmetterlinge*, . . . 1: 40 pp., 35 pls.

McAlpine, D. K., 1982. A new genus of Australian littoral flies (Diptera: ? Canacidae). *Mem. ent. Soc. Wash.* 10: 108-117.

Mathis, W. N., 1982. Studies of Canacidae (Diptera), 1: suprageneric revision of the family, with revisions of new tribe Dynomiellini and new genus *Isocanace*. *Smithson. Contr. Zool.* 347: 29 pp.

A METHOD FOR CULTURING THE OVOVIVIPAROUS BLOWFLY *CALLIPHORA HILLI* HARDY (DIPTERA: CALLIPHORIDAE)

By H. Williams and A. M. M. Richardson
Zoology Dept., University of Tasmania, Box 252C, G.P.O. Hobart 7001

Abstract

The ovoviviparous fly, *Calliphora hilli*, is difficult to culture, due to premature oviposition. This problem can be overcome by strict management of the protein supply, allowing the flies access to protein only at emergence and when embryogenesis is complete.

Calliphora hilli is an important member of the guild of necrophagous flies found in south-eastern Australia and Tasmania, and it has also been found in myiasis (Norris, 1959). For comparative studies of carrion utilization, it is important to have laboratory cultures of this fly.

Most of the flies in the guild are oviparous (with the exception of *C. hilli* and *C. augur*) and are easy to rear. Rearing of *C. augur* has been reported by Callinan (1980), but the authors experienced difficulty in rearing *C. hilli*.

The fly is anautogenous and so protein meals are necessary to initiate and sustain egg development. With an unlimited supply (of liver, liver exudate or beef albumin), egg development preceeded normally up to Stage V (Vogt *et al*., 1974), but at this stage the flies deposit their eggs on the medium which result in their rapid degeneration.

There are two possible explanations for this behaviour. The first is simply that fertilization was not occurring in the culture. This was ruled out when copulation was observed and when dissection of the spermatheca proved that sperm transfer was taking place. The second possibility was that the protein source provided too strong an oviposition cue, causing the flies to oviposit before embryogenesis was complete. To test this newly emerged flies were allowed a protein meal, and subsequently fed only on sugar and water. The protein restriction was maintained until 24 h after the flies had passed Stage V (i.e. 120 h at 20°C). This allowed the eggs to complete embryogenesis *in utero*. After this time, a piece of liver was presented to the flies and normal ovoviviposition was observed.

In order to culture *C. hilli* successfully by this method, care should be taken to ensure that the ovarian development of the flies is synchronised, so that, when access to the protein is allowed, there will be no Stage V females present.

References

Callinan, A. P. L., 1980. Aspects of the ecology of *Calliphora augur* (Fabricius) (Diptera: Calliphoridae), a native Australian blowfly. *Aust. J. Zool.* 28: 679-684.

Norris, K. R., 1959. The ecology of sheep blowflies in Australia. *Monogr. Biol.* 8: 514-544.

Vogt, W. G., Woodburn, T. L. and Tyndale-Biscoe, M., 1974. A method of age determination in *Lucilia cuprina* (Wied.) (Diptera: Calliphoridae) using cyclic changes in the female reproductive system. *Bull. ent. Res.* 64: 365-370.

Aust. ent. Mag. 11(6), January, 1985

THE LIFE HISTORY OF *CHAETOCNEME CRITOMEDIA SPHINTERIFERA* (FRUHSTORFER) (LEPIDOPTERA: HESPERIIDAE: PYRGINAE)

By G. A. Wood
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Abstract

The life history of the banded red-eye, *Chaetocneme critomedia sphinterifera*, is described, the larval food plants are listed and comment is made on the number of larval instars of other Pyrginae.

Introduction

Chaetocneme critomedia sphinterifera (Fruhstorfer) is distributed from Cape York to the Claudie River; specimens have been taken from January to April and in July and November (Common and Waterhouse, 1981).

Working upon the assumption that *C. c. sphinterifera* would feed upon lauraceous plants as do other members of the genus, an examination of these was made in the Iron Range area. Larvae of *C. c. sphinterifera* were found feeding upon eight species of Lauraceae and were reared within netting sleeves enclosing the food plants.

Life history

Egg. Translucent whitish; domed, slightly higher than wide, 1 mm at base; with 21 coarse, vertical, ribs.

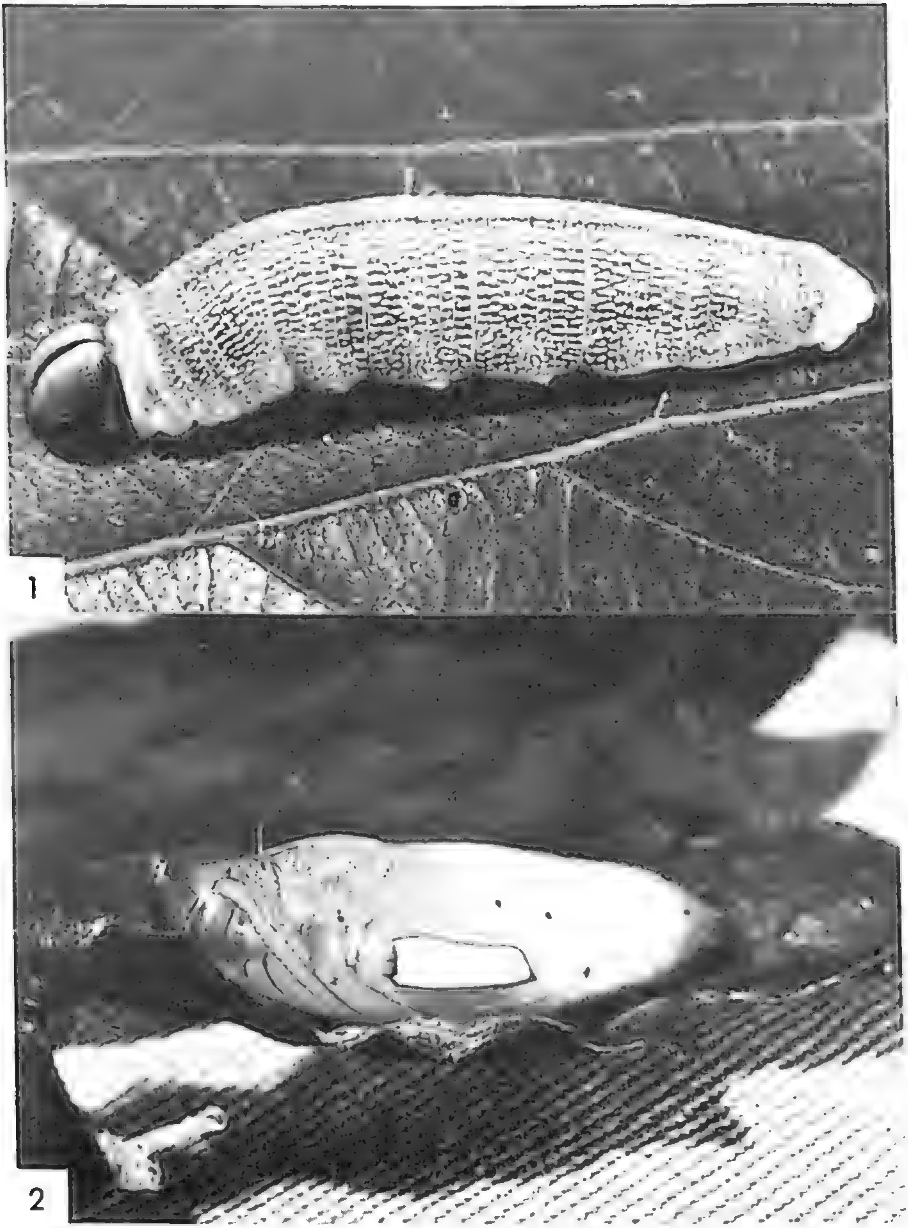
First instar. Length 4 mm. Head rounded, granulated; at first red, later turning brown; divided by a shallow median longitudinal groove. Body red and covered with fine setae; prothorax brown or black.

Third instar. Length 12 mm. Head less rounded than first instar; granulated; black, divided by median longitudinal groove. Body green with red suffusion and minute white spots; prothorax dark red.

Fifth instar. Length 25 mm. Head elongated; granulated; divided by a deep median, longitudinal groove; longitudinal groove marked by a sharply-defined, black area; surrounding this a narrow, cream-coloured band; remainder of head brown. Body green but usually with red suffusion, covered with elongated white spots.

Sixth instar. (Fig. 1). Length 34 mm. Head as in fifth instar but colours less well defined. Body green but usually with red suffusion, elongated white spots dominant.

Pupa (Fig. 2). Length 25 mm. Smooth, pale yellow with small brown spots; abdominal spiracles brown. Head with a short projection, viewed anteriorly this approximates a stylized heart in shape but with an extra indent at its base. Wing bases with a prominant patch of white waxy scales, this edged dark brown.



Figs 1, 2. *Chaetocneme critomdeia sphinterifera* (Fruhstorfer): (1) sixth instar larva; (2) pupa.

Food plants. The food plant most often selected is *Cryptocarya triplinervis* R. Br., but the following are also used: *Cryptocarya hypospodia* F. Muell., *Endiandra glauca* R. Br., *Cinnamomum oliveri* F. M. Bail., *Litsea glutinosa* (Lour.) C. B. Rob., *Litsea leefeana* (F. Muell.)., *Neolitsea dealbata* (R. Br.)., *Neolitsea australiensis* Kosterm. (all Lauraceae).

Notes. Eggs are laid singly on the upperside of mature leaves of the food plant.

First instar larvae construct a shelter by eating out a horseshoe-shaped section of leaf and bending the centre piece backwards. This is accomplished by constructing a silken hinge at the attached end of the isolated section, which gradually raises the piece until it has travelled through 180°. Larvae assume a hunched posture beneath the roof of the shelter and feed at night. As larvae grow they construct further shelters but these differ from the first in that the isolated end is anchored by a silken thread. Some larvae detach and caste away old shelters. Late instar larvae construct shelters by cutting out the centre of one leaf and bending it down upon another. This is achieved with tensioned silken threads which anchor the centre piece at six or more places.

Pupation occurs within the final shelter. Pupae are suspended beneath the roof of this shelter by a cremaster and a Y-shaped central girdle, the fork of which supports the pupa. Pupal duration is from two to three weeks. Adults emerge at dusk and it is late at night before they are ready to fly.

First instar larvae collected in July produced adults in September and October. As this is a period of only four months and contains the coolest and driest period of the year when development is slowest, it appears that there may be three generations annually.

In rearing *Chaetocneme critomedia sphinterifera* I was particularly interested in the number of instars involved, as I had found *Chaetocneme beata* (Hewitson) and *Chaetocneme porphyropis* (Meyrick and Lower) to have six. Other Pyrginae studied are *Netrocoryne repanda expansa* Waterhouse which I found also has six instars and *Tagiades japetus janetta* Butler which has only five. To my knowledge these are the first reports of any Australian butterfly with more than five instars.

Acknowledgement

I wish to thank B. P. M. Hyland, Division of Forest Research, C.S.I.R.O. Atherton, for identifying the food plants.

Reference

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Second edition. Angus and Robertson, Sydney. 682 pp.

Aust. ent. Mag. 11(6), January, 1985

FOOD PLANT RECORDS OF *EUPLOEA CORE CORINNA* (W. S. MACLEAY) WITH SOME NOTES ON LARVAL COLORATION

By Elly Scheermeyer* and Myron P. Zalucki†
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Abstract

Two colour morphs of the larvae of *E. core corinna* are described and new food plant records are presented. The spatial distribution of *E. core* in relation to food plants is discussed.

Introduction

During the past three years we have made numerous field observations on *Euploea core corinna* (W.S. Macleay). Five new larval food plants were found and one of us (E. S.) found two previously unrecorded colour morphs of fifth instar larvae in addition to the normal black-banded orange and white form.

Larval colour morphs

The first of these had the normal orange-brown colour replaced by purple. It was found frequently in drier country near Charters Towers and Marlborough in Queensland. All larvae of this morph were feeding on rubber-vine, *Cryptostegia grandiflora* (Asclepiadaceae), sometimes side by side with normal-coloured larvae.

The second morph was very lightly coloured; greenish with white bands on the thorax and various shades of yellow and orange separated by white bands on the abdominal sections. The single specimen observed was feeding on a fig tree, *Ficus* sp. (Moraceae) in Townsville.

In laboratory experiments larvae of *E. core* often lose some of their orange-brown colour when developing at low temperatures (18 to 20°C) and become nearly black and white. The above colour morphs, however, were not produced during rearing at the following temperatures, 18, 20, 24, 27, and 30°C.

Introduced food plants

Euploea core corinna has been observed to breed on a variety of introduced plants which are grown as ornamentals in suburban gardens, viz. *Nerium* (oleander), *Mandevilla, Trachelospermum* (all Apocynaceae) and *Stephanotis, Hoya* and *Asclepias* (all Asclepiadaceae) (Common and Waterhouse, 1981). D.P.A. Sands (pers. comm.) noted complete development from egg to pupa on *Plumeria* (frangipani) (Apocynaceae) in Brisbane, 1983. On *Asclepias*, which has become a very common plant in the wild, survival of the larvae is extremely poor (Rahman *et al.*, 1984; Kitching and Zalucki, 1983) and pupae are rarely found, although oviposition occurs regularly. It would appear that the presence of *Asclepias* does not have any important effect on the distribution of *E. core* and the same is true for *Plumeria* (frangipani). The early instars usually die on *Plumeria* and only rarely is it used for oviposition. On *Allamanda* eggs and first instar larvae are also often encountered, but no complete development has yet been recorded. *Mandevilla, Trachelospermum* and *Stephanotis* are not common and would be of a minor influence on the distribution of the butterfly. On the other hand *Nerium* (oleander), is a very common garden ornamental being found in all major cities of Australia and many townships. It seems largely responsible for the presence of *E. core* in large cities devoid of native food plants. In the A.C.T. for example, where no native food plants occur, *E. core* has been observed to breed on *Nerium* in some years (Kitching *et al.*, 1978). These well watered garden ornamentals could have an important effect on the distribution inland. *Cryptostegia grandiflora* (Asclepiadaceae) was introduced to Australia after European settlement. In 1875 it was cultivated in Brisbane and, subsequently, it was taken north to the mining towns. There it has spread in the wild and has become a very common plant in central and north Queensland and along the Gulf rivers, reaching pest proportions in some areas (Kleinschmidt and Johnson, 1979). *Cryptostegia* is still extending its distribution inland and into the Northern Territory. It is usually found along road sides and river beds inland. Along these rivers, which are dry or nearly so during most of the year, considerable populations of *E. core* can be found. The tall trees or clusters of vines on the river banks provide shelter for the butterflies throughout the year. This plant has had an important effect on the distribution of *E. core* already, as can be inferred from the large populations of the butterfly found around *Cryptostegia*-infested areas. The food plant list of *E. core* is still incomplete. With recent plantings of rarer exotic species and native species from the rainforest in gardens, *E. core* encounters continually new potential food plants. Possibly *Ficus lyrata*, an exotic from tropical West Africa, and *Ficus pumila*, an exotic from China and Japan, may become regular food plants as eggs, third and fourth instar larvae have been noticed on these species. Other species in the Moraceae, Apocynaceae and Asclepiadaceae undoubtedly await recognition as food plants.

Native food plants

Below I have listed the native food plants of *Euploea core corinna*. They are grouped by family with notes on their distribution and usual habitat. Those previously unrecorded are marked by an asterisk (*).

Not all native food plants are used with equal frequency by *E. core*. Accordingly, I have separated food plants into three groups: frequently used, occasionally used and rarely used. A food plant was defined as frequently used when it was observed by many entomologists in various locations and larvae were present commonly throughout the breeding season. Occasionally used food plants were those on which larvae were found irregularly or those which could not be checked personally in their natural habitat (*Carissa ovata, Leichhardtia australis* and *Gymnanthera nitida*). Food plants on which larvae were found only once, but completed development, were described as rarely used. On *Maclura cochinchinensis* (Moraceae) only eggs and first instar larvae have been found so far, but it is used for oviposition frequently. The insects' preferences for particular food plants seem to vary locally. Disregarding garden ornamentals the native *Parsonsia straminea* seems highly preferred in the Brisbane area whereas in Townsville and the Burdekin area, the preferred species is introduced *Cryptostegia grandiflora*. Both plants are very common and this may be why they are used relatively more often than other not so common species of food plants.

The following abbreviations are used: W.A. (Western Australia), N.T. (Northern Territory), Q. (Queensland), N.S.W. (New South Wales), V. (Victoria) and S.A. (South Australia).

MORACEAE

Ficus obliqua: W.A., Q., N.S.W.; also in S.E. Asia, Philippines, Indonesia and New Guinea (Beard, 1970; Williams, 1979; Beadle *et al.*, 1972; Jacobs & Pickard, 1981). In the Kimberley region of W.A. and along the coast in N.S.W. and Q. Frequently used.

F. platypoda: W.A., N.T., Q., S.A.; endemic in Australia (Beard, 1970; Jessop, 1981; Williams, 1979; Black, 1977). A wide spread tree, especially of rocky outcrops and gullies. Frequently used.

**F. coronata*: W.A., N.T., Q., N.S.W., V.; endemic in Australia (Beard, 1970; Jacobs & Pickard, 1981; Beadle *et al.*, 1972; Willis, 1972). Along the coast in or near rainforest, inland confined to gullies. Rarely used, recorded by R. L. Kitching, nr Brisbane, 1983.

**F. benjamina*: N.T., Q.; also in S.E. Asia. A tree native to northern Q. but introduced in cities along the east coast and to the N.T. (information supplied by Q. Herbarium). Frequently used, recorded by C. Hagen, Brisbane in 1983.

APOCYNACEAE

Parsonsia straminea: Q., N.S.W.; endemic in Australia (Williams, 1979; Jones & Gray, 1977; Beadle *et al.*, 1972; Jacobs & Pickard, 1981). A widespread climber along or near the coast, mainly in wet sclerophyll forest on open sunny places. Very common in southern Q. and N.S.W. Frequently used.

**P. eucalyptophylla*: Q., N.S.W.; endemic in Australia (Williams, 1979; Jones & Gray, 1977; Jacobs & Pickard, 1981). A climber especially in drier areas in southern Q. and northern N.S.W. Occasionally used, recorded by E. Scheermeyer, Brisbane, 1983.

**Ichnocarpus frutescens*: Q.; also in E. India and the Archipelago (Bailey, 1900). Rarely used, recorded by E. Scheermeyer, Magnetic Island, 1980.

Carissa ovata: Q., N.S.W.; endemic in Australia (Williams, 1979; Jacobs and Pickard, 1981). A widely distributed shrub from northern N.S.W. northward, especially along banks of coastal creeks and on well drained ridges in dry vine scrub and brigalow areas. Occasionally used, originally recorded by Sankowsky (1978) at Wallaville (Q.).

ASCLEPIADACEAE

Hoya australis: W.A., N.T., Q., N.S.W.; also in some Pacific Islands (Jones & Gray, 1977; Jacobs & Pickard, 1981). A wide spread climber found in rainforest, along stream banks and on rocky escarpments from northern N.S.W. northward. Frequently used.

Leichhardtia australis (*Marsdenia leichhardtiana*): W.A., N.T., N.S.W., V., S.A.; endemic in Australia (Blackall & Grieve, 1974; Beard, 1970; Ewart & Davies, 1917; Jessop, 1981, Jacobs & Pickard, 1981; Ewart, 1930; Willis, 1972; Black, 1965). Usually found inland near water courses. Occasionally used, originally recorded by Edwards (1948).

Secamone elliptica: N.T., Q., N.S.W.; endemic in Australia (Bailey, 1900; Jacobs & Pickard, 1981). A large, thick stemmed, tall climber in dry or littoral rainforest from the subtropics northward. Occasionally used, originally recorded by Sankowsky (1975).

Gymnanthera nitida: W.A., N.T., Q.; endemic in Australia (Beard, 1970; Ewart & Davies, 1917; Jones & Gray, 1977; Bailey, 1900). A tall climber along stream banks, mainly near the coast. Occasionally used, originally recorded by Sankowsky (1975).

Sarcostemma australe: W.A., N.T., Q., N.S.W., S.A.; endemic in Australia (Beard, 1970; Blackall & Grieve, 1974; Jessop, 1981; Jones & Gray, 1977; Williams, 1979; Jacobs & Pickard, 1981; Black, 1965). A widespread scrambling bush with rudimentary leaves, along the coast and inland usually in open forest on rocky hills or in *Acacia* scrub. Occasionally used (Sankowsky, 1975; Atkins, 1975). The tender stems are eaten.

Marsdenia suaveolens: N.S.W.; endemic in Australia (Jacobs & Pickard, 1981; Beadle *et al.*, 1972). A widespread shrub in heath, but often scrambling in forests. Very little is known of this plant as a food plant–it is mentioned in Rainbow (1907).

Cynanchum carnosum (*Ischnostemma carnosum*): W.A., N.T., Q., N.S.W.; endemic in Australia (Beard, 1970; Jacobs & Pickard, 1981). A climber mainly found along the coast from northern N.S.W. to the Kimberley region in W.A. Occasionally used, originally recorded by Sankowsky (1975).

From this description of the range of food plants it becomes clear that *E. core* will be found mainly in open forest and woodland along the coast and near the edges of rainforest. Inside the rainforest, however, it is rarely seen. Inland the distribution of *E. core* seems limited to areas with vine thickets, which often occur near natural springs, along river courses, in gullies of usually rocky ranges and in sandstone or limestone gorges.

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We would like to thank Dr R.L. Kitching for reviewing this paper. We are also grateful to Dr D. P. A. Sands, Dr R. L. Kitching and C. Hagen for bringing the additional food plant records to our attention and the Queensland Herbarium for supplying information regarding some food plant distributions.

References

Atkins, A. F., 1975. Larval foodplants of some Queensland butterflies. *News. Bull. ent. Soc. Qd* 3: 117-119.

Bailey, F. M., 1900. *The Queensland flora.* Part III. H. J. Diddams, Brisbane.

Beadle, N. C. W., Evans, O. D. and Carolin, R. C., 1972. *Flora of the Sydney region.* A. H. and A. W. Reed, Sydney.

Beard, J. S. (Ed.), 1970. *West Australian plants.* 2nd edition, Society for growing Australian Plants, Sydney.

Black, J. M., 1965. *Flora of South Australia.* Part IV. 2nd edition. AGPS, Adelaide.

Black, J. M., 1977. *Flora of South Australia.* Part II. 2nd edition. AGPS, Adelaide.

Blackall, W. E. and Grieve, B. J., 1974. *How to know Western Australian wildflowers.* Parts I, II, III. University of Western Australia Press, Perth.

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Angus and Robertson, Sydney.

Edwards, E. O., 1948. Notes on butterflies of western Queensland. *Aust. Zool.* 11: 225-232.

Ewart, A. J., 1930. *Flora of Victoria.* AGPS, Melbourne.

Ewart, A. J. and Davies, O. B., 1917. *The flora of the Northern Territory.* McCarron, Bird, Melbourne.

Jacobs, S. W. and Pickard, J., 1981. *Plants of New South Wales.* AGPS, Sydney.

Jessop, J. P., (Ed.), 1981. *Flora of Central Australia.* A. H. and A. W. Reed, Sydney.

Jones, D.L. and Gray, B., 1977. *Australian climbing plants.* A.H. and A.W. Reed, Sydney.

Kitching, R. L. and Zalucki, M. P., 1983. A cautionary note on the use of oviposition records as larval food plant records. *Aust. ent. Mag.* 10: 64-66.

Kitching, R.L., Edwards, E.D., Ferguson, D., Fletcher, M.B. and Walker, J.M., 1978. The butterflies of the Australian Capital Territory. *J. Aust. ent. Soc.* 17: 125-133.

Kleinschmidt, H. E. and Johnson, R. W., 1979. *Weeds of Queensland.* S. R. Hampson, AGPS, Brisbane.

Rahman, H. U., Zalucki, M. P. and Scheermeyer, E., 1984. The effect of host plant on the development and survival of the immature stages of *Euploea core corinna* (Lepidoptera: Nymphalidae). *J. Aust. ent. Soc.* (in press).

Rainbow, W. J., 1907. *A guide to the study of Australian butterflies.* T. C. Lothian, Melbourne.

Sankowsky, G., 1975. Some new food plants for various Queensland butterflies. *Aust. ent. Mag.* 2: 55-56.

Sankowsky, G., 1978. Some new food plants for various Queensland butterflies. *Aust. ent. Mag.* 5: 77-79.

Williams, K. A. W., 1979. *Native plants of Queensland.* Private publication, Brisbane.

Willis, J. H., 1972. *A handbook to plants in Victoria.* Vol. 2. Melb. Univ. Press, Carlton.

Aust. ent. Mag. 11(6), January, 1985

MIGRATION RECORDS IN AUSTRALIA: 5
LYCAENIDAE AND NYMPHALINAE (LEPIDOPTERA)

By C. N. Smithers
The Australian Museum, 6-8 College St., Sydney, N.S.W. 2000

Abstract

Of 134 Australian species of Lycaenidae four have been reported as migrants and of 28 species of Nymphalinae five are considered confirmed or possible migrants. New migration data on species in these groups and a summary of published records are given.

Introduction

This paper presents new migration data on species of Lycaenidae and Nymphalinae in Australia. Previously, similar records have been published on Hesperiidae and Papilionidae (Smithers, 1978), Danainae and Acraeinae (Smithers, 1983) and Pieridae other than *Anaphaeis java teutonia* (Fabricius) (Smithers, 1983a). Of the 134 species of Lycaenidae in Australia only four have been suggested as migrants. Of the 28 species of Nymphalinae recorded for the continent five have been confirmed as, or are suspected of being, migrants.

Lycaenidae

Lampides boeticus (L.)

This species was recorded on Erskine Island, Capricorn Group, from 13-23rd May 1970 (Reeves, 1971). Its presence on an island reported to be devoid of suitable larval food plants implies immigration of adults. *L. boeticus* was collected in the Great Australian Bight, 320 km from land, on board m.v. *Iron Cavalier* on 8th March 1969 (obs. L. G. Packman). Other insects were observed and collected at the same time (Smithers, 1970). It was seen moving south in August and September 1974 at Mt Tamborine, Queensland (Moulds, 1976). These records suggest that long distance flights may be a frequent occurrence for the species in Australia. It is known to be a migrant in other parts of its range such as India and Europe.

Zizina labradus (Godart)

Apart from the conspicuous SW migration observed in January, 1963 between Milthorpe and Blayney, New South Wales, (Smithers, 1963) few additional observations have been reported. Many specimens were seen moving N at Ryde, Sydney, on 28th November, 1966 (obs. J. V. Peters), an invasion was reported for Heron Island, Queensland, in January 1971 (Fletcher, 1973) and very strong N movement (against a strong wind) was seen from Cobar to 100 km W of Cobar on 12th October, 1977 (obs. C. N. and A. S. Smithers).

Theclinesthes onycha onycha (Hew.)

This species was seen on Erskine Island, Capricorn Group, from 22nd-23rd May 1970 (Reeves, 1971); the comment under *L. boeticus* above applies here.

Narathura araxes eupolis (Miskin)

Moulds (1976) records migration of this species in a SSE direction at Lloyd Bay (25.ix.1974) and Restoration Bay (13.x.1974) Queensland.

Nymphalidae

Nymphalinae

Hypolimnas bolina nerina (F.)

Although this species occasionally appears in New Zealand (Hudson 1928, 1950; Gibbs 1961; Holloway 1954, 1962; Fox 1978) and is sometimes seen in numbers well south of its normal range there does not appear to be any record of extensive unidirectional flight. Ramsay and Ordish (1966) have a full account of New Zealand records. Moulds (1963) and Peters (1963) record specimens seen in Sydney during January and February 1962 and Moulds (1964) records specimens in the same area during January, February and March 1963. Rose (1972) mentions specimens in Kuring-gai Chase National Park, near Sydney, in February and March 1971. During the same period specimens were seen in various areas near Sydney (obs. J. V. Peters, C. Trickett, L. C. Haines, M. Lovell, G. F. Smithers) and it was reported as common at Maitland (obs. A. D'Ombrain). At Orange (obs. M. S. Moulds) it was common from 20th-27th January.

Movement patterns of this species appear to be very similar to those of *Euploea core* and it is interesting that the extensive southerly invasion of 1971 coincided with an invasion of *Danaus hamatus hamatus* (W. S. Macleay) (Smithers, 1983).

Hypolimnas missipus (L.)

This species occasionally appears in coastal New South Wales well south of its normal range but there are no reports of obvious unidirectional flights. There is one published record (Evans 1977) of this species appearing on Norfolk Island. It is not known whether it is established there.

Junonia villida calybe (Godt.)

Hudson (1928, 1939), Holloway (1954), Gibbs (1961) and Fox (1978) refer to appearances of this species in New Zealand and Williams (1920, 1939) refers to it as a migrant and gives details of a northerly movement in the early morning off Port Pirie, South Australia, on 12th March 1939. K. A. Williams (1968) reported northerly movements from Gosford to Port Macquarie, N.S.W., on 10th and 11th November, 1966 at which time Gall (1966) reported immense westerly migrations at Stradbroke Island and Shore Bay, Queensland. Table 1 shows that movement was evident at that time at least as far south as Sydney. Hembrow (1968, 1974) reported a north-westerly movement in the Belmont-Ipswich-Tamborine area in November 1966 and a northerly movement in Brisbane in November 1973.

Table I gives recent significant records of movements. In 1966 there were clearly large scale movements extending from Sydney to Queensland, varying from west to north during the second half of October and into November. In 1967 a mainly north-westerly movement was noted in Queensland from late September to early November. In 1968 a small westerly or south-westerly movement seems to have taken place at least in northern New South Wales and south-eastern Queensland during October and November. Records for 1969 and 1970 are few but in April and October westerly and south-south-westerly movements were seen in Sydney in 1969 and a single observation of a north-north-westerly movement was made for April 1970. There are no reports from then until 1977 when a spectacular migration to the north or north-west over a period of two weeks in April was seen about 50 km north of Singleton. A similarly spectacular movement was observed at the same place from late March to late April 1980 and again in April 1981.

TABLE 1
Summary of new migration records of *Junonia villida*

Locality	Date	Direction	Observer
Sydney, N.S.W.	22.x.66	NW 1/min/20m	A. S. and C. N. Smithers
Mt. Tamborine, Q.	12.xi.66	WNW	M. S. Upton
Edungalba, Q.	27.ix.-16.xi.67 (peak 9.xi.67)	NW (sometimes NE or W)	E. Adams
Gold Coast - Yatala, Q.	8.x.68	SW	A. Bird
Sawtell, N.S.W.	18.xi.68	W (from sea)	P. Wilson
Sydney, N.S.W.	12.iv.69	W 23/min	M. Gray and R. Jeffery
Sydney, N.S.W.	15.x.69	SSW 12-15/min/30m	J. V. Peters and R. Jeffery
Wallacia, N.S.W.	4.iv.70	NNW 10/min/50m	J. V. Peters
48km N Singleton, N.S.W.	12.iv.77	NW 10/min/20m	C. N. Smithers
48km N Singleton N.S.W.	16-17.iv.77	N 5/min/20m	C. N. Smithers
48km N Singleton N.S.W.	23-25.iv.77	NW 1-2/min/20m	C. N. Smithers
48km N Singleton N.S.W.	22.iii.80	NW 1-15/min/20m	C. N. Smithers
48km N Singleton N.S.W.	5-6.iv.80	NW 100/15min/20m	C. N. Smithers
48km N Singleton N.S.W.	12.iv.80	NW 100/15min/20m	C. N. Smithers
48km N Singleton N.S.W.	27.iv.80	NNW 10/min/20m	C. N. Smithers
48km N Singleton N.S.W.	5.iv.81	N 1/min/20m	C. N. Smithers
48km N Singleton N.S.W.	17-20.iv.81 (movement ceased by 25.iv.81)	N 10/min/20m	C. N. Smithers

In 1981 the movement continued until 20th April but was no longer in evidence when the area was visited again on the 25th.

There is some variation in time of year at which major movements take place in this species; these can be summarized as follows:

1966. – late October - early November.
1967. – October - early November.
1968. – October - November.
1969. – April. October.
1970. – April.
1977. – April.
1980. – March - April.
1981. – April.

Smithers (1969) has reported variation in times of movement for *Vanessa kershawi* (McCoy). The variation does not coincide from year to year in the two species. There is less data for *J. villida* than *V. kershawi* but clearly the former is a species which warrants further study in eastern Australia.

There emerges from the data so far available a clear indication of time periods in the year when obvious population movements can be expected, an October/November period and an April period. The records show predominently northerly movements for both periods with occasional records for other directions. These are mainly for coastal localities and might well represent local variations in directions. Detailed observations over a small area during heavy migration need to be made to establish whether this is so.

Vanessa kershawi (McCoy)

Smithers and Peters (1966) and Smithers (1969) provide accounts of migrations of *V. kershawi* in eastern Australia from 1963-1968 and summarize the earlier literature on its movements. Smithers (1974) reported on its movement in Western Australia in 1973. Between the spring of 1969 and mid September 1981 more than 230 observations on movements have been recorded in eastern Australia. It is not practicable to provide full details of these observations in table form similar to those for other species but a summary is presented here; details of the original data are filed in the Australian Museum.

Perusal of the data shows that periods of population movement can be distinguished and these are recorded here as separate movements, the data pertaining to a particular movement being covered by a general statement on its extent, direction and period in chronological order.

1969. 1-9 September.–Small SW, SSW migration at Turramurra, N.S.W.

1970. February-March.–Large numbers seen in Dandenong area, Victoria; with movement from there to N. N movement seen in Sydney at the same time.

1971. September-October.–Erratic, small scale S, SW and W movements over wide area from Victoria to Queensland. At no time were populations high and movements lasted for a few days only in each area.

1972. Early October.–Light migrations to SW, W, Sydney, N.S.W.

1973. Mid-August-and October.–Large migrations SW, W in many localities from Victoria to as far north as 48 km N of Singleton, N.S.W. and from coast to as far inland as Bathurst. These migrations were taking place at the time of the Western Australian migrations reported by Smithers (1974).

1974. End September-mid October.–Light S, SW movements recorded 48 km N of Singleton, N.S.W., Sydney and 27 km N of Albury.

1978. 5 March.–Large influx and N movement. Engadine, nr. Sydney.
8-18 November.–Large scale movements S, SW, WSW from Cowra, Bathurst, Wagga Wagga, Sydney.

1979. 18 August-8 September.–Large scale movements S, SW, W recorded 48 km N of Singleton, N.S.W. and Sydney.

1981. 21 April.–Heavy migrations N 48 km N of Singleton, N.S.W.
11-13 September.–Strong migrations SE, 48 km N of Singleton, N.S.W.

These records show that the main movements in *V. kershawi* can be expected in a S, SW or SSW direction over a period of weeks at some time from mid August to late November. The flights do not occupy the whole of this period between these extremes. This confirms the general conclusions reached on the basis of earlier data (Smithers, 1969). The new data also shows that in the February-March-April period there are less conspicuous, possibly shorter, periods of migration activity, with the movement predominantly northerly. This is suggested by the observations in 1970, 1978 and 1981. The 1970 records, from the Dandenongs, Victoria (obs. A. M. D. Riddell) is particularly interesting as it suggests that the actual beginning of the movement was observed. There were large numbers seen "assembling in a forest". A few days later they were seen taking off in groups in a northerly direction. At about the same time northerly movements were recorded in Sydney. Gibbs (1969) and Fox (1978) recorded occurrence of *V. kershawi* in New Zealand in September-November 1968 at a time when major flights were seen in eastern Australia (Smithers, 1969). It seems, therefore, that there is an established and observable pattern, in this species, of two-way migration towards southern areas in spring and early summer and away from them in autumn.

Vanessa itea (F.)

Seitz (1890) records *Vanessa itea* as flying out to sea and although it is generally thought of as a migrant species there are remarkably few observations recorded. This may be due to the fact that the moving populations are usually small and migrations are not obvious. Records of migration for *V. itea* are summarized in Table 2.

Although there are so few detailed records for this species it seems that there is usually a southerly or westerly movement between September and November. The records for March 1963 and January 1964 for Broken Bay and Kariong and for April 1981 for north of Singleton are interesting in that they indicate a return movement (as the Dandenong record does for *V. kershawi* above). Occasional specimens of *V. itea* are often seen amongst moving populations of *V. kershawi* and the two species have a very similar migration pattern. Also, all of the records for *V. itea* of which details are known occurred within or very close to periods during which *V. kershawi* migrations have been reported although their directions of flight do not always correspond, e.g. when *V. kershawi* was recorded as flying N (21.iv.1981) *V. itea* was flying to the NW at the same locality. It is interesting to note that at the same time and place *J. villida* was also migrating N in large numbers.

TABLE 2
Summary of migration records for *Vanessa itea*

Locality	Date	Direction	Observer
At sea, 4.5km off Cronulla, N.S.W.	10.xi.1938	–	D. L. Serventy
Off Montague Is., N.S.W.	1.xi.1939	–	D. L. Serventy
Tambourine Lake, Ulladulla, N.S.W.	4.ix.1963	SSW (many specimens)	I. F. B. Common
8km E Braidwood, N.S.W.	21.x.1951	WSW 4-11/min/250m	I. F. B. Common
Broken Bay,	iii.1963	N	M. Burnell
Kariong, N.S.W.	19.i.1964	NNW	M. Burnell
Sydney (several localities)	22-28.xi.1966	S, W	C. N. Smithers and J. V. Peters
Hunter's Hill N.S.W.	2.x.1967	SSW	J. Hutchinson
Turramurra, N.S.W.	31.viii.1969	SW	C. N. Smithers
Turramurra, N.S.W.	7-9.ix.1969	SW	C. N. Smithers
Ryde, N.S.W.	8.ix.1969	SW	C. N. Smithers
Sydney	26.ix.1973	SW	C. N. Smithers and R. Brewer
48km N Singleton, N.S.W.	30.ix.1973	SW (few, with *V. kershawi*)	C. N. Smithers
Turramurra, N.S.W.	4.x.1973	SSW	C. N. Smithers
Richmond, N.S.W.	4.x.1973	SSW	C. N. Smithers
48km N Singleton, N.S.W.	21.iv.1981	NW	C. N. Smithers

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References

Evans, B., 1977. *Hypolimnas misippus* (L.) and *Euploea core corinna* (W. S. Macleay) (Lepidoptera: Nymphalidae) from Norfolk Island. *Aust. ent. Mag.* 3(6): 106.

Gall, I., 1966. Our butterflies over the ocean. *Courier Mail* 19 Nov. 1966.

Fletcher, B. S., 1973. Observations on a movement of insects at Heron Island, Queensland. *J. Aust. ent. Soc.* 12: 157-160.

Fox, K. J., 1978. The transoceanic migration of Lepidoptera to New Zealand–a history and a hypothesis on colonisation. *N.Z. Ent.* 6: 368-380.

Gibbs, G. W., 1961. New Zealand butterflies. *Tuatara* 9: 65-76, 2 pls.

Gibbs, G. W., 1969. A large migration of the Australian Painted Lady Butterfly *Vanessa kershawi* (McCoy) in New Zealand. *N.Z. Ent.* 4(2): 14-21.

Hembrow, C. R., 1966. Report on butterfly migration 13th November 1966. *Qd Nat.* 18(5 & 6): 115.

Hembrow, C. R., 1974. Butterfly migration. *Q.N.C. News* 62: 7.

Holloway, B. A., 1954. Notes on Lepidoptera. *N.Z. Ent.* 1(4): 13-14.

Holloway, B. A., 1962. *Melanitis leda* (Linn.) and other migrant butterflies in New Zealand during 1962. *Rec. Dominion Mus.* 4(8): 79-82.

Hudson, G. V., 1898. *Moths and butterflies of New Zealand.* Wellington. i-xix, 144 pp.

Hudson, G. V., 1928. *The butterflies and moths of New Zealand.* Wellington. i-xi, 386 pp.

Hudson, G. V., 1939. *A supplement to the butterflies and moths of New Zealand.* Wellington. pp. 385-481, pls LIII-LXII.

Hudson, G. V., 1950. *Fragments of New Zealand Entomology.* Wellington. 188 pp. 19pls.

Moulds, M. S., 1963. Records of northern butterflies in the Sydney district. *Commun. R. zool. Soc. Ent. Sect.* 17: 36-38.

Moulds, M. S., 1964. Records of northern butterflies in the Sydney district. *Commun. R. zool. Soc. Ent. Sect.* 23: 63-67.

Moulds, M. S., 1976. Migration of *Narathura araxes eupolis* (Lepidoptera: Lycaenidae) across Lloyd Bay, Cape York Peninsula. *Aust. ent. Mag.* 2(6): 130-132, 1 fig.

Ramsay, G. W. and Ordish, R. G., 1966. The Australian blue moon butterfly *Hypolimnas bolina nerina* (F.) in New Zealand. *N.Z. J. Sci.* 9(3): 719-729.

Reeves, D. M., 1971. Notes on some butterflies from Erskine Island. *Qd Nat.* 20(1-3): 54-55.

Rose, A. B., 1972. Additional records of butterflies from Kuring-gai Chase National Park, New South Wales. *Aust. ent. Mag.* 1(2): 5-6.

Seitz, A., 1890. Algemeine Biologie der Schmetterlinge. I Theil. *Zool. Jb. Abt. Syst.* 5: 281-343.

Smithers, C. N., 1963. A migration of *Zizeeria labradus. Commun. R. zool. Soc. ent. Sect.* 17: 36.

Smithers, C. N., 1969. A note on migration of *Vanessa kershawi* (McCoy) (Lepidoptera: Nymphalidae) in Australia. 1963-1968. *Aust. Zool.* 15: 188-194.

Smithers, C. N., 1970. Migration records in Australia. 1. Homoptera, Coleoptera, Diptera and Hymenoptera. *Aust. Zool.* 15: 380-382.

Smithers, C. N., 1974. A migration of *Vanessa kershawi* (McCoy) (Lepidoptera: Nymphalidae) in Western Australia. *West. Aust. Nat.* 13(1): 16.

Smithers, C. N., 1978. Migration records in Australia. 2. Hesperiidae and Papilionidae (Lepidoptera). *Aust. ent. Mag.* 5(1): 11-14.

Smithers, C. N., 1983. Migration records in Australia. 3. Danainae and Acraeinae (Lepidoptera: Nymphalidae). *Aust. ent. Mag.* 10(2,3): 21-27.

Smithers, C. N., 1983a. Migration records in Australia. 4. Pieridae other than *Anaphaeis java teutonia* (Fab.) (Lepidoptera). *Aust. ent. Mag.* 10(4): 47-54.

Smithers, C. N. and Peters, J. V., 1966. A migration of *Vanessa kershawi* (McCoy) in Australia. *J. ent. Soc. Qd* 5: 67-69.

Williams, C. B., 1930. *The migration of butterflies.* London. i-xii, 473 pp.

Williams, C. B., 1939. Some butterfly migrations in Europe, Asia and Australia. *Proc. R. ent. Soc. Lond.* (A) 14: 131-137.

Williams, K. A. W., 1968. Migration of Caper White butterfly in November, 1966. *Qd Nat.* 18(5 & 6): 113-115.

ERRONEOUS RECORD OF THE FAMILY PELECINIDAE (HYMENOPTERA: PROCTOTRUPOIDEA) FROM AUSTRALIA

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Abstract

The published record of *Pelecinus* Latreille from Australia is shown to be based upon a specimen bearing incorrect locality data.

The family Pelecinidae comprises one extant genus, *Pelecinus* Latreille, which includes one described species, *Pelecinus polyturator* (Drury), and several undescribed species (Johnson 1982). *P. polyturator* is a parasitoid of soil-dwelling scarabaeid beetle larvae. All species are between three and six centimetres in total length and the slow-flying females are particularly conspicuous. Pelecinidae have been recorded incontrovertibly only from the Nearctic and Neotropical regions (Muesebeck 1979, Johnson 1982) and Riek's (1970) record from the Northern Territory of Australia of "an introduced species" has remained unverified.

The family may have very ancient origins and might have had a much wider geographical distribution in Mesozoic and Tertiary times (Kozlov 1974). This raises the question of the possible relict nature of the reported distribution of modern Pelecinidae.

Riek (pers. comm.) based his record of Pelecinidae from Australia on a specimen in the collection of A. N. Burns, formerly Curator of Entomology of the National Museum of Victoria (NMV), Melbourne. In January, 1983, I examined in the NMV two damaged females of *P. polyturator.* Their state and manner of preservation indicate that they were prepared initially by the same hand and are of similar age. One specimen, on a black pin and lacking the metasoma, bears an old, yellowed label on which is written in an unrecognised hand: "Palmyra, N.J. VIII–25.27". Palmyra (40.00N, 75.01W) is a locality in New Jersey (N.J.), U.S.A. The second specimen, remounted on a stainless steel pin and with three metasomal segments intact, bears a large, more modern label on which is written in A. N. Burns' hand: "Palmyra, N.T. 8–25.27". The specimen also bears a small printed label: "Collection A. N. Burns." Clearly, in preparing the label for the second specimen Burns erroneously transcribed "N.J." as "N.T." which is the standard abbreviation for the Northern Territory. There is nothing to suggest that either specimen originates from Palmyra (32.03S, 115.44E), Western Australia (W.A.), which is the only Australian locality known to bear this name (*teste* Division of National Mapping). The incorrectly relabelled specimen is almost certainly the basis for Riek's record of the Pelecinidae from Australia. No specimens of Pelecinidae are known from any other collections of Australian Hymenoptera (Naumann, unpub.) and thus, there is no evidence that the family occurs in Australia or has been introduced on any occasion.

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References

Johnson, N. F., 1982. Pelecinidae. In S. P. Parker ed. *Synopsis and classification of living organisms.* McGraw Hill Book Company, New York. 661 pp.

Kozlov, M. A., 1974. An early Cretaceous ichneumon of the family Pelecinidae (Hymenoptera, Pelecinoidea). *Paleontological Journal* 8: 136-138.

Muesebeck, C. F. W., 1979. Superfamily Pelecinoidea. In K. V. Krombein, P. D. Hurd, Jr., D. R. Smith and B. D. Burks ed. *Catalogue of Hymenoptera of America north of Mexico.* Vol. 1. Smithsonian Institution Press, Washington, D. C. 1119-1120.

Riek, E. F., 1970. Hymenoptera. Chapter 37 in *The insects of Australia.* Melbourne University Press, Melbourne. Pp. 867-959.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

ATKINS, Andrew

1979. Report from England. *Victorian Ent.* 9(6): 60-64.
Lepidoptera: some Australian butterflies briefly mentioned.

AUSTIN, A. D.

1981. *Hickmanella*, a new genus of Scelionidae from Australia (Hymenoptera: Proctotrupoidea). *J. Aust. ent. Soc.* 20(4): 303-308, text-figs 1-13.

BRIESE, D. T.

1981. The incidence of parasitism and disease in field populations of the potato moth *Phthorimaea operculella* (Zeller) in Australia. *J. Aust. ent. Soc.* 20(4): 319-326, tables 1-4, text-figs 1-4.

BROOKS, George

OBITUARY. *News Bull. Aust. ent. Soc.* 11(4): 75-76.

BROOKS, John Taylor

OBITUARY. *News Bull. ent. Soc. Qd* 7(6): 81-83.

BRUNET, B. L.

1981. Some observations of the north Queensland stag beetle Lucanidae. *N. Qd Nat.* 45(No. 178): 12-13, illustr.
Coleoptera: *Palacrognathus muelleri*

CANTRELL, B. K.

1979. Notes on some Diptera attracted to blossom of *Buckinghamia celsissima* F. Muell. *News Bull. ent. Soc. Qd* 7(6): 83-84.

1981. The immature stages of some Australian Sarcophaginae (Diptera: Sarcophagidae). *J. Aust. ent. Soc.* 20(3): 237-248, text-figs 1-54.

COOK, I. M. and SPAIN, A. V.

1982. The effects of temperature and moisture on survival of the immature stages of the buffalo fly, *Haematobia irritans exigua* de Meijere (Diptera: Muscidae). *Aust. J. Zool.* 30(6): 923-930, table 1, text-figs 1-4.

DAVIES, Margaret, TYLER, M. J. and MARTIN, A. A.

1979. Frogs preyed on by ants? *Victorian Nat.* 96(3): 97.
Hymenoptera: *Oecophylla smaragdina*

DOMROW, Robert

1980. The genus *Raillietia* Trouessart in Australia (Acari: Dermanyssidae). *Proc. Linn. Soc. N.S.W.* 104(3): 183-193, text-figs 1-28.

DUNN, K. L.

1979. A collecting trip to north Queensland. [Continued.] *Victorian Ent.* 9(4): 44 and 9(5): 56.

1982. A collecting trip to Maryborough, Queensland. *Victorian Ent.* 12(1): 2-5.
Lepidoptera: many species mentioned

1982. A visit to south eastern Queensland and coastal New South Wales. *Victorian Ent.* 12(2): 13-17.
Lepidoptera: several butterfly species mentioned

1983. A record of audible pupal stridulation for a species of the genus *Hypochrysops* C. & R. Felder (Lepidoptera: Lycaenidae). *Victorian Ent.* 13(2): 13-14.

1983. An inland distribution record for *Ogyris abrota* Westwood in Victoria (Lepidoptera: Lycaenidae). *Victorian Ent.* 13(2): 16-17.

1983. An additional note on *Theclinestes miskini miskini* (T. P. Lucas) (Lepidoptera: Lycaenidae) from the You Yangs, Victoria. *Victorian Ent.* 13(4): 44.

1984. *Acacia diffusa* Lindl.–a new larval foodplant for *Jalmenus evagoras evagoras* (Donovan) (Lepidoptera: Lycaenidae). *Victorian Ent.* 14(1): 8.

HOLMES, David R.

1981. Summer collecting at Bermagui, New South Wales. *Victorian Ent.* 11(3): 28-29.
Lepidoptera: many species mentioned

HORRIDGE, G. A.

1977. Insects which turn and look. *Endeavour* (n.s.)1(1): 7-17, text-figs 1-20.
Diptera, Odonata, Hymenoptera, Orthoptera, Mantodea

JAHNKE, Barry

1982. Gregarious moths. *QNC News.* (Newsl. Qd Nat. Club) 131: 7-8.
Lepidoptera: Gelichiidae: *Dichomeris capnites*

JAMES, D. G.

1982. Ovarian dormancy in *Danaus plexippus* (L.) (Lepidoptera: Nymphalidae)—oligopause not diapause. *J. Aust. ent. Soc.* 21(1): 31-35, tables 1-3.

JOHNSON, Dorothy

1981. Observations from roadside collecting. *Victorian Ent.* 11(3): 26-27.
Coleoptera: *Leptoplus duponti*

JOHNSON, S. S.

1982. A collecting trip to Tathra. *Victorian Ent.* 12(4): 38-39.
Lepidoptera: several butterfly species mentioned

KEALL, J. B.

1980. Some ants recently intercepted entering New Zealand (Hymenoptera: Formicidae). *N.Z. Ent.* 7(2): 119-122, text-figs 1-6.

KEALL, J. B. and SOMERFIELD, K. G.

1980. The Australian ant *Iridomyrmex darwinianus* established in New Zealand (Hymenoptera: Formicidae). *N.Z. Ent.* 7(2): 123-127, text-figs 1-4.

KELLY, Peter G.

1982. A brief history of the paropsines (Coleoptera: Chrysomelidae). *Victorian Ent.* 12(4): 39-40.

KIKKAWA, J., WEBB, L. J., DALE, M. B., MONTEITH, G. B., TRACEY, J. G. and WILLIAMS, W. T.

1981. Gradients and boundaries of monsoon forests in Australia. *Proc. ecol. Soc. Aust.* 11: 39-52, tables 1-2, text-figs 1-6.
Lepidoptera: butterflies

LAWRENCE, John F.

1981. Notes on larval Lucanidae (Coleoptera). *J. Aust. ent. Soc.* 20(3): 213-219, text-figs 1-10.

LYNDON, Ellen

1983. About ants. *Latrobe Valley Nat.* 231: 5.
Hymenoptera: *Athanogaster longiceps nystalomyrma*

WALKER, K. L.

1982. Some aspect of the native Australian bee fauna. *Victorian Ent.* 12(3): 26-30, table 1, text-figs 1-6.

WALTER, Ruth

1978. A cicada reply! *Darling Downs Nat.* 1(1): 8.
Cicadidae: populat style notes

WARD, Philip S. and TAYLOR, Robert W.

1981. Allozyme variation, colony structure and genetic relatedness in the primitive ant *Nothomyrmecia macrops* Clark (Hymenoptera: Formicidae). *J. Aust. ent. Soc.* 20(3): 177-183, tables 1-4, text-figs 1 & 2.

WILSON, L. T. and ROOM, P. M.

1982. The relative efficiency and reliability of three methods for sampling arthropods in Australian cotton fields. *J. Aust. ent. Soc.* 21(3): 175-181, tables 1-5.
Lists species of Lepidoptera, Thysanoptera, Hemiptera, Neuroptera, Coleoptera, Araneida.

WILSON, W. J.

1982. Notes on life histories of some Queensland butterflies. *Circ. ent. Sect. R. Zool. Soc. N.S.W.* 21: 1-2. [Cyclostyled, foolscap]

ZWICK, P.

1981. Australian *Edwardsina* (Diptera: Blephariceridae), new and rediscovered species. *Aquatic Insects* 3: 75-78.

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CONTENTS

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A guide to the
BEETLES OF SOUTH-EASTERN AUSTRALIA

by

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B.Sc., Ph.D., D.Phil.

Fascicle No. 6

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Family HYDROPHILIDAE
(Scavenger Water Beetles)

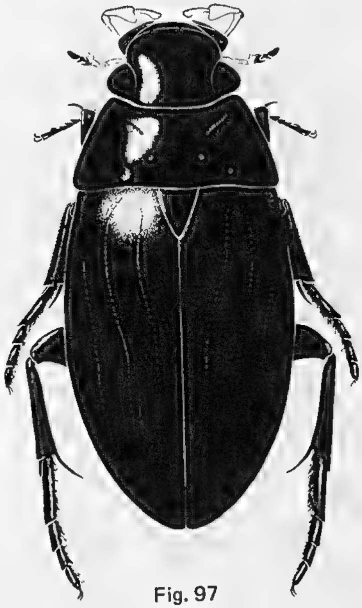


Fig. 97
Hydrophilus latipalpus Cast.

Tarsal formula: 5-5-5

Antennae: short, loosely clavate

Convex, oval species, variable in size (2-40 mm in the local area) and drab in colour; maxillary palpi long and usually filiform; antennae short, with a loose and asymmetric club; middle and hind legs more or less modified for swimming in most species. Larvae campodeiform, with short, 4-segmented thoracic legs and often abdominal prolegs; urogomphi short.

Although resembling, superficially, the Dytiscidae, aquatic Hydrophilidae are more convex and are readily distinguished by their longer maxillary palpi and much shorter, clubbed antennae. They are also inferior swimmers that stroke the legs alternately. The adults feed, at least in part, on vegetable matter but the larvae are believed to be exclusively predacious. Some of the species are entirely terrestrial but little is known about life histories. However, Anderson (1976) reared four of the aquatic species.

Hydrophilus (*Hydrous*) *latipalpus* Cast. (Fig. 97) is our finest species; it is a shiny ebony-black beetle about 40 mm long and sharply keeled beneath the entire thorax; the second segment of the maxillary palpi is triangularly expanded. The smaller *albipes* Cast. (25-30 mm) is similar but the palpi are unmodified; both live in slow-flowing or stagnant waters, where submerged weeds abound, and they frequently fly at night. Species of *Sternolophus* are much smaller (11-14 mm) but otherwise similar in form and habits. *Berosus* includes about six species in the south-eastern States; these are generally rather pallid beetles but darker varieties of all of them are known. They are very weak swimmers that spend much of their time crawling over submerged vegetation. *B. australiae* Muls. (5-8 mm) (Fig. 92), is light brown, often with obscure darker marks (or sometimes entirely dark) and is known from Victoria and New South Wales. The larvae of this genus are unusual in possessing long, lateral, abdominal gills.

Among the terrestrial species may be mentioned *Sphaeridium discolor* d'Orchymont (6-7.5 mm), black, elytra with a broad, pale apical band, which

Beetles of South-eastern Australia – B. P. Moore
Fascicle 6, pp. 85-100, October, 1984. ISBN 0 909451 15 X

is common in cowdung in the tropical region and is apparently still spreading southwards. This Oriental species evidently became established in northern Australia along with the introduction of water buffalo; subsequently it extended its range to New South Wales with the aid of the cattle industry. *Cercyon haemorrhoidalis* F. (3-3.5 mm), black, elytral apices dull red, is a European species with similar habits that reached this country via the early cattle ships and is now firmly established.

Species of the genus *Psuedohydrobius* are exceptionally pale in colour and have the unusual habit of visiting flowers, especially those of *Leptospermum*; they also fly readily at night. *P. floricola* Blbn (5-7 mm), entirely yellowish brown, occurs in the mountains east of Melbourne, and *P. flavus* Lea (3-4.5 mm), pale straw-yellow, is known from Wollongong, New South Wales to as far north as tropical Queensland.

Family HISTERIDAE

Tarsal formula: 5-5-5

Antennae: short, geniculate, clavate

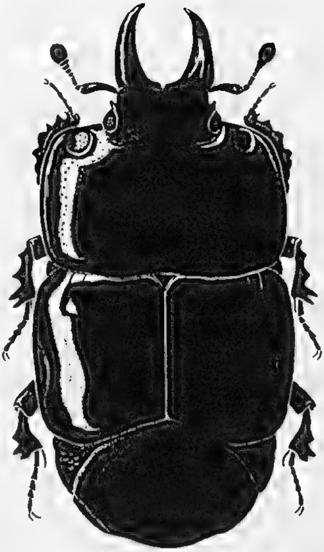


Fig. 98
Hololepta sidnensis Mars.

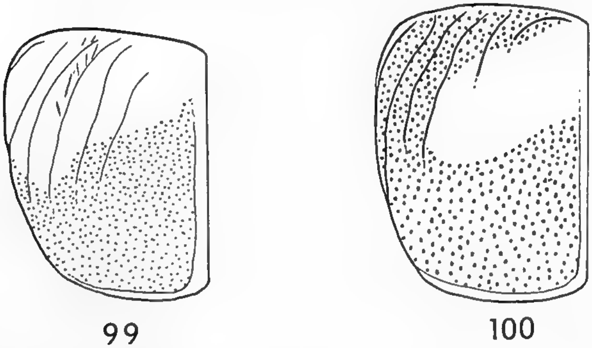
Small to medium sized, compact species, with a hard, polished integument and retractile appendages; fore tibiae usually armed with short spines or teeth; elytra truncate, leaving the apex of the abdomen exposed. Larvae campodeiform, with short 4-segmented legs.

These beetles, which are easily recognised on their general build and appearance, are entirely predacious on the early stages of other insects and are to be found in a wide variety of habitats. The flattened types occur under bark or in rotten trunks and feed mainly on cucujid and other beetle larvae there, whereas the convex species frequent dung, carrion or rotting vegetable matter of various kinds, where they feed upon dipterous maggots. Some highly specialised species, of which the principal genus is *Chlamydopsis* (Fig. 94), spend their whole life-cycle with ants, probably as tolerated guests, since they possess trichomes that produce attractive secretions.

Larval Histeridae are also predacious and occur together with the adults; they are of the campodeiform type and superficially resemble those of Carabidae, but are less mobile; their legs are 4-segmented and there is only one claw to each tarsus.

Species of *Saprinus* are the most commonly observed; these are rotund, brilliantly metallic beetles that occur mainly about carrion. The handsome *S. cyaneus* F. (Pl. II, C) and the very similar *S. pseudocyaneus* White are among the most widespread; they are both about 5 mm long, usually with a bronze pronotum and purplish-blue elytra, and they differ chiefly in the length and development of the elytral striae and in puncturation (Figs 99, 100), In the allied *Saprinodes* the fore tibiae are slender and falciform (hooklike) *S. falcifer* Lewis (3-4 mm) (Fig. 93) being common in carcasses in the drier parts of New South Wales.

Species of *Gnathoncus* may be recognised by the presence of three fine striae on the vertical margins of the elytra (only one to two in the



Figs 99-100. *Saprinus* spp., elytral sculpture. (99) *S. cyaneus* F.; (100) *S. pseudocyaneus* White.

above-mentioned genera). These are small (3.5-4 mm) beetles that occur in dung and carrion in the open and on bat guano in caves. In *G. ripicola* Mars. the elytral subsutural stria is incomplete and in *G. incisus* Er. it is obsolete.

Our only native species of *Hister* (a worldwide genus) is the rather small *walkeri* Lewis (5.5-6 mm), a convex, shining black beetle that is quite common in piles of damp sawdust around coastal timber mills. However, several larger aliens have been introduced in recent years as a control measure for bushfly larvae in cattle dung. Of these *nomas* Er. (6-9 mm) is now well established throughout the coastal districts of New South Wales; it has the propleura glabrous (hirsute in *walkeri*).

Hololepta includes the largest of the flattened forms. *H. sidnensis* Mars. (12-15 mm) (Fig. 98), entirely shining black, with large and prominent, sickle-like jaws, is found in the rotting bases of dead Grass trees (*Xanthorrhoea*) in New South Wales, where it preys on maggots and chafer grubs. *Platysoma* species are somewhat similar but much smaller (3-5 mm) and are found mainly under bark of fallen timber. *Teretrius* and *Teretriosoma* include minute (1.5-2 mm) brownish, cylindrical species with subcortical habits.

Family SILPHIDAE
(Carrion Beetles)

Tarsal formula: 5-5-5

Antennae: short, lightly clavate

Large, flattened, dull reddish-brown and black beetles; elytra prominently ribbed, covering the entire abdomen or leaving the apex exposed. Larvae broadly oval, protected by a complete series of dark, leathery plates (sclerites) (Fig. 85); terminal appendages small.

This important family includes the well known Burying beetles, or Sexton beetles, of the northern hemisphere, but is poorly represented in Australia, with only three species. This evidently reflects the scarcety of natural carrion in this country, before the advent of modern man, and also the dry climate, which renders many carcasses unsuitable through rapid mummification.

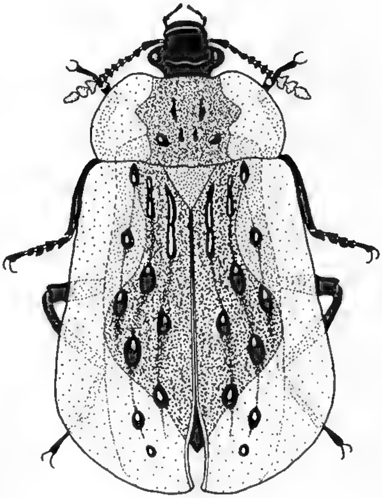


Fig. 101
Ptomaphila lachrymosa Schreib. ♂

Diamesus osculans Vig. (25-45 mm) (Fig. 95), dull black in male, shining in female, elytra obscurely banded with reddish-brown in both sexes, is primarily an Oriental species but is established in tropical Australia and ranges as far south as Canberra in hot, humid summers; it breeds mainly in the larger carcasses of water buffalo and domestic cattle and often comes to light. Size variation is very marked in this species and sexual dimorphism between the larger specimens is quite striking, the males being strongly rugose, whereas females are merely finely punctate. The typical male hind femora are grossly inflated and dentate and the corresponding tibiae are strongly curved (Fig. 103). In small males, however, these parts are less developed and approach the simple form of females (Fig. 102).

Figs 102 - 103. *Diamesus osculans* Vig., left hind legs in ventral view. (102) ♀; (103) major ♂.

Our only endemic species of Siliphidae belong to the genus *Ptomaphila*. *P. lachrymosa* Schreib. (22-26 mm) (Fig. 101), dull black with broad reddish-brown margins, is common in our area and frequently flies to lights at night. The elytra bear three rows of black, tear-shaped tubercles (hence the name *lachrymosa*) and are much broader in the male than in his mate. The slaterlike larva (Fig. 85) is found on carrion that is beginning to dry out. A second, more elongate species, *P. perlata* Kraatz, with reduced elytral tubercles, ranges southward from tropical Queensland and the two congeners apparently coexist in parts of New South Wales. A third species (*P. ovata* Portevin) has been described from New Guinea.

Family SCAPHIDIIDAE

Tarsal formula: 5-5-5

Antennae: slender, loosely clavate

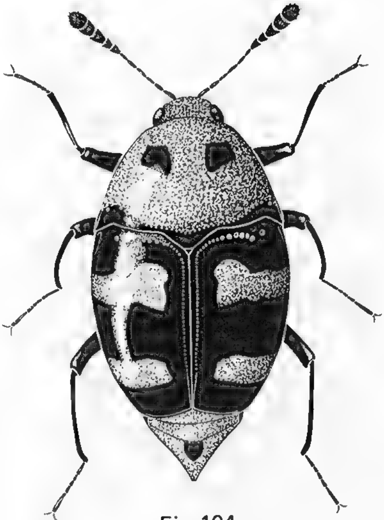


Fig. 104
Scaphidium alpicola Blbn

Very small to small, convex, shining, fusiform (spindle-shaped) beetles; legs slender; elytra truncate, leaving the pointed apex of the abdomen exposed. Larvae also fusiform, with 3-segmented antennae and 2-segmented urogomphi.

The larger species, in particular, are highly characteristic and readily recognised at first sight but some of the smaller ones might be confused with certain Feather-winged beetles (family Ptiliidae, *q.v.*) in which, however, the abdomen is much less sharply tapered and the underwings are widely fringed. Scaphidiids are fungus-feeders, both as adults and larvae, and are therefore restricted to damp, shady places where their food abounds. The family is a small but worldwide one and there are about 40 species in this country, most of them restricted to the coastal forests of the eastern States.

The largest species belong to *Scaphidium*, of which the red and black *alpicola* Blbn (5 mm) (Fig. 104) is probably the best known, locally; it is common in Tasmania and the wetter parts of Victoria and southern New South Wales. *S. distinctum* Achard is very similar but the pronotum is largely, and the pygidium entirely, black. The Australian species of this genus, which differ only in minor characters of coloration and puncturation, have been revised recently by Löbl (1976).

Among the smaller species, those of the genus *Scaphisoma* are by far the most numerous, in the south-eastern States. These beetles are only about 1.5 mm long and have relatively longer antennae than those of *Scaphidium*, with a more open and irregular terminal club, segment 7 being obviously larger than segment 8. The Victorian *Scaphisoma fernshawense* Blbn is mostly light reddish-brown, the elytra with 4 black spots and numerous deep punctures that are quite characteristic; the remaining species, with smooth elytra, are difficult to identify, although they have been revised by Löbl (1977), along with those of other, mostly tropical, genera.

Some specialists now place all of these beetles as a subfamily Scaphidiinae of Staphylinidae.

Family STAPHYLINIDAE
(Rove Beetles)

Tarsal formula: 5-5-5, but reduced in
some small forms

Antennae: filiform to moniliform, sometimes lightly clavate

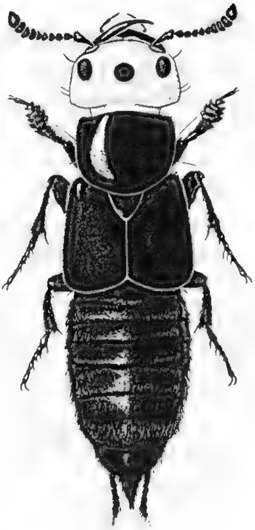


Fig. 105

Creophilus erythrocephalus F.

Very small to moderately large, lithe, elongate beetles, with abbreviated elytra, usually leaving more than half of the abdomen exposed; abdomen flexible, often carried arched over the back; underwings usually fully developed, folded in a complicated way when at rest under the short elytra.

Species of this family are generally readily recognised as such but a few members of other families, where abbreviated elytra also occur, might be confused with them. Pselaphids may be distinguished by their short, immobile abdomen and slow movements, and certain Melyridae with short elytra, that resemble staphylinids rather closely, have a much softer and more pliable integument.

Staphylinids, because of their slender form and short elytra, are not very drought resistant and are thus best represented in the wetter regions of the world, where they are often dominant in the leaf-litter fauna. The Australian species are therefore not numerous by global standards, although many new discoveries are to be expected here. However, the coastal regions of the eastern States form the local headquarters of this distinctive family and some very fine species are to be found there and in the adjacent ranges.

Staphylinid larvae, like the adults, are predacious on other insect larvae and similar soft-bodied arthropods; they are of the campodeiform type and are not unlike the adults in build but of course, lack the large compound eyes, wings and elytra. They may be distinguished from larval carabids by their 4-segmented legs, with a single strong tarsal claw (5-segmented and usually 2-clawed in Carabidae). Staphylinid pupae are usually obtect, unlike those of most other beetles.

Taxonomic relationships within this family are not well understood and the identification of most of the smaller species in any fauna is a matter of considerable difficulty. Only a few of the larger and more conspicuous kinds (most of them members of the subfamily Staphylininae) that occur locally can therefore be considered here.

The local 'Devil's coach-horses' (a picturesque name from English folklore), *Creophilus eyrthrocephalus* F. (Fig. 105) and *C. lanio* Er., are certainly our most conspicuous staphylinids; they are often common about carrion during the summer months, where they feed voraciously on fly maggots that abound in such situations. The two species are very closely related and it is rather surprising that they should occur together; they show about the same size range (15-20 mm) and similar colouring: head bright orange-red with a central black spot; elytra steel-blue; thorax, appendages and hindbody black. However, the spot on the head in *erythrocephalus* is sharply defined and circular, and the terminal abdominal segment is entirely black; in *lanio*, the head-spot is oval and diffuse and the last abdominal segment is partly yellow. The male genitalia also show consistent differences and males may be distinguished from females (as in most staphylinids) by their larger heads.

Unfortunately, the beautiful metallic gold and blue *Actinus* species of New Guinea and tropical Queensland, perhaps the finest of all staphylinids, do not extend to our region but we have several of the related, but less brightly coloured, *Hesperus* species in our wet coastal forests. These are readily recognised by their characteristic build and fast movements, when disturbed. *H. australis* Macl. (12-14 mm) (Fig. 108), metallic bronze, with the tip of the abdomen orange-yellow and the terminal three antennal segments conspicuously pale, may often be found under fallen gum leaves on forest tracks.

Species of *Antimerus* are also fine beetles (up to 22 mm long) that occur under logs, etc., in the wettest forests from the Otway Range in western Victoria to across the Queensland border. In these the head is large in both sexes and the front and middle tarsi are very broad: *A. smaragdinus* Fvl, (Fig. 107) black, foreparts bronze-green or steel-blue, mandibles slender, prothorax semi-circular, abdomen with a median keel above (mountains of Victoria); *A. punctipennis* Lea, black, foreparts bronze, mandibles stouter, prothorax subrectangular, abdomen unkeeled (wet forests of N.S.W. and S. Qd). *Lonia regalis* Oll. (18-20 mm), black, abdomen greenish, is another fine species of the more northern forests of our region. Members of the cosmopolitan genus *Philonthus* often abound in rotting vegetable matter (including garden compost) and may be recognised by the twin series of large punctures on the disc of the prothorax; several of the commonest local species are established aliens (e.g., *politus* L., 9-12 mm, foreparts bronze, 3-4 punctures in each discal series).

Cafius species are mostly mottled with grey pubescence and are found on the sea shore, under seaweed and other jetsam; *pacificus* Er. (*littoralis* Fvl) (8-12 mm), thorax strongly punctured, and *australis* Redt. (11-18 mm) (Fig. 106), thorax almost smooth, are large and common representatives in our area and there are several smaller species.

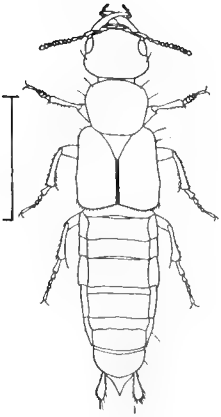
Thyreocephalus (*Eulissus*) includes very elongate, parallel-sided and heavily armoured species that are able to survive in drier habitats such as paddocks and suburban gardens. The largest member of the genus is *chloropterus* Er. (17-23 mm), greenish- or coppery-black, the entire upper surface matt; *erythropterus* Er. (10-14 mm) and *lorquini* Fvl (*rufitarsis* Fvl) (16-18 mm) (Fig. 109) have shining foreparts and light, reddish-brown elytra, whereas *coelestis* Fvl (12-13 mm) and *cyanopterus* Er. (12-14 mm) are the common species with blue elytra. The related *Zeteotomus* (*Metoponcus*) *cyaneus* Macl. (8.5-10 mm) (Fig. 110), also with blue elytra, and a hindbody barred with red and black, occurs mostly under bark of fallen timber.

Among the multitude of smaller staphylinids, the riparian *Paederus* species (Paederinae) are easily recognised by their banded (warning) patterns of orange-red and steel blue. Species that have been investigated chemically, overseas, have been shown to contain a powerful vesicant (paederin) and our members of this worldwide genus may be expected to share this effective means of defence. *P. cruenticollis* Germ. (6-8 mm) (Fig. 111) is the most common, locally, and is often to be seen on damp ground or creek margins, running actively in bright sunshine, with the tail held high in typical staphylinid fashion. Species of the related genus *Ochthephilum* (*Cryptobium*) are also riparian but are less brightly coloured; they may be recognised by their long, slender mandibles and geniculate antennae. *O. mastersi* Macl. (11-13 mm) (Fig. 112), prothorax and apices of elytra reddish-brown, bases of femora light yellow, is the largest and is quite frequent along the Murray-Murrumbidgee river system.

Sartallus signatus Sharp (Oxytelinae) (4.5-5 mm) (Fig. 113), pale yellowish, each elytron with a dark central fleck, occurs on the sea shore, under dead seabirds and other carrion, above highwater mark; it is exceptional in the family in having rather long elytra that cover much of the hindbody.

Stenus (Steninae) is another worldwide genus, whose species are easily recognised by their very large and prominent eyes, rugose sculpture and characteristic, measured gait. When fallen into water, these beetles use the secretion from their anal glands to propel themselves to safety after the manner of the old fashioned, camphor-driven toy boat. *S. maculatus* Macl. (Fig. 114) and *S. pustulifer* Fvl are our largest species (6-8 mm) and are to be found in very wet forests near the east coast; they are very similar, rugose black, with a large yellow spot on each elytron, but the male of *maculatus* has a large tooth on the hind trochanters. The more slender *S. puncticollis* Macl. (4.2-4.4 mm), black, elytra coppery, palpi and femoral bases pale yellow, occurs in marshy places along the Murray and Murrumbidgee rivers. The Australian *Stenus* species have been revised by Puthz (1970).

Figs 106-114. Staphylinidae. (106) *Cafius australis* Redt.; (107) *Antimerus smaragdinus* Fvl; (108) *Hesperus australis* Macl.; (109) *Thyreocephalus lorquini* Fvl; (110) *Zeteotomus cyaneus* Macl.; (111) *Paederus cruenticollis* Germ.; (112) *Ochthephilum mastersi* Macl.; (113) *Sartallus signatus* Sharp; (114) *Stenus maculatus* Macl.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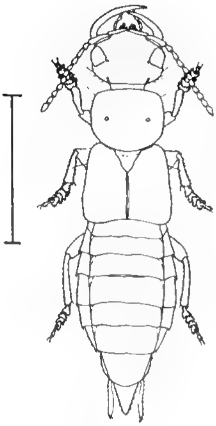
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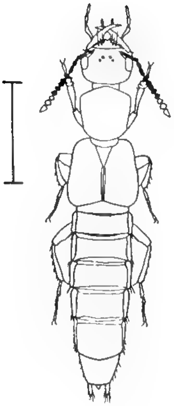
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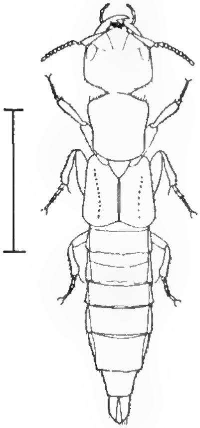
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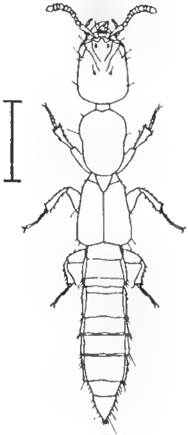
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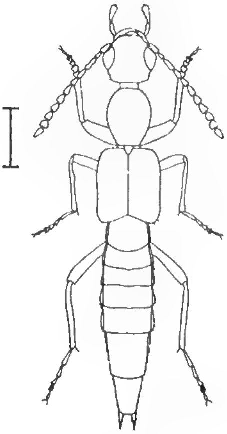
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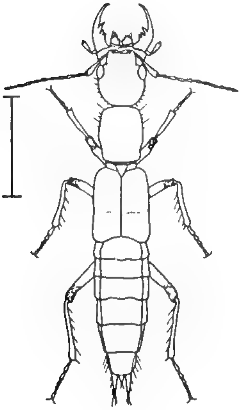
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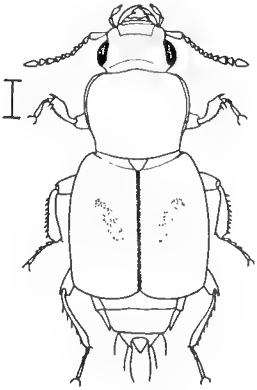
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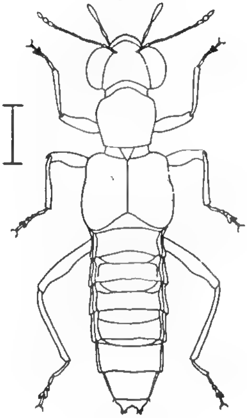
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Family PSELAPHIDAE

Tarsal formula: 3-3-3 (reduced in
myrmecophiles)

Antennae: clavate

Very small to small species with strongly reduced elytra and a short, inflexible abdomen; maxillary palpi usually long.

In appearance, these beetles are generally distinctive, but they may be confused with Scydmaenidae (which, however, have complete elytra) and small Staphylinidae. However, in the latter the abdomen is mobile and the antennae are seldom clubbed. Free-living Pselaphidae are mostly found in very moist habitats, such as moss, leaf litter and rotten fungi, where they prey upon other small creatures, both as larvae and adults. However, a number of highly specialised pselaphids live in the nests of ants or termites, where they are tolerated 'guests'. Most of the latter possess special glands that secrete substances highly attractive to their hosts, which tend them as they do their own brood.

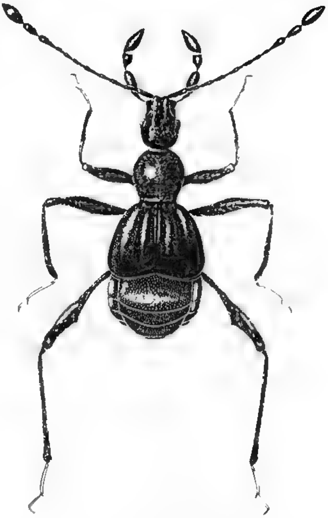


Fig. 115

Tyromorphus speciosus King

Although mostly minute in size, with very limited water reserves, pselaphids fly in immense numbers on suitably warm, humid evenings and are then attracted in droves to electric lights. Our finest species, the all-brown *Tyromorphus speciosus* King (3.5 mm) is, however, flightless; this species (Fig. 115), which is typical of the subfamily Pselaphinae, is widespread in the wet forests of Victoria and New South Wales and is also found occasionally in caves. The bright red *Pselaphus lineatus* King (2 mm) resembles a velvet mite.

The subfamily Clavigerinae contains the myrmecophiles; these are generally blind and pallid beetles, with reduced segmentation in tarsi and antennae. The latter are often highly modified in shape and serve as 'handles' when the beetles are transported by their hosts. At least a dozen species of the genus *Articerus* have been recorded from the south-eastern States. According to Lea (1910), they are found mostly in the nests of smaller ants of the genera *Colobopsis, Crematogaster* and *Iridomyrmex*, but one species (*bipartitus* Raffr.) also occurs with termites.

Family PASSALIDAE
(Bess Beetles)

Tarsal formula: 5-5-5

Antennae: lamellate

Large to very large, elongate, heavily armoured, shining black species, with a pronounced 'waist' between the prothorax and hindbody; antennae curved and folding like a fern frond, but not elbowed; underwings usually fully developed; sexes similar externally; larvae elongate, with only two pairs of well developed legs.

A very uniform family whose members are readily recognised as such, the world over. Most of the species are tropical and only a few reach southern Australia, with just one species in Tasmania.

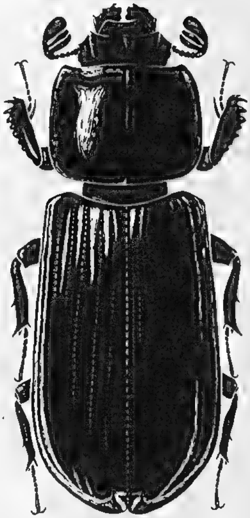
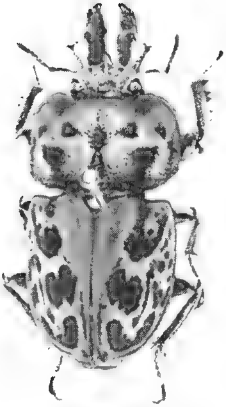


Fig. 116.
Aulacocyclus edentulus Macl.

These beetles feed exclusively on rotten wood and are semi-social, adults and larvae of all stages generally being found together. According to the German entomologist Ohaus, who studied a Brazilian species, the young larvae are unable to masticate the solid wood and are dependent upon the activity of the adults for suitably shredded material. Both larvae and adults stridulate, the former by rubbing their modified and reduced hind legs against a file at the base of the mid-coxae, the latter by scraping the abdomen against the folded underwings. Apparently the sounds produced help to keep the colony together. The larvae are of the scarabaeiform type but are much less curved than the 'curl-grubs' of Stag beetles and chafers.

Mastochilus quaestionis Kuw. (44-51 mm), the largest species in our area, extends only a little south of the Queensalnd border but *Pharochilus dilatatus* Dalm. (30-36 mm) is common in the forests of N.S.W. *P. politus* Burm. (32-35 mm) occurs in similar situations in Victoria and Tasmania. *Analaches australiensis* Stol. (25-30 mm), from N.S.W. and Qd., is an exceptionally flattened form, whereas species of *Aulacocyclus* are markedly cylindrical in shape. The latter may also be recognised by the stout, curved, forward-pointing horn on the head and the mid- and hind tibiae carry a distinct tooth at about the mid-point. *Aulacocyclus edentulus* Macl. (26-31 mm) (Fig. 116) is widespread in the southern mainland States; *A. collaris* Blbn (23-26 mm), smaller and narrower with a shorter horn, is found in Queensland, southwards to about the Blue Mtns.

Dibb (1938) gives a synopsis of the Australian passalid fauna.



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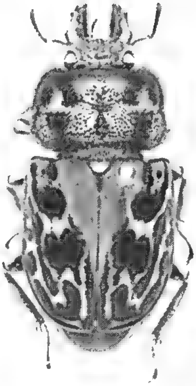

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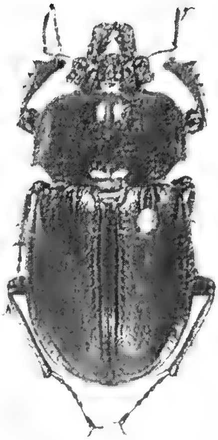

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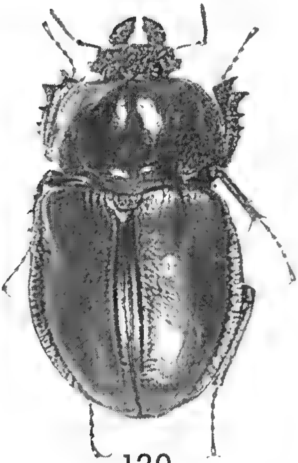

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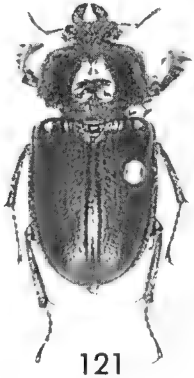

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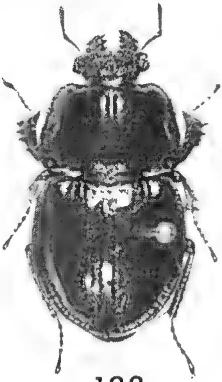

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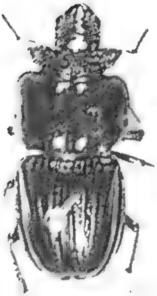

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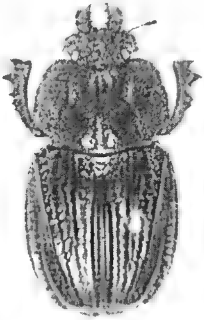

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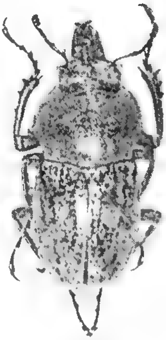

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Family LUCANIDAE
(Stag Beetles)

Tarsal formula: 5-5-5

Antennae: Usually geniculate; apical segments lamellate or serrate

Small to large, heavily armoured species; mandibles often antler-like in males, short and pincer-like in females; fore tibiae dentate; tarsi with a slender, setose process (arolium) between the claws; larvae scarabaeiform, with a vertical anal slit, living in or under rotten wood.


Fig. 126
Ceratognathus niger Westw. ♂

Stag beetles are generally readily recognised by their build and appearance, although the Australian species do not show the fantastic developments of male head and mandibles to be seen in many exotic forms. Probably most adults do not feed but a few species partake of sap, visit flowers or chew young foliage. About a half of our species are flightless and are generally found in or under the fallen timber in which the larvae feed. The family is concentrated in the wetter areas of the continent, with only one or two species extending beyond the 500 mm (20″) isohyet.

The brilliant metallic bronze and green *Phalacrognathus muelleri* Macl., perhaps the finest of all stag beetles, is confined to the rainforest of tropical Queensland, but the related *Lamprima aurata* Lat. (Figs 137, 138) and *L. latreillei* Macl., which are also exceptionally brightly coloured, are fortunately quite plentiful in the south-eastern States. The males, which are generally larger (23-33 mm) than their mates, and have longer mandibles, are usually of a lovely burnished golden green or bronze colour, but the females are more shinging and more variable in hue: golden-bronze, blue, purple or greenish-black. These fine beetles are diurnal in habit and are often to be seen on the wing during midsummer days; the larvae feed in old dry logs and stumps of

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Figs 117-125. Lucanidae. (117) *Rhyssonotus nebulosus* Kirby, ♂; (118) *R. nebulosus*, ♀; (119) *R. jugularis* Westw., ♂; (120) *R. jugularis*, ♀; (121) *R. parallelus* Deyr., ♂; (122) *R. politus* Cart., ♀; (123) *R. laticeps* Macl., ♂; (124) *R. costatus* Cart., ♀ (poor specimen); (125) *Caccostomus squamosus* Newm., ♂. All approximately twice natural size.

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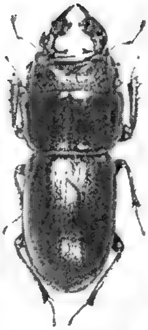

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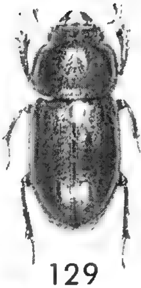

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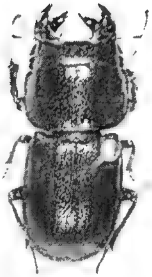

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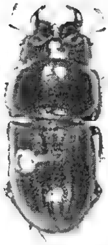

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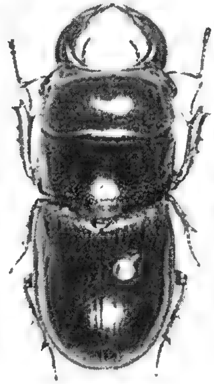

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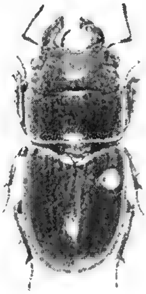

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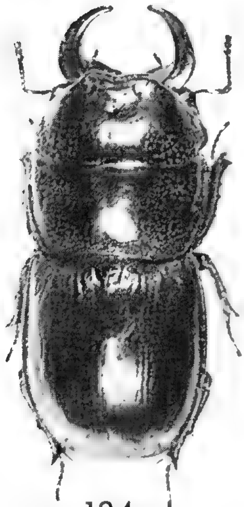

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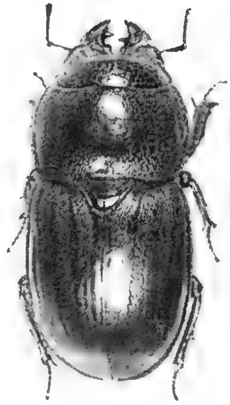

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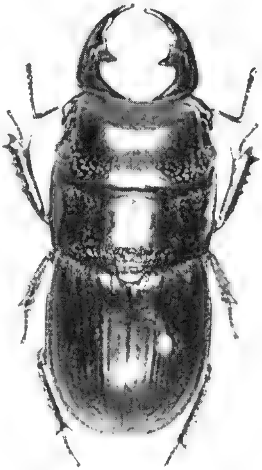

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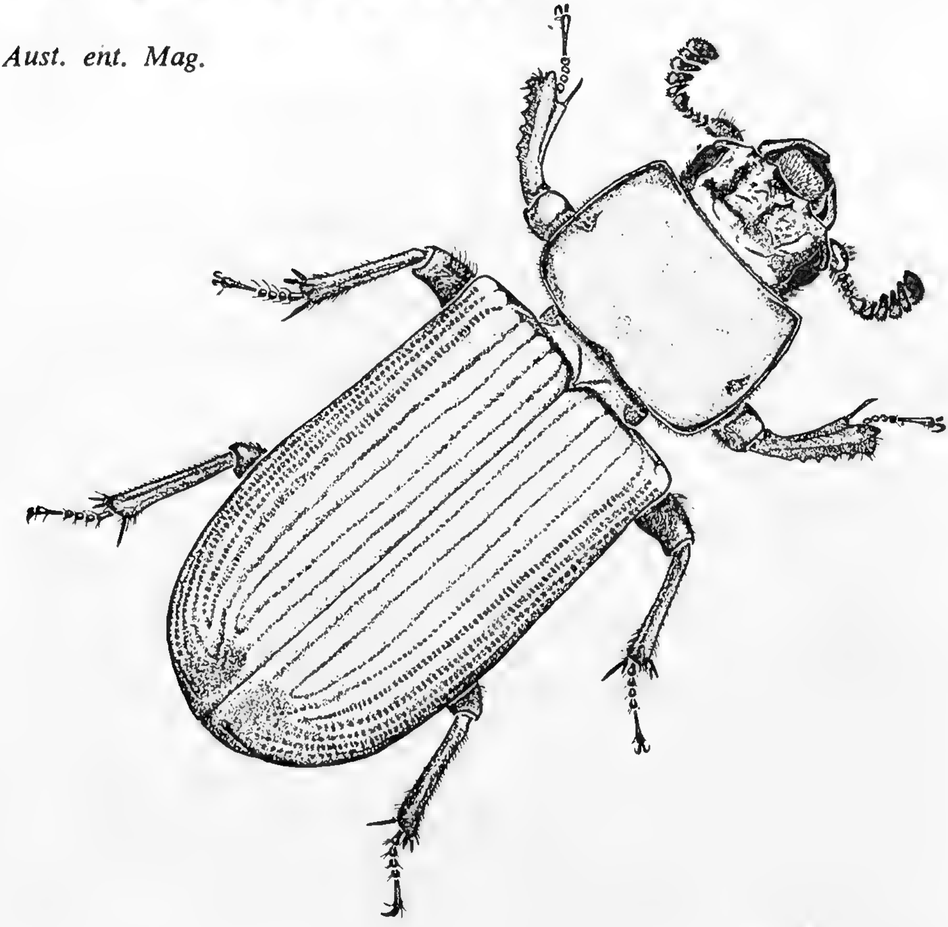

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COVER

Illustrated by Marnie Holmes

Pharochilus dilatus Dalm. (length 28-36 mm) is a common species in forested areas of eastern Australia. Like other Passalidae the larvae and adults live together in groups feeding on rotting logs. Both larvae and adults can stridulate; the larvae by rubbing their hind legs against a file and the adults by scraping their abdomen against their underwings.

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BUTTERFLIES (LEPIDOPTERA: HESPERIOIDEA, PAPILIONOIDEA) OF KANGAROO ISLAND, SOUTH AUSTRALIA

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Abstract

The known butterfly fauna of Kangaroo Island is recorded. The enviroment is discussed insofar as it relates to butterfly habitats and their larval food plants. Attention is drawn to the extensive areas of unspoiled native bushland which remain on the island and the extent to which these have been reserved as conservation parks and a national park, and the unique opportunity these offer for further faunistic and floristic studies.

Introduction

With an area of some 4250 sq km Kangaroo Island ranks second to Tasmania in the size of Australia's offshore islands. The first reference to a butterfly from this island is that of the French explorers Peron and Freycinet (1816) who included "une espece de papillon de la division des Brassicaires de M. Latreille" in their list of entomological collections. A further reference to Kangaroo Island is made in the distribution data of one species by Tepper (1882). Subsequently Fisher (1978) included the island in the distribution of 10 species, and drew attention to the paucity of material available. Most of these records were from material in the South Australian Museum and the Australian National Insect Collection, Canberra, collected largely by the late F. M. Angel and F. E. Parsons prior to 1955, and from limited material in the Museum of Victoria, Melbourne and the Australian Museum, Sydney.

Following field work in 1981 and 1982 and examination of the collection of J. A. Bonnin this list is now extended to 24 species and an additional subspecies. *Geitoneura acantha ocrea* (Guest) has not been included although its distribution given in Common and Waterhouse (1972) includes Kangaroo Island. The original source of this record has not been located (I. F. B. Common, pers. comm.) and there was no relevant material in any of the institutional or private collections examined.

As a result of the very limited degree to which serious field work has been carried out on the island the records of several species are confined to single specimens. In the species list which follows the probable abundance of these is projected, taking into account the known abundance of their larval food plants. Further field work may extend the list of species given here.

Environment and habitats

Kangaroo Island measures approximately 140 km from west to east and about 55 km at its widest point (Fig. 1). At its eastern end it lies some 13 km from Fleurieu Peninsula on the South Australian mainland; isolation from the mainland by rising sea levels probably occurred about 9500 years ago (Lampert, 1979). Its climate is temperate and mild; its average annual rainfall is estimated in the absence of long-term records to vary over the island from 500 mm to 900 mm (Burrows, 1979). Its topography for the most part is gently undulating, with the highest point less than 300 m above sea level.

The vegetation of the island is difficult, if not impossible, to describe briefly because of its many complex and often puzzling characteristics (Lange, 1979). Broadly, there are a number of mallee-type associations, with considerable variations between dense, low scrub, dominated by *Eucalyptus* spp. and inhabited by few butterflies, and more open areas of heath and sometimes savannah. It is in these open areas and on the edges of the dense scrub that most butterfly species have been recorded. At the western, wetter end there are open forest and low open forest formations with *Eucalyptus* spp. reaching a height of 30 m, and with some understorey of sclerophyllous heath species (Specht, 1972). Here, too, are several perennial creeks, often heavily overgrown with *Pteridium esculentum* (Forster f.) Nakai (bracken) interspersed with *Gahnia* spp. and providing typical habitats for some hesperiid butterflies (Fig. 2). Coastal formations are diverse but rather similar to some mainland coastal areas in South Australia. Included in these communities are a number of species which serve as food for the larvae of some butterflies. Coastal clifftops often support fairly dense formations of mat plants and low shrubs but few butterflies are found in these areas.

Both *Gahnia trifida* Labill. and *G. sieberiana* Kunth occur widely, particularly at the edges of the many brackish and freshwater lagoons that occur throughout the island. *G. clarkei* Benl is less common. *G. deusta* (R. Br.) Benth. has a restricted distribution, occurring mainly near parts of the southern coast; [*G. filum* (Labill.) F. Muell. is referred to by Wood (1930) but the occurrence of this species requires confirmation]. Four species of hesperiids, *Hesperilla idothea clara, H. donnysa delos, H. chrysotricha leucosia* and *Motasingha a. atralba*, and one additional subspecies, *H. d. diluta*, have been recorded from these plants. A dwarf endemic species, *Gahnia hystrix* J. Black, is found in some localities but there is no evidence to suggest that this is a larval food plant of a butterfly. Some common larval food plants are notably absent from the island's flora. Mistletoes, widely distributed over

Fig. 1. Kangaroo Island, showing major areas of conservation. 1: Flinders Chase National Park. 2-9: Cape Torrens, Western River, Kelly Hill, Vivonne Bay, Seal Bay, Cape Gantheaume, Dudley and Cape Hart Conservation Parks.

Fig. 2. *Gahnia sieberiana* (centre), larval food plant of *Hesperilla idothea clara, H. donnysa delos* and *H. chrysotricha leucosia*, in dense understory at Breakneck River, Flinders Chase.

much of mainland South Australia, are represented by one infrequent species, *Amyema melaleucae* (Miq.) Tieghem. *Gahnia lanigera* (R. Br.) Benth., widespread in southern South Australia, is absent. The family Asclepiadaceae is not represented although the introduced *Asclepias rotundifolia* Miller (cotton bush) is well established on the nearby coast of Fleurieu Peninsula. The genus *Cassia* is not recorded.

Intensive development of the island for farming began less than 40 years ago. Since then large areas of natural vegetation have been replaced by pastures, particularly in the central western areas and on Dudley Peninsula. There remain considerable tracts of native scrub along roadsides, and sixteen areas, representing more than one-fifth of the total land surface, have been reserved as conservation parks. The largest of these, Flinders Chase National Park, has an area of some 59,000 ha and extends over much of the western end. Corridors of native bushland are also being preserved in perpetuity under Vegetation Heritage Agreements between the State Government and Landowners. There are no rabbits on the island. There is evidence that burning by extensive natural fires has occurred occasionally before European occupation, but burning by aboriginal man ceased about 2000 years ago, at the end of his occupation of the island (Lampert, 1979).

Here, then, is a substantial area with a high degree of conservation, at least by mainland standards, and with tracts of native vegetation which have been influenced little by man until quite recently. It provides an admirable resource for continuing faunistic (and floristic) studies, and the survival of most of its butterfly species seems reasonably assured.

Species list

Species are arranged in families and follow the sequence given in Common and Waterhouse (1981).

HESPERIIDAE

Hesperilla idothea clara Waterhouse, 1932. Two specimens were reared from a larva and pupa taken from *Gahnia sieberiana* at Breakneck River, Flinders Chase. These specimens emerged in November and January.

Hesperilla donnysa delos Waterhouse, 1941. Widely distributed from Flinders Chase to American River. Larvae occur with those of *H. chrysotricha leucosia* on *Gahnia sieberiana* and *G. trifida*. Adults have been collected in November and December.

Hesperilla donnysa diluta Waterhouse, 1932. This subspecies is recorded from Seal Bay Conservation Park, where its larvae feed on *Gahnia deusta* with those of *Motasingha a. atralba*. All specimens were collected in November.

Hesperilla chrysotricha leucosia Waterhouse, 1938. This species is widely distributed. It is recorded from Flinders Chase and American River, and from many localities between. Its larval food plants, *Gahnia sieberiana* and *G. trifida*, occur frequently in roadside vegetation and in swampy areas. Adults appear mainly in October and November. Specimens in the South Australian Museum have been identified by L. Couchman as

Fig. 3. Habitat of *Motasingha a. atralba* and *Hesperilla donnysa diluta*, with the larval food plant, *Gahnia deusta*, in foreground. Seal Bay Conservation Park.

Fig. 4. *Choretrum glomeratum* (left), larval food plant of *Ogyris otanes*, in a typical habitat of this butterfly, Dudley Conservation Park.

subspecies *naua* Couchman, 1949, described originally from Eyre Peninsula, but with longer series of specimens available for examination there is no evidence to support this. Kangaroo Island specimens are placed here therefore in subspecies *leucosia*, which occurs also on nearby Fleurieu Peninsula.

Motasingha dirphia trimaculata (Tepper), 1882. A single specimen taken from Rocky River, Flinders Chase, in December. The species' mainland larval food plants, *Lepidosperma carphoides* F. Muell. ex Benth. and *L. viscidum* R. Br. occur widely on the island.

Motasingha atralba atralba (Tepper), 1882. Taken from Seal Bay Conservation Park in November, where larvae feed on *Gahnia deusta*. There is no evidence of an autumn brood on Kangaroo Island although both spring and autumn emergences occur in many mainland localities. A typical habitat is shown in Fig. 3.

PIERIDAE

Eurema smilax (Donovan), 1805. A single specimen taken at American River in January. On the mainland the larvae feed on *Cassia* spp., which do not occur on Kangaroo Island. It may be presumed that occasional specimens will reach the island from the mainland. Migratory flights of this species are well recorded and individuals are quite capable of flying long distances.

Delias aganippe (Donovan), 1805. Tepper (1882) includes Kangaroo Island in the distribution of this species, referring probably to a specimen in the South Australian Museum labelled "Kangaroo Island, J. Wright". Possible larval food plants on the island include *Exocarpos cupressiformis* Labill. The butterfly has not been collected in recent years.

Anaphaeis java teutonia (Fabricius), 1775. Large numbers of this butterfly reach Kangaroo Island from time to time in the course of migratory flights from the north. These flights begin in the Flinders Ranges where the larval food plant, *Capparis mitchellii* Lindley, occurs, and the flights reach southern areas of the state from October to December. In October 1981 a number of specimens were observed flying south over Gulf St. Vincent and the species was widespread on the island. This could well be the species listed by Peron and Freycinet (1816), who visited the island in early January.

Pieris rapae rapae (Linnaeus), 1758. This introduced species is well established on the island. Its larvae feed on many cultivated domestic plants and possibly some native species.

NYMPHALIDAE

Danaus plexippus plexippus (Linnaeus), 1758. A single specimen has been observed. The larvae feed on plants of the family Asclepiadaceae which do not occur on Kangaroo Island. However, the introduced *Asclepias rotundifolia* is common on Fleurieu Peninsula and occasional specimens of the butterfly could be expected to reach the island from the mainland.

Danaus chrysippus petilia (Stoll), 1790. One specimen has been taken at American River in January. The larvae feed on *Asclepias rotundifolia* and, with *D. p. plexippus*, it would be expected to reach the island occasionally from the mainland.

Geitoneura klugii klugii (Guerin-Meneville), 1830. This is quite common, inhabiting partly shaded grassy slopes and savannah woodlands. Larvae feed on a variety of grasses (Gramineae).

Heteronympha merope merope (Fabricius), 1775. This species is common, with similar habitats and larval food plants to those of *Geitoneura k. klugii*.

Vanessa kershawi (McCoy), 1868. Common throughout the island. Larval food plants include *Helichrysum* spp. of which seven are recorded from Kangaroo Island.

Junonia villida calybe (Godart), 1819. This species, although not commonly encountered or recorded, should occur over most of the island. Its many larval food plants include *Plantago* spp. of which four are recorded from the island.

LYCAENIDAE

Ogyris idmo halmaturia Tepper, 1890. This is a rare butterfly, known only from isolated specimens throughout most of its range. A few specimens have been collected near Kingscote and at Rocky River, usually in December. Its life history is not known, but there is some evidence that its early stages are associated with the sugar ant *Camponotus nigriceps* (Common and Waterhouse, 1981).

Ogyris otanes C. & R. Felder, 1865. Fisher (1978) describes this species as quite rare on Kangaroo Island. More recent field work indicates that it is reasonably abundant, having been collected or observed in various localities from Flinders Chase to Dudley Conservation Park. Its larval food plant, *Choretrum glomeratum* R. Br., rare now on the mainland, occurs widely along roadsides and in conservation areas. Its larvae live in association with a sugar ant, *Myrmophyma ferruginipes*, which builds a nest in sand at the base of the food plant. The life history of this species was described by Burns and Angel (1952) from material collected near Kingscote. A typical habitat is shown in Fig. 4.

Candalides acastus (Cox), 1873. Specimens have been taken in December. The larval food plants of this butterfly, twining *Cassytha* spp., occur widely on the island.

Candalides hyacinthinus simplex (Tepper), 1882. Several specimens have been taken at Ravine de Casoars in Flinders Chase. Larvae feed on *Cassytha melantha* R. Br., which is widespread, and the butterfly should be reasonably abundant from October to February.

Nacaduba biocellata biocellata (C. & R. Felder), 1865. A single specimen has been taken in April. The butterfly should be reasonably abundant during the summer months as its larval food plants, *Acacia* spp., are well represented.

Neolucia agricola agricola (Westwood), 1851. Specimens have been collected at Seal Bay Conservation Park, but the butterfly probably occurs widely as its larvae feed on the flowers of various plants of the family Leguminosae which are common on the island.

Theclinesthes albocincta (Waterhouse), 1903. Several specimens have been taken from Dudley Peninsula, in January. The larval food plant, *Adriana klotzschii* (F. Muell.) Muell.-Arg., occurs commonly in some coastal areas and the butterfly should be reasonably abundant in these localities from November to April.

Theclinesthes serpentata serpentata (Herrich-Schaffer), 1869. This is a common species, particularly in coastal areas. At D'Estrees Bay larvae feed on *Atriplex cinerea* Poiret, and probably on other *Atriplex* spp. which occur on the island.

Zizina labradus labradus (Godart), 1824. This species is widespread and common, its larvae feeding on various plants of the family Leguminosae.

Discussion

Due to the proximity of Kangaroo Island to the mainland it is probable that four species, *Eurema smilax, Anaphaeis java teutonia, Danaus p. plexippus* and *D. chrysippus petilia*, are occasional visitors, carried there by favourable winds or in the course of migratory flights. These species are unlikely to establish breeding colonies on the island because of the comparative scarcity or total absence of suitable food plants for their larvae.

None of the material collected so far suggests that any subspecific differences have arisen from isolation of the butterfly populations. There is some indication that emergence of adult butterflies may occur slightly later in the season than on the mainland.

Acknowledgements

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References

Burns, A. N. and Angel, F., 1952. The small brown azure. *Victorian Nat.* 68: 183-186.

Burrows, K., 1979. Climate. *In* M. J. Tyler, C. R. Twidale and J. K. Ling (Eds), *Natural history of Kangaroo Island*, pp. 53-64. Royal Society of South Australia, Adelaide.

Common, I. F. B. and Waterhouse, D. F., 1972. *Butterflies of Australia.* Angus and Robertson, Melbourne.

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Revised edition. Angus and Robertson, Melbourne.

Fisher, R. H., 1978. *Butterflies of South Australia.* Handbooks of the flora and fauna of South Australia. Govt. Printer, Adelaide. 272 pp., 16 pls.

Jessop, J. P., 1983. *Vascular plants of South Australia.* Botanic Gardens and State Herbarium, Adelaide.

Lampert, R. J., 1979. Aborigines. *In* M. J. Tyler, C. R. Twidale and J. K. Ling (Eds), *Natural history of Kangaroo Island*, pp. 81-89. Royal Society of South Australia, Adelaide.

Lange, R. T., 1979. Native vegetation. *In* M. J. Tyler, C. R. Twidale and J. K. Ling (Eds), *Natural history of Kangaroo Island*, pp. 65-80. Royal Society of South Australia, Adelaide.

Peron, F. and Freycinet, L. C. D. de., 1816. *Voyage de Decouvertes aux Terres Australes . . . Sur . . . le Geographe, le Naturaliste, et . . . le Casuraina, pendant . . . 1800 . . . 1804.*

Specht, R. L., 1972. *The vegetation of South Australia.* 2nd edition. Handbooks of the flora and fauna of South Australia. Govt. Printer, Adelaide.

Tepper, J. G. O., 1882. The Papilionidae of South Australia. *Trans. Proc. Rep. R. Soc. S. Aust.* 4: 25-36.

Wood, J. G., 1930. An analysis of the vegetation of Kangaroo Island and the adjacent peninsulas. *Trans. Proc. R. Soc. S. Aust.* 54: 105-139.

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DRAGONFLIES AND DAMSELFLIES (ODONATA) FROM BARROW AND NEARBY ISLANDS OFF THE COAST OF WESTERN AUSTRALIA

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Abstract

This paper provides records of six species of recently collected Odonata from the Montebello, Lowendal and Barrow Island groups off the coast of Western Australia.

Introduction

This paper deals with Odonata collected and observed between 1st and 18th May, 1982 on the Montebello and Lowendal Islands and on Barrow and nearby smaller islands off the coast of Western Australia. Ten islands were visited, most time being spent on Barrow, by far the largest of the islands. Descriptions of the islands, especially Barrow, can be found in Serventy and Marshall (1964), Butler (1970, 1975, 1975a) and Burbidge and Main (1971). Recent detailed vegetation studies of Barrow have been carried out by Buckley (in press). The Montebello islands are described in Montague (1914). Material collected will be deposited in the Western Australian Museum.

There is no permanent fresh water on any of the islands but on Barrow there is a large galvanized iron tank set in a concrete surround in which rainwater accummulates. There are a few brackish water pools, also on Barrow. After rain ephemeral pools are found in drainage courses, especially where earth walls have been built across them to slow down water loss to the sea but these pools are too short-lived to be of value as breeding sites for damselflies or dragonflies. Nymphal exuviae of *Pantala flavescens* (Fabricius) were found on the sides of the tank and females of *Macrodiplax cora* (Brauer) were seen apparently ovipositing in one of the brackish pools. These were the only signs of breeding activity noticed on any of the islands.

Table 1 lists the islands visited and the species collected and observed on each. It should be noted that the Lowendals are not individually named; the two visited are the largest of the southern islands and that immediately to the north of it. The dragonfly nomenclature used here is that of Watson (1974).

Watson (1969) did not record any species from the offshore islands when dealing with the fauna of the adjacent Western Australian mainland and did not, apparently, include the islands when he gave the distribution of Australian Odonata by broad regions (Watson 1974). The islands dealt with here lie off the coast of his "north-west of Western Australia" region and all the species recorded here from the islands were listed for the mainland of his region. The present records appear to be the first which are specifically from the islands. It should be remembered that the records and comments in this paper relate only to the period from 1st to 18th May, 1982.

Records

COENAGRIONIDAE

Ischnura aurora Brauer

Only one female of this species was collected near the centre of Barrow Island. Despite the fact that it is small and a weak flyer it is a species which has invaded many islands across wide expanses of water. It is widespread in Australia and New Zealand and occurs from India to the central Pacific (Watson 1969). It is possible that it breeds in the tank on Barrow Island but no direct evidence for this was found.

AESHNIDAE

Hemianax papuensis (Burmeister)

This is a powerful flyer and frequent immigration from the mainland is likely. It is well known as a long distance migrant, having been reported migrating with *Diplacodes bipunctata* (Brauer). One specimen was taken on Barrow Island and a second captured, but escaped, on Boodie Island.

LIBELLULIDAE

Pantala flavescens (F.)

This was by far the commonest species, sometimes seen in large numbers, apparently congregating in areas where suitable insect prey was in flight or in the lee of high ground, sheltering from wind. It was collected or seen on all the islands except Mushroom Island, the smallest visited. Undoubtedly immigration is frequent as it is a well known, almost worldwide, strongly-flying migrant species. It breeds on Barrow Island in the tank referred to above and is the only species of which nymphal exuviae were found.

Trapezostigma loewi (Brauer)

This species was collected only on Barrow Island. It is a strong flying migrant species and frequent immigration from the mainland seems likely.

Macrodiplax cora (Brauer)

Five specimens were collected on Barrow Island and others seen on Hermite Island (Montebellos). A female was seen apparently ovipositing in a brackish pool on Barrow Island but there was no evidence of the presence of nymphs.

Diplacodes bipunctata (Brauer)

This migrant species was common and seen on all islands except Hermite although undoubtedly it occurs there at times. Frequent immigration is possible as it is a widespread species occurring from Indonesia to Micronesia and Oceania as well as over much of Australia (Watson 1969).

Comments

With the exception of *I aurora* all the species recorded are strong flyers and most have been recorded as migrants in Australia or other parts of their range (Tillyard 1917, Smithers 1970). All are, therefore, probably

TABLE 1
Records of Odonata on Montebello, Lowendal and Barrow Islands and nearby smaller islands

Species	Montebellos		Lowendals		Barrow and nearby islands					
	Trimouille	Hermite	Lowendal (N)	Lowendal (S)	Mushroom	N. Double	S. Double	Barrow	Middle	Boodie
COENAGRIONIDAE										
Ischnura aurora								*		
AESHNIDAE										
Hemianax papuensis								*		*
LIBELLULIDAE										
Pantala flavescens	*	*	*	*		*	*	*	*	*
Trapezostigma loewi								*		
Macrodiplax cora		*						*		
Diplacodes bipunctata	*		*	*	*	*	*	*	*	*

frequently immigrant, opportunistic species which invade the islands from the mainland. Judging by the large populations of *P. flavescens*, which was definitely breeding on Barrow, there was considerable reinforcement of the locally bred population by immigration from elsewhere.

The uncertainty of the limited breeding areas on the islands must result in unstable populations of Odonata. This is confirmed by comments from several employees of the Western Australian Petroleum Company on Barrow Island that they had seldom seen such large numbers of dragonflies on the island as were present in May. Any migrant strong flyer from the mainland is a likely temporary inhabitant and further observation would certainly lead to additional species being recorded from time to time. Should, for any reason, substantial areas of fresh water become available on the island there would certainly be rapid colonization and establishment of breeding populations.

Acknowledgements

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References

Buckley, R. C., (in press). The vegetation of Barrow Island, W.A.

Burbidge, A. A. and Main, A. R., 1971. Report on a visit of inspection to Barrow Island, November, 1969. *Rep. West. Aust. Dep. Fish Faun.* 8: 1-26.

Butler, W. H., 1970. A summary of the vertebrate fauna of Barrow Island, W.A. *West. Aust. Nat.* 11(7): 149-160.

Butler, W. H., 1975. Additions to the fauna of Barrow Island, W.A. *West. Aust. Nat.* 13(4): 78-80.

Butler, W. H., 1975a. *Barrow Island.* W.A. Petroleum Co., Perth.

Montague, P. D., 1914. A report on the fauna of the Monte Bello Islands. *Proc. zool. Soc. Lond.* 1914(3): 625-675, pls I-IV.

Serventy, D. L. and Marshall, A. J., 1964. A natural history reconnaissance of Barrow and Monte Bello Islands, 1958. *C.S.I.R.O. Techn. Pap. Div. Wildl. Res.* 6: 1-23.

Smithers, C. N., 1970. Migration records in Australia. 1. Odonata, Homoptera, Coleoptera, Diptera and Hymenoptera. *Aust. Zool.* 15(3): 380-382.

Tillyard, R. J., 1917. *The biology of dragonflies.* Cambridge, 396 pp., 4 pls., 188 figs.

Watson, J. A. L., 1969. Taxonomy, ecology and zoogeography of dragonflies (Odonata) from the north-west of Western Australia. *Aust. J. Zool.* 17: 65-112.

Watson, J. A. L., 1974. The distributions of the Australian dragonflies (Odonata). *J. Aust. ent. Soc.* 13: 137-149.

FAVORABILITY OF FAGACEOUS FOLIAGE AS FOOD FOR *NOVACASTRIA NOTHOFAGI* SELMAN (COLEOPTERA: CHRYSOMELIDAE)

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Abstract

Young larvae of *Novacastria nothofagi* Selman, when transferred from foliage of their natural host, *Nothofagus moorei*, to foliage of other species of *Nothofagus* and Fagaceae, initiated feeding on a number of species, including all *Nothofagus* spp. tested, and sweet chestnut, *Castanea sativa.* Development to pupation was successfully completed only on the natural host and on one other species, *Nothofagus cunninghamii.*

Introduction

Novacastria nothofagi Selman, a leaf-beetle recently discovered on Antarctic beech, *Nothofagus moorei*, is of great taxonomic interest since it is an apparently isolated species linking the paropsine genera with many of the non-paropsine genera of the subfamily Chrysomelinae in Australia (Selman and Lowman, 1983). Australian Chrysomelinae feed mainly on hosts in the families Myrtaceae, Mimosaceae and Papilionaceae.

In its natural habitat, the temperate rainforests of northern New South Wales, *N. nothofagi* larvae were observed to feed exclusively on the spring foliage flush of *N. moorei* which is the sole representative of the family Fagaceae in these forests. Laboratory tests confirmed that *N. nothofagi* larvae would not feed on young foliage from other species (families Monimiaceae and Epacridaceae) associated with *N. moorei*, but rather wandered away from the foliage and died.

The family Fagaceae is represented in the temperate regions of the southern hemisphere only by the genus *Nothofagus*, which has a widely disjunct distribution, the extant species being relicts of a formerly richer flora (van Steenis, 1971). No other species of Chrysomelinae have been reported feeding on foliage of *Nothofagus* species. In this study, young *N. nothofagi* larvae collected from Antarctic beech foliage, were fed foliage of a range of *Nothofagus* species representing the temperate distribution of the genus, as well as on foliage of other species of Fagaceae.

Materials and methods

N. nothofagi larvae were collected on newly flushed, spring foliage of *N. moorei* near Armidale, New South Wales and airfreighted to Ridgley, Tasmania, where tests were undertaken on newly flushed spring foliage from arboretum specimens of *Nothofagus* species and other species of Fagaceae.

Feeding tests were carried out under normal photoperiod and temperature conditions in the laboratory. Five young larvae (first or second instar) were transferred from *N moorei* foliage to fresh foliage of each test "host" placed in petri dishes on moistened filter paper. The remainder of the larvae were reared through to pupation on foliage of *N. moorei.* Foliage was changed at daily intervals, and a fine paint-brush was used to transfer the larvae.

Results and discussion

Results are shown in Table 1. Prolonged feeding was only maintained on one species (*N. cunninghamii*) in addition to the natural host and even this species may not support full development from eclosion; this aspect was not investigated. Feeding of *N. nothofagi* larvae on foliage other than that of the natural host has not been previously reported. Of the potential host species tested, the feeding activity was restricted to *Nothofagus* species with the exception of sweet chestnut, *Castanea sativa.*

Hill (1983) has postulated a close degree of relatedness between *N. moorei* and *N. cunninghamii* based on evidence inferred from Tasmanian macrofossils. The two species may have shared a common early Tertiary ancestor. The finding from the current study is further evidence for this close relationship. It is interesting that a niche similar to that occupied by *N. nothofagi* on *N. moorei* is apparently unoccupied by a species of *Novacastria* on *N. cunninghamii.*

TABLE 1
Feeding of *Novacastria nothofagi* larvae on foliage of various species of Fagaceae. (+ = feeding, – = no feeding and wandering)

"Host"	Area of origin	Feeding after 1 day	Feeding after 2 days	Reared to pupation
Nothofagus moorei (natural host)	N.S.W., Qld	+	+	+
N. cunninghamii	Tas., Vic.	+	+	+*
N. menziesii	New Zealand	+	–	–
N. obliqua	Chile	+	–	–
N. pumilio	Chile	+	–	–
Castanea sativa	Europe	+	–	–
Fagus sylvatica	Europe	–		
Quercus robur	Europe	–		

* Of five larvae, three died but two were reared to pupation.

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References

Hill, R. S., 1983. Evolution of *Nothofagus cunninghamii* and its relationship to *N. moorei* as inferred from Tasmanian macrofossils. *Aust. J. Bot.* 31: 453-465.

Selman, B. J. and Lowman, M. D., 1983. The biology and herbivory rates of *Novacastria nothofagi* Selman (Coleoptera: Chrysomelidae), a new genus and species on *Nothofagus moorei* in Australian temperate rain forests. *Aust. J. Zool.* 31: 179-191.

van Steenis, C. G. G. J., 1971. *Nothofagus*, key genus of plant geography, in time and space, living and fossil, ecology and phylogeny. *Blumea.* 79: 65-98.

THE LIFE HISTORY OF *TAGIADES JAPETUS JANETTA* BUTLER (LEPIDOPTERA: HESPERIIDAE: PYRGINAE)

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Abstract

The life history of *Tagiades japetus janetta* Butler is described and the larval food plant listed.

Introduction

The black and white flat butterfly, *Tagiades japetus janetta* Butler, is distributed on the Australian mainland from Cape York to Shute Harbour (Common and Waterhouse 1981). J. F. R. Kerr (Common and Waterhouse 1972, 1981) has suggested that this species may have extended its range farther south quite recently. It was not taken by F. P. Dodd in the Kuranda or Cairns areas early this century, nor by A. N. Burns when he lived at Meringa between 1925 and 1930. As its food plant is found continuously along the coast into northern New South Wales (Jones and Gray 1977), this skipper may even further expand its distribution.

Life history

Food plant. Dioscorea transversa (R. Brown), common yam vine (Dioscoreaceae).

Egg (3 examined). White, domed, 0.8 mm at base. Shell with 13 fine, vertical, ribs.

First instar. Head smooth, pale brown, semi-circular at base and flat on top, except for a shallow median, longitudinal groove. Body finely haired, entirely red or red with green dorsal region, anal plate pale brown. Prothorax occasionally brown or black. Length 2.8 mm.

Second instar. Head granulated, dark brown, less rounded at base, median longitudinal groove deeper. Body with green dorsal region.

In the following instars the head comes to resemble a stylized heart in shape. Body becomes more green, red area contracting to base.

Fifth instar. (Fig. 1). Head granulated, black, approximating a stylized heart in shape. Body green with minute white spots. Length 26 mm.

Pupa (Fig. 2). Smooth, translucent green with isolated brown spots and patches of white waxy scales. These are found on the operculum, wing cases and abdominal segments. Head bears a short projection, directed slightly upwards and bluntly conical in shape. Length 20 mm.

Notes

Eggs are laid singly on the upperside of young leaves of the food plant. First instar larvae construct shelters by eating out a roughly triangular shaped section of leaf, remaining attached only at its apex, and folding this backwards. The leaf edge is often used as the base of this triangle. The folding of the leaf is achieved by constructing a silken hinge at the still attached apex

Figs 1, 2. *Tagiades japetus janetta*: (1) fifth instar larva; (2) pupa.

of the triangle. This gradually raises the section until it has travelled through 180 degrees. Larvae assume a hunched posture beneath the roof of the shelter and feed at night. Several shelters of this type are constructed by each larva as it grows. Late instar larvae construct shelters by joining overlapping leaves. Pupation occurs within the fifth instar shelter. The pupa is suspended beneath the roof of this shelter by a cremaster and "Y" shaped central girdle, the fork of which supports the pupa.

The life cycle takes approximately six weeks in the summer months; egg six days, larva 23 days, pupa 10 days.

The population of this species fluctuates very markedly throughout the year, being greatest toward the end of the wet, when the foodplant supports maximum foliage. With the coming of the dry most plants die back to an underground tuber, only those plants along permanent watercourses that retain foliage support a greatly reduced population.

References

Common, I. F. B. and Waterhouse, D. F., 1972. *Butterflies of Australia.* Angus and Robertson, Sydney, 498 pp.

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Revised edition, Angus and Robertson, Sydney. 682 pp.

Jones, D. L. and Gray, B., 1977. *Australian climbing plants.* A. H. & A. W. Reed, Sydney. 166 pp.

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SELECTIVE POSITIONING OF ARBOREAL TENTS BY WEAVER ANTS *OECOPHYLLA SMARAGDINA* (F.): A POSSIBLE CO-EVOLUTIONARY DEVELOPMENT WITH MAHA-DAN TREES, *SYZYGIUM CUMINI* (L.)SKEEIS

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Abstract

Weaver ants *O. smaragdina* locate their tents preferentially near the inflorescences of flowering Maha-dan trees (*S.cumini*). As the fruits complete development nutrient sources for the ants at these sites are probably reduced; the tents are gradually abandoned. During development however, the fruits are protected by the presence of *O. smaragdina.* A coevolution of *O. smaragdina* with *S. cumini,* surprisingly the first indicated for the completely arboreal ant, is suggested by these data.

Introduction

The two extant species of weaver ants of the genus *Oecophylla* [*O. longinoda* (Latr.) in Africa and *O. smaragdina* in S.E. Asia and Melanesia] are famed for their construction of arboreal tents made from leaves bound together with larval silk (Holldobler and Wilson 1977). Little information is available concerning the biology of *O. smaragdina* (Hemmingsen 1973) but that of *O. longinoda* has been described in detail by Ledoux (1950) and Way (1954) and the social behaviour of this species has been the subject of detailed research (Holldobler and Wilson 1978). In addition to building their main nests both species build silken tents around major food sources (usually concentrations of honey producing scale insects tended by the ants). This event is described as rare in *O. longinoda* (Ledoux 1950) while Dodd (1902) recorded tents of *O. smaragdina* as common around fruits and berries of *Ficus* and *Terminalia* spp. in northern Australia.

This note records the selective positioning of tents of *S. smaragdina* on inflorescences in maha-dan trees (*Syzygium cumini*) in Sri Lanka and provides some evidence suggesting a possible co-evolutionary development between the species involved.

Methods

The observations were made during two brief visits to the sand-dune area near Yala bungalow at the mouth of the Menik Ganga, S.E. Sri Lanka (6°24′N 81°30′E). One visit to the study tree, growing 100 m from the sea, was made in early August, the second 2-4 weeks later at the height of the dry season (May-September). The tree was divided into five equal sections, each covering the full height of the tree and the number of tents built on inflorescences, leaves and branches noted.

Results

The number of tents in these locations at the first visit is given in Table 1. As no significant differences were found between sections these were pooled and a significantly greater number of tents was found on inflorescences relative to other sites ($\chi^2 = 20.22$ d.f. = 2, $P < 0.001$). About 80% of the inflorescences on the tree were associated with ant tents.

The drop in proportion of fruits with tents as the fruits ripen is shown in Table 2. This is statistically significant ($\chi^2 = 10.01$, d.f. = 2, $P < 0.01$) despite the small sample size. These results suggest the hypothesis that the ants, attracted to the nectar produced by the flowers, serve to protect these and subsequently the developing fruit. At some stage after the disappearance of the nectar resource the ants cease to maintain the tent and by the time the fruits have fully developed and are ready to be dispersed, the ants have gone and fruit eaters have unhindered access to the fruit.

TABLE 1

The number of *O. smaragdina* nests located on fruit clusters, leaves or branches of *S. cumini*. Counts are given separately for the five sections into which the tree was divided for observational purposes.

	1	2	3	4	5	Total
Fruits	4	3	4	3	5	19
Leaves	1	2	1	3	1	8
Branch	0	0	0	0	0	0

TABLE 2

The number of ripe (all fruit black), unripe (all fruit green) and ripening (black and green fruit) bunches of fruit on the tree, and the proportion of each type occupied by an *O. smaragdina* nest.

	Unripe	Ripening	Ripe
Number with ants	3	8	0
Number without ants	0	3	5
Proportion occupied	1.00	0.73	0.00

Discussion

Silken tents are usually built around herds of scale insects and Dodd (1902) noted the high densities of these on the fruits around which tents were built. No scale insects were seen in the present case, but they are inconspicuous and could well have been missed. The fact that the tent was built in the body of the inflorescence often leaving individual flowers outside the silk webs suggests that although nectar was certainly taken directly from the cup-like receptacles of the flowers, much of the resource tapped by the ants may have been indirectly obtained from scales which can extract nutrients from the phloem in the stems of the growing fruit. This nutrient supply would only reduce close to the full ripening of the fruit and the ants would remain on the inflorescence throughout the period of ripening.

That the association described above has undergone some degree of coevolution beyond an initial accidental mutualism is shown by differences in the behaviour of the ant on *S. sumini* from that previously recorded for *O. smaragdina.* First, the resource was not entirely enclosed in the tent, some flower heads being left free. Second, butterflies, flies and bees were seen to visit the flowers outside the tent and were not attacked by the ants. Both species of *Oecophylla* have been recognised as voracious predators of other insects (usually hemipterans but beetles, butterflies, other ants, spiders, bees and even young birds are taken) and they obtain a significant proportion of their food from this source (Ledoux 1950, Way 1954). Clearly the latter behaviour would reduce pollination of the host plant and has been modified on Maha-dan trees (at least during the flowering season).

The genus *Oecophylla* is entirely arboreal and has had a long evolutionary history in this habitat (Wilson and Taylor 1964). This note is the first record of a possible coevolution between *O. smaragdina* and one of the tree species it inhabits.

These Sri Lankan data are of particular interest in relation to the Australian situation because of the widespread occurrence of *Oecophylla smaragdina* in northern Australia, and previous records of fruit-nest associations in that area (Dodd 1902). It is hoped that publication of the Sri Lankan data will stimulate further research on the possibility of *Oecophylla*/plant coevolution in Australia.

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References

Dodd, F. P., 1902. Notes on the Queensland green tree ants (*Oecophylla smaragdina*). *Victorian Nat.* 18: 136-140.

Hemmingsen, A. M., 1973. Nocturnal weaving on nest surface and division of labour in weaver ants (*Oecophylla smaragdina* Fabricius, 1775). *Vidensk. Meddr. Dansk Naturh. Foren.* 136: 49-56.

Holldobler, B. and Wilson, E. O., 1977. Weaver ants. *Scientific Amer.* 237 (6): 146-154.

Holdobler, B. and Wilson, E. O., 1978. The multiple recruitment systems of the African weaver ant *Oecophylla longinoda* (Latreille) (Hymenoptera: Formicidae). *Behav. Ecol. Sociobiol.* 3: 19-60.

Ledoux, A., 1950. Recherche sur la biologie de la fourmi fileuse [*Oecophylla longinoda* (Latr.)]. *Ann. Sci. Nat.* (11) 12(3-4): 313-461.

Way, M. J., 1954. Studies on the life history and ecology of the ant *Oecophylla longinoda* Latreille. *Bull. ent. Res.* 45: 93-112.

Wilson, E. O. and Taylow, R. W., 1964. A fossil ant colony: new evidence of social antiquity. *Psyche* 71: 93-103.

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

ALLSOPP, P. G.

1981. Revision of the Australian species of *Phaenognatha* Hope (Coleoptera: Scarabaeidae: Aclopinae). *J. Aust. ent. Soc.* 20(3): 185-195, text-figs 1-12.

ANDERSON, J. M. E.

1981. Estimating abundance of the aphid *Aphis eugeniae* van der Goot on *Glochidion ferdinandi* (Muell. Arg.) (Euphorbiaceae), using a subjective and biomass method. *J. Aust. ent. Soc.* 20(3): 221-222, text-fig. 1.

BURNS, Gordon

1983. Checklist of Victorian *Stigmodera* (*Castiarina*) (Coleoptera: Buprestidae). Subgenus *Castiarina* LaPorte & Gory. *Victorian Ent.* 13(6): 69-72.

1984. Review of Victorian *Stigmodera* (*Castiarina*) checklist. *Victorian Ent.* 14(2): 18-19.

FITT, G. P.

1981. The ecology of northern Australian Dacinae (Diptera: Tephritidae) I. Host phenology and utilization of *Opilia amentacea* Roxb. (Opiliaceae) by *Dacus* (*Bactrocera*) *opiliae* Drew & Hardy, with notes on some other species. *Aust. J. Zool.* 29(5): 691-705, tables 1-3, text-figs 1-4.

GOODING, Charles George Llewellyn

COLLECTION. *Victorian Ent.* 9(5): 48.

GREEN, K.

1982. Migration of an ichneumonid wasp over a subalpine pass. *Victorian Nat.* 99(6): 260.

Hymenoptera: *Lissopimpla excelsa*

GRESSITT, Judson Linsley

OBITUARY. *Pacif. Insects* 24(2): 207.

HARRISON, Norma

1983. Collection of Mrs Norma Harrison, Harrisons Road, Stanhope. *Victorian Ent.* 13(5): 53.

Lepidoptera: *Danaus plexippus, Papilio aegeus aegeus, Polyura pyrrhus sempronius, Anaphaeis java teutonia*

HATELEY, Keith

1981. Jewel beetles of the Kiata district. *Victorian Ent.* 11(1): 10.

HAWKESWOOD, T. J.

1981. Notes on the pollination of *Nuytsia floribunda* (Labill.) R. Br. (Loranthaceae) and some literature reviewed. *West. Aust. Nat.* 15(1): 17-21.

1982. Notes on the life history of *Aspidomopha maculatissima* Boheman (Coleoptera: Chrysomelidae: Cassidinae) at Townsville, north Queensland. *Victorian Nat.* 99(3): 92-101, table 1, text-figs 1-5.

1983. Notes on the biology and distribution of a rare jewel beetle *Pseudotaenia waterhousei* (Van de Poll) (Coleoptera: Buprestidae). *Victorian Nat.* 100(6): 238-241, text-figs 1 & 2.

HAWKESWOOD, T. J. and PETERSON, Magnus

1981. A record of a centipede killing and feeding on a sawfly larva. *West. Aust. Nat.* 15(1): 29-30, text-fig. 1.

1982. A review of larval host records for Australian jewel beetles (Coleoptera: Buprestidae). *Victorian Nat.* 99(6): 240-251, text-figs 1-8.

HOPPER, Stephen D.

1981. Foraging behaviour of megachilid bees on *Swainsona canescens* (Fabaceae) and its coevolutionary implications. *West. Aust. Nat.* 15(1): 8-11, text-fig. 1.

OSMELAK, J. A.

1983. Occurrence of leaf-mining Diptera in cultivated crops. *Aust. ent. Mag.* 10(1): 9-10.

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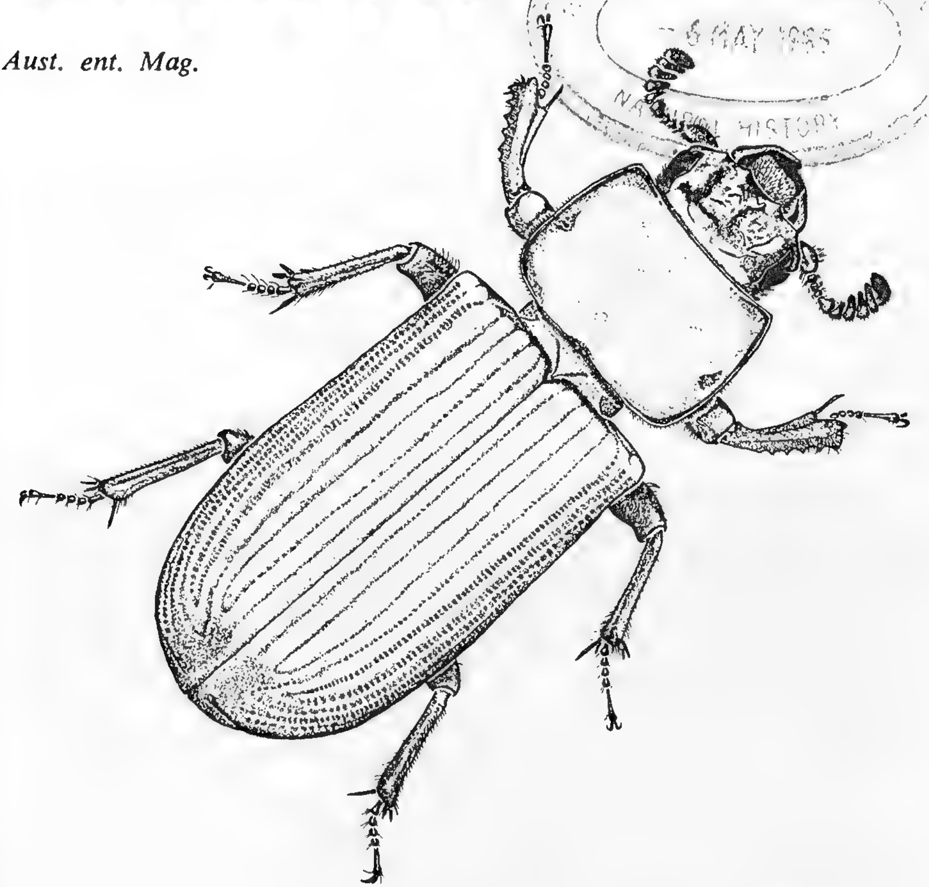

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COVER

Illustrated by Marnie Holmes

Pharochilus dilatus Dalm. (length 28-36 mm) is a common species in forested areas of eastern Australia. Like other Passalidae the larvae and adults live together in groups feeding on rotting logs. Both larvae and adults can stridulate; the larvae by rubbing their hind legs against a file and the adults by scraping their abdomen against their underwings.

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TRICHOTICHNUS MORAWITZ, A GENUS NEW TO AUSTRALIA (COLEOPTERA: CARABIDAE: HARPALINAE)

By Martin Baehr
Zoologische Staatssammlung, Maria-Ward-Str. 1 b, D-8000 Munchen 19, West Germany

Abstract

The carabid genus *Trichotichnus* Morawitz is recorded from Australia for the first time based on three female specimens taken on the Atherton Tableland and near the Mulgrave River, northern Queensland.

In the carabid material collected by the author from December 1981 to January 1982 in northern Queensland three specimens of a species were found, which were identified with some uncertainty as *Trichotichnus (Carbunus) straneoi* (Louwerens 1962). All specimens are females with the collecting data: 12 km northeast of Kairi, Atherton Tableland, northern Queensland, 30.xii.1981 (1); 30 km south of Little Mulgrave, Mulgrave River, North Queensland, 12.i.1982 (2). One specimen will be given to the Australian National Insect Collection (C.S.I.R.O.), Canberra.

Trichotichnus straneoi was described from the island of Amboina in the Moluccas (Louwerens 1962) and is also distributed in New Guinea, New Britain, and New Ireland (Darlington 1968). The Queensland specimens agree only partly with the original description of Louwerens. These differences are the most striking ones:—Size after Louwerens 5 mm, but measurements of the Queensland specimens are: 6.0 mm, 6.05 mm, and 6.35 mm. Louwerens states the ratio width/length of pronotum as 1.75, in the Queensland specimens the same ratio is between 1.53 and 1.58. The base of the pronotum is in the Queensland specimens much less densely punctate, especially in the middle of base, than in the type. The short description of the same species in New Guinea by Darlington (1968) agrees much better with the specimens from Queensland, even though these are above average length.

Louwerens placed the species in the genus *Carbanus* Andrewes. Because of the large eyes, whose lower border is very near the base of the mandibles, *Carbanus* was originally placed into the Acupalpina. But the presence of plurisetose labial palpes already precludes such an arrangement. Body shape, dense puncturation of the base of the pronotum, and the fine pubescence on the prosternum and the base of abdomen characterize the species sufficiently as a member of the genus *Trichotichnus.* Perhaps *Carbanus* should be given the rank of a subgenus of *Trichotichnus.*

With regard to the type series the Australian specimens are especially distinguished by their large size, apart from the differences mentioned above. But at this time there is no reason for classifying them as a separate subspecies, since we must wait for the discovery of the males of the species in Australia.

Regarding the ecology of *Trichotichnus straneoi* in New Guinea Darlington (1968) only indicates that it is found mainly at light, but he made no other statements. All Australian specimens came from the Atherton Tableland and its eastern escarpment, at the base of Cape York Peninsula. Both collecting localities are within about 30 km of each other and are situated in rain forest areas in the vicinity of small rivers. The specimen from Kairi and one of the specimens from the Mulgrave River flew to light in the late evening. The second Mulgrave River specimen was collected in forest floor litter between piles of dead leaves in undisturbed rain forest. This agrees very well with Darlington's (1968) statements on the habits of *Trichotichnus* species of New Guinea. Apart from these observations virtually nothing is known about the phenology, life history and feeding habits of this and other *Trichotichnus* species in the Australian/New Guinean region.

Contrary to Darlington's (1968, 1971) statements *Trichotichnus straneoi* represents another genus of the Oriental-Palearctic fauna in northern Australia. This species was found in rain forest areas at the base of Cape York Peninsula, as is true for some other oriental or palearctic/oriental genera, which are poor in species or monospecific in Australia. In most cases, where the same species is involved in Australia and New Guinea or south-eastern Asia, respectively, these are winged species like *Trichotichnus straneoi* with large distribution areas. It is to be expected, that in Australia *T. straneoi* could also be discovered in the rain forest areas of central Cape York Peninsula, i.e. the McIllwraight Range and at Iron Range. Thus, it could be another example of an element of the tropical oriental fauna using the rain forest areas of Cape York Peninsula as stepping stones for invading northern Australia.

References

Darlington, P. J. Jr., 1968. The carabid beetles of New Guinea. Part III. Harpalinae (continued): Perigonini to Pseudomorphini. *Bull. Mus. comp. Zool.* 137: 1-253.

Darlington, P. J. Jr., 1971. The carabid beetles of New Guinea. Part IV. General considerations, analysis and history of the fauna, taxonomic supplement. *Bull. Mus. comp. Zool.* 142: 129-337.

Louwerens, C. J., 1962. New Carabidae from Indonesia, chiefly from Amboina. *Tijdschr. Entomol.* 105: 135-147.

THE LARVA OF *DIADOXUS ERYTHRURUS* (WHITE) (COLEOPTERA: BUPRESTIDAE)

By T. J. Hawkeswood
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Abstract

The larva of *Diadoxus erythrurus* (White) is described from material collected from the Dunmore State Forest, south-east Queensland. Comparisons are made with previously described buprestid larvae from Australia [*Prospheres aurantiopicta* (Laporte & Gory) and *Pseudotaenia waterhousei* (Van de Poll)].

Introduction

The general biology of *Diadoxus erythrurus* (White) and *D. scalaris* Laporte & Gory was recently reviewed by Peterson and Hawkeswood (1980). The beetles of this genus are commonly known as cypress pine jewel beetles since they are destructive borers of cypress pine (*Callitris* spp.) and introduced *Cupressus* spp. (Cupressaceae) throughout Australia (Froggatt, 1907; French, 1911; Hadlington and Gardner, 1959; Peterson and Hawkeswood, 1980; Hawkeswood and Peterson, 1982).

The larvae of Australian Buprestidae are poorly known (Hawkeswood and Peterson, 1982) with only the larvae of *Prospheres aurantiopicta* (Laporte & Gory) (Levey, 1978a) and *Pseudotaenia waterhousei* (Van de Poll) (Hawkeswood, 1984) being described in any detail.

Diadoxus erythrurus (White) is perhaps the most economically important Australian buprestid, yet the larva has remained undescribed and the genus is in need of revision. An opportunity to describe the larva recently arose when Messrs M. De Baar and M. Hockey collected live material from the Dunmore State Forest, south-eastern Queensland (*c.* 27°40′S, 150°50′E).

The terminology used for the larval description generally follows that of Benoit (1964, 1966), Bily (1972, 1975a, 1975b) and Hawkeswood (1984).

Description of larva

(Figs 1-10)

Length of last instar 17.0-24.0 mm (mean 19.9), width of the prothorax 4.0-5.2 mm (mean 4.6), width of abdomen 2.2-3.0 mm (mean 2.4). Larva is of the usual buprestid type with an enlarged prothorax into which the head capsule is retracted. Body dark cream to pale orange-yellow in colour, apodous, very weakly sclerotized except for mandibles, epistome, hypostome and spiracles. Epistome and hypostome reddish-brown, strongly sclerotized. Body almost glabrous except for a lateral pubescence of sparse, posteriorly directed hairs on the lateral margins of head, thoracic segments and abdomen and some moderately dense patches of microtrichiae on head.

Head and mouth parts

Epistome (Fig. 2): about 3.8-4.0 times wider than long; anterior margin weakly bisinuate between the mandibular condyles which are large; posterior margin almost straight between the lateral tentorial pits; epistome bearing two, very small, sensory areas (epistomal sensory pits) in the middle. Clypeus (Fig. 2) narrow, membranous, glabrous, dark cream to yellow in colour, about 2.4-2.6 times wider than long, collar-shaped, anterior margin straight. Labrum (Figs 2, 4, 5) pale brown, mostly membranous (weakly sclerotized in some areas); about 1.0-1.2 times wider than long; anterior margin arcuate between prominent rounded lateral lobes; with a fringe of dense, short, stiff setae along the anterior margin and a wider fringe of similar setae on the lateral lobes.

Labrum dorsally (hypopharnyx) with the following setae on either side: one moderately long, sharp seta near the anterior margin of the lateral lobe; a similar seta almost half the distance from the lateral margin to the midline and a slightly longer, sharp seta on the lateral margin about half the distance from the lateral lobe to the anterior margin of the clypeus; ventral surface (epipharynx) with three short, blunt, stiff setae on the lateral lobes just below the anterior margin and a dense covering of short, stiff, sharp setae on most of the epipharynx extending to the lateral lobes.

Antennae (Fig. 7): 3-segmented; 1st segment broadly cylindrical, about 1.1 times longer than wide, with a dense, broad fringe of short, stiff, sharp spines on anterior margin; 2nd segment about 0.8-1.0 times longer than wide, with a dense, broad fringe of short, stiff, sharp spines on the anterior margin and a very long, sharp seta situated a short distance behind apex near external lateral margin; apex of 2nd segment shallowly concave, encircling the 3rd segment which is very small and peg-shaped without spines; 1st segment is situated on a non-sclerotized segment bearing sharp spines.

Mandibles (Fig. 6): black, with two teeth at apex and a sub-apical tooth on the dorso-lateral margin.

Hypostome (Fig. 3): moderately sclerotized; posterior margin slightly arcuate.

Labio-maxillary complex (Fig. 3): maxillary basis (cardo) membranous, fused to the labium, glabrous except for a single, anteriorly directed seta situated on a strongly chitinized sensory area near external posterior angle; stipes moderately sclerotized, glabrous except for a dense fringe of short, spines along anterior and internal lateral margins and a very long, anteriorly directed seta, close to anterior margin near midline. Maxillary palpus (Figs 3, 8): 2-segmented; basal segment about 1.2-1.5 times longer than apical segment, glabrous except for a fringe of short spines on anterior margin and a moderately long, anteriorly directed, sharp seta on external anterior angle. Mala slightly longer than the basal segment of maxillary palpus, with three moderately long, sharp setae at apex and two short, blunt spines on internal lateral margin below anterior margin; anterior margin with a fringe of short, stiff spines. Labium (Fig. 3) pale brown, mostly membranous; prelabium about 2.0 times wider than long; external anterior angle broadly rounded; anterior margin with a broad fringe of short, fine spines; post-labium glabrous, smooth, except for a short, sharp sensory seta situated on a prominently sclerotized area about half way from the lateral margin to midline; labial palpi absent.

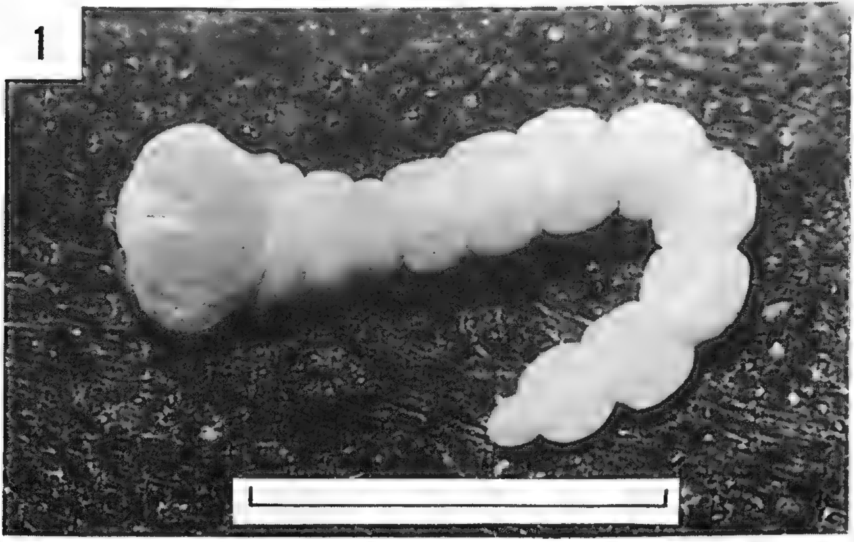
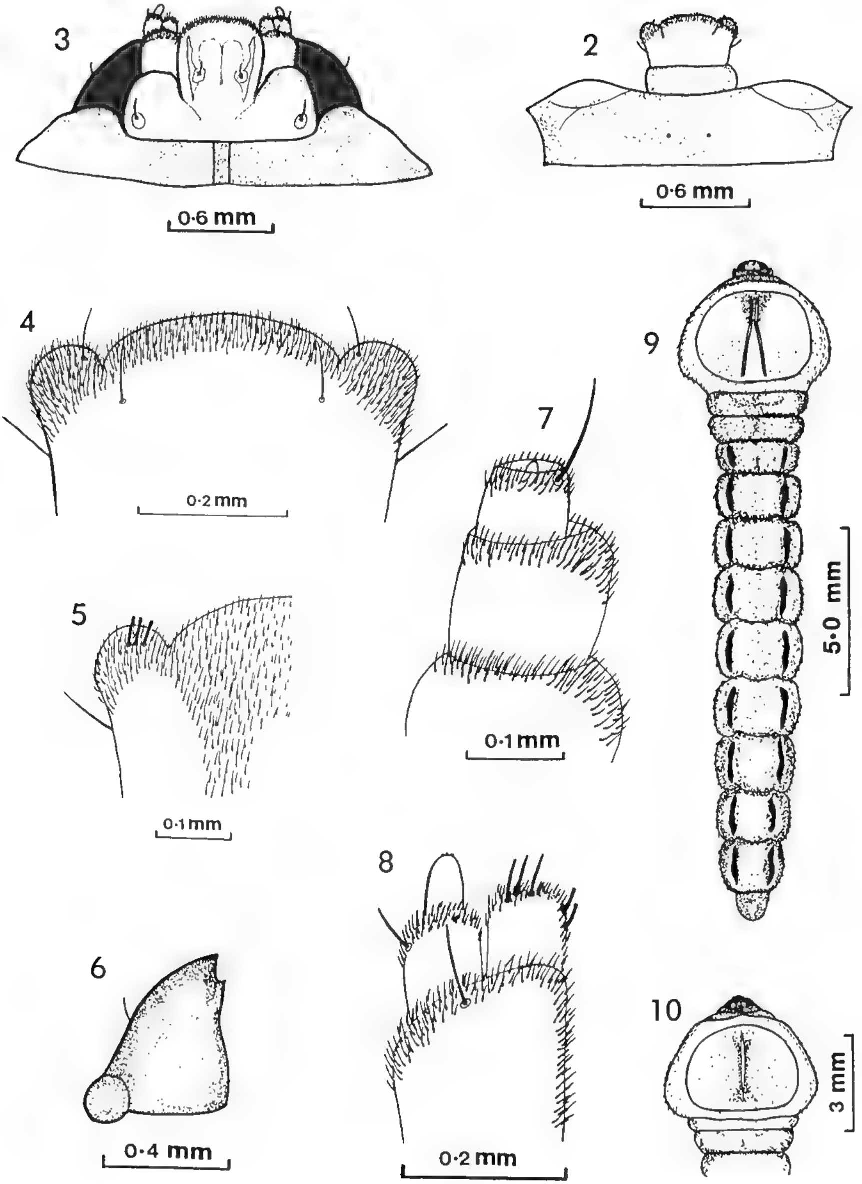


Fig. 1. Larva of *D. erythrurus.* (Scale line = 10 mm).



Figs 2-10. Larva of *D. erythrurus*: (2) epistome, clypeus and labrum; (3) hypostome and labio-maxillary complex; (4) dorsal surface of labrum (hypopharynx) showing arrangement of short, stiff setae and longer setae; (5) ventral surface of half of labrum (epipharynx) showing arrangement of short, stiff setae and blunt spines; (6) left mandible; (7) antennae; (8) stipes, maxillary palp and mala; (9) dorsal view showing thoracic and abdominal segments; (10) ventral view showing thoracic segments.

Thorax

Pro-, meta-, and mesothorax dark cream in colour, without rudiments of legs (see Bily, 1972; Hawkeswood, 1984), mostly glabrous except for a few short, sharp, posteriorly directed setae on lateral margins (Figs 9, 10). Prothorax (Figs 9, 10) 1.8-2.0 times wider than long; dorsal plate with two, well-defined median grooves coalescing anteriorly forming an inverted V-shaped groove then extending almost parallel a short distance, not completely dividing the plate (Fig. 9), whole surface densely covered in orange-brown micro-granules, becoming slightly reticulate towards anterior margin of plate; ventral plate with a single, median groove almost dividing plate (Fig. 10), showing a reticulate pattern of small, dense, orange-brown micro-granules adjacent to the groove in the midline; both plates impunctate, not finely and longitudinally rugose. Mesothorax about 3.0 times wider than long; spiracles narrow and reniform in shape, 0.8-1.0 mm long. Metathorax about 2.5-2.8 times wider than long, without spiracles; ambulatory pads not well developed.

Abdomen

Abdominal segments (Figs 1, 9): cream to yellow in colour; 1st segment about two-thirds width of mesothorax (about 2.0 times wider than long), slightly narrower than the other segments, without ambulatory pads; segments 2-6 of similar size, segments 7-9 becoming progressively smaller, segment 10 the smallest, conical in shape, without paired sclerotized structures. Spiracles broadly reniform in shape, 0.3-0.4 mm long. Thoracic and abdominal segments 1-10 clothed laterally with a few, sparse, usually posteriorly directed, sharp, fine setae.

MATERIAL EXAMINED: 6, Brisbane, ex. sawn timber of *Callitris columellaris* F. Muell. (Cupressaceae), 17 April 1975, "Mikes Supp." (QDF); 3, Dunmore State Forest via Dalby, ex. log billets of *Callitris columellaris* F. Muell., em. 10 Jan. 1982, coll. R. A. Yule, M. Hockey and M. De Baar (QDF).

The record of *C. columellaris* as a larval food plant for *Diadoxus erythrurus* has been previously recorded by Hawkeswood and Peterson (1982).

Discussion

There has been much controversy over the higher classification of the Buprestidae, the main arguments arising from comparative studies of adult morphology. Few systematic studies have been made of larval taxonomy but those that have been completed (e.g. Bily, 1972, 1975a, 1975b; Volkovitsh, 1979), showed important characters separating taxa both at the generic and specific levels.

According to Thery (in Carter, 1929), the genus *Diadoxus* belongs to the subfamily Chalcophorinae (tribe Chalcophorini) along with *Cyria, Cyrioxus, Cyphogastra, Chrysodema, Pseudotaenia, Paracupta, Chalcotaenia* and *Iridotaenia.* However, Levey (1978b) suggested that *Diadoxus, Cyria* and *Cyrioxus* should be included in the tribe Epistomentini (of Chalcophorinae ?) on the basis of adult morphology and stated that the Chalcophorini appeared to be a polyphyletic group. Since all possible evidence is needed to provide a better understanding of their taxonomy, it was hoped that a detailed study of the *Diadoxus* larva may assist by providing comparative data and more characters to be used in taxonomic considerations of closely related groups.

A comparison of the larvae of the only three Australian buprestid species described to date is provided in Table 1, using characters I consider to be of importance in larval taxonomy. Of the 16 characters listed, *Pr. aurantiopicta* shares only two of these with *D. erythrurus* (i.e. similar size and seta on 2nd antennal segment long) and only three with *Ps. waterhousei* (i.e. presence of well-developed ambulatory pads, presence of rudimentary legs, and hypopharynx with four long setae). Using a simple matching coefficient of similarity, a value of 0.12 is obtained between *Pr. aurantiopicta* and *D. erythrurus* and 0.21 between *Pr. aurantiopicta* and *Ps. waterhousei*, indicating, in both cases, a marked dissimilarity between the respective taxa.

On the basis of adult morphology, the status of *Pr. aurantiopicta* in the Polycestinae (Polyctesini) appears valid at this stage, although its larva does not appear to have any affinities with those of *Acmaeoderella* (Volkovitsh, 1979) or *Ptosima* (Bily, 1972), both of which are also placed in the Polycestinae (Bily, 1977).

Diadoxus erythrurus and *Ps. waterhousei* show a closer relationship than between either species and *Pr. aurantiopicta.* They share seven of the 16 characters listed in Table 1, giving a similarity coefficient of 0.44. However, this value is too low to support the retention of *D. erythrurus* in the Chalcophorinae with *Pseudotaenia* as originally proposed by Carter (1929). At present, *D. erythrurus* must remain in the Epistomentini as suggested by Levey (1978b), although no other Epistomentini larvae have been described for comparison.

The larva of *D. erythrurus* appears to be somewhat intermediate between those of *Pr. aurantiopicta* and *Ps. waterhousei*, sharing some characters with

TABLE 1
Comparison of main taxonomic characters between the larvae of *Prospheres aurantiopicta* (Laporte and Gory), *Diadoxus erythrurus* (White) and *Pseudotaenia waterhousei* (Van de Poll)

Pr. aurantiopicta	*D. erythrurus*	*Ps. waterhousei*
* Body length 21-27 mm	Body length 17-24 mm	Body length 68-87 mm
Wide epistome: length/width ratio = 5.0:1.0	Narrow epistome: l/w ratio = 3.5:1.0	Narrow epistome: l/w ratio = 3.5:1.0
Labrum with shallow lateral lobes and biarcuate anterior margin	Labrum with rounded lateral lobes and slightly arcuate anterior margin	Labrum with prominent rounded lateral lobes and arcuate anterior margin
Hypopharynx with 4 long setae	Hypopharynx with 3 long setae	Hypopharynx with 4 long setae
Mandibles with 5 teeth and a large rugose boss on the external face	Mandibles with 3 teeth and a smooth external face	Mandibles with 4 teeth and a smooth external face
† Antennae with spines on apex of 2nd segment only	Antennae with spines at the apex of 1st and 2nd segments	Antennae with spines at the apex of 1st and 2nd segments
Seta on 2nd antennal segment long	Seta on 2nd antennal segment long	Seta on 2nd antennal segment short
Last antennal segment elongate	Last antennal segment short	Last antennal segment short
Mala with 2 sharp setae and 6 blunt spines	Mala with 3 sharp setae and 2 blunt spines	Mala with 4 sharp setae only
Maxillary palpus (1st segment) with one sharp and one blunt spine	Maxillary palpus with no spines or setae	Maxillary palpus with no spines or setae
One groove on dorsal thoracic plate	Two grooves on dorsal thoracic plate	Two grooves on dorsal thoracic plate
Anterior margin of labium biarcuate	Anterior margin of labium arcuate	Anterior margin of labium arcuate
Setose elevations absent from labium	Setose elevations absent from labium	Setose elevations present
Rudimentary legs present	Rudimentary legs absent	Rudimentary legs present
Ambulatory pads well developed	Ambulatory pads poorly developed	Ambulatory pads well developed
Dorsal and ventral prothoracic plates showing a reticulate pattern of micro-granules either side of median grooves	Dorsal plate densely covered with randomly distributed micro-granules; ventral plate with reticulate pattern of micro-granules either side of median grooves	Dorsal and ventral plates with randomly arranged conical asperities

* Levey (1978a) did not provide measurements of the larva nor scales on his drawings of the larva (Figs 9, 10). The dimensions provided above were taken from the following material housed at the Department of Forestry, Brisbane: 3, Kandanga, 17 July 1974, R. A. Yule and F. R. Wylie, "ex sawn and stacked 8 month hoop pine".

† Levey (1978a) regards the antennae of *P. aurantiopicta* as 4-segmented, but according to Bílý (1982, pers comm.) the antennae of almost all Buprestidae are 3-segmented, and the basal or "1st segment" may be regarded as part of the epistome, since it is membranous and differs from the true antennal segments by not being sclerotized.

either species (e.g. microgranules on the prothoracic plates as in *Pr. aurantiopicta*, and two grooves on the dorsal thoracic plate as in *Ps. waterhousei*), but possessing some characters not found in either taxon (e.g. mandibles with 3 teeth) (Table 1).

Morphological studies of buprestid larvae are still in their infancy in Australia but study of further species should benefit contemporary studies dealing with adult morphology and taxonomy because of the complexity of the larvae so far examined and the multitude of characters to utilize.

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References

Benoit, P., 1964. Comparative morphology of some *Chrysobothris* larvae (Coleoptera: Buprestidae) of eastern Canada. *Can. Ent.* 96: 1107-1117.

Benoit, P., 1966. Descriptions of some *Chrysobothris* larvae (Coleoptera, Buprestidae) occurring in the United States and Mexico. *Can. Ent.* 98: 324-330.

Bílý, S., 1972. The larva of *Ptosima flavoguttata* (Illiger) (Coleoptera, Buprestidae). *Acta Ent. Bohemoslav.* 69: 18-22.

Bílý, S., 1975a. Larvae of European species of the genus *Chrysobothris* Eschsch. (Coleoptera, Buprestidae). *Acta Ent. Bohemoslav.* 72: 418-424.

Bílý, S., 1975b. The larvae of eight species of genus *Anthaxia* Eschscholtz, 1829 from the central Europe (Coleoptera, Buprestidae). *Studia Ent. Forestalia* 2: 63-82.

Bílý, S., 1977. *Key to the jewel beetles of Czechoslovakia (Buprestidae, Coleoptera).* Academia Praha, Czechoslovakia. 51 pp. (In Czech).

Carter, H. J., 1929. A check list of the Australian Buprestidae. *Aust. Zool.* 5: 265-304.

French, C., 1911. *Handbook of destructive insects of Victoria.* Gov. Printer, Melb.

Froggatt, W. W., 1907. *Australian insects.* W. Brooks and Co., Sydney. 449 pp.

Hadlington, P. and Gardner, M. J., 1959. *Diadoxus erythrurus* (White) (Coleoptera-Buprestidae), attack of fire-damaged *Callitris* spp. *Proc. Linn. Soc. N.S.W.* 84: 325-332, pl. XVI.

Hawkeswood, T. J. 1984. The larva of *Pseudotaeria waterhousei* (Van de Poll) (Coleoptera: Buprestidae). *Aust. J. Nat. Hist.* 1 (in press).

Hawkeswood, T. J. and Peterson, M., 1982. A review of larval host records for Australian jewel beetles (Coleoptera: Buprestidae). *Victorian Nat.* 99: 240-251.

Levey, B., 1978a. A taxonomic revision of the genus *Prospheres* (Coleoptera: Buprestidae). *Aust. J. Zool.* 26: 713-726.

Levey, B., 1978b. A new tribe, Epistomentini, of Buprestidae (Coleoptera) with a redefinition of the tribe Chrysochroini. *Syst. Zool.* 3: 153-158.

Peterson, M. and Hawkeswood, T. J., 1980. Notes on the biology and distribution of two species of *Diadoxus* (Coleoptera: Buprestidae) in Western Australia. *West. Aust. Nat.* 14: 228-233.

Volkovitsh, M., 1979. On the larval morphology of buprestid beetles on the genus *Acmaeoderella* Cobos (Coleoptera, Buprestidae). *Proc. Zool. Inst. USSR.* 73: 21-38. (In Russian with English summary).

NOTES ON THE TAXONOMY AND DISTRIBUTION OF INDO-AUSTRALIAN PAPILIONIDAE (LEPIDOPTERA)

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Abstract

Notes are presented on: (i) the type locality of *Princeps albinus* (Wallace), (ii) the subspecies and synonymy of *P. pitmani* (Elwes & de Niceville) and *P. hipponous* (C. & R. Felder), (iii) the populations of supposed *P. canopus* (Westwood) in the Solomon Islands and Vanuatu, (iv) the systematic position of *Graphium meeki* (Rothschild & Jordan), (v) the systematic position and synonymy of *G. mendana* (Godman & Salvin), and (vi) the occurrence of *G. macleayanum* (Leach) in Papua New Guinea.

Introduction

Additional information has become available since Hancock (1983a, b) went to press, enabling these papers to be updated and some taxonomic uncertainties relating to Indo-Australian Papilionidae to be resolved.

In a study of the *Papilio fuscus* group, Hancock (1983a) tentatively assigned the type locality of *P. albinus* Wallace to Humboldt Bay, and accorded species status to *P. pitmani* Elwes & de Niceville and *P. hypsicles* Hewitson. Two subspecies each were recognized in *P. pitmani* and *P. hipponous* C. & R. Felder. D'Abrera (1982), following earlier authors, included *P. pitmani* in *P. hipponous* and recognized five subspecies in the latter. Samson (1982) included *P. hypsicles* in *P. canopus* Westwood and described two new subspecies of the latter from the Solomon Islands and Vanuatu. Racheli & Haugum (1983) transferred *P. heringi* Niepelt to the *fuscus* group but Hancock (1983c) suggested that this species was a hybrid between *P. fuscus* Goeze and *P. tydeus* C. & R. Felder.

Hancock (1983b) revised the classification of the Papilionidae, splitting the genus *Papilio* Linnaeus into six genera and assigning all the species in the family into species-groups. Some of these species were assigned tentatively to groups, pending further information, particularly on the male genitalia. Miller & Miller (1981) have provided this information for *Graphium meeki* (Rothschild & Jordan) and *G. mendana* (Godamn & Salvin), and their systematic positions can now be resolved. In Hancock (1983b), *G. meeki* was provisionally included in the *agamemnon* group, whilst *G. mendana* was assigned to a group of its own.

This paper attempts to resolve the taxonomic uncertainties concerning *P. albinus, G. meeki* and *G. mendana*, and the disparities between the classifications of D'Abrera (1982) and Samson (1982) on the one hand, and of Hancock (1983a) on the other, for the taxa *P. pitmani, P. hipponous, P. hypsicles* and *P. canopus.* In addition, the occurrence of *Graphium macleayanum* (Leach) in Papua New Guinea is discussed. The status of *P. heringi* has been discussed by Hancock (1983c) and need not be commented upon further. All the species of *Papilio* mentioned above were transferred to *Princeps* Hübner by Hancock (1983b).

Type locality of *Princeps albinus* (Wallace)

Hancock (1983a) noted that the type locality of *Papilio albinus* Wallace was New Guinea, possibly Humboldt Bay. This was incorrect. Wallace (1865, p. 36), in his discussion of the Papilionidae of this region, referred to 'New Guinea' as a locality on several occasions but the only indications of more precise localities are given as 'Dorey' and 'south-west coast of New Guinea'. Although Dorey appears to have been Wallace's only landing in New Guinea, his collectors spent a month at Amberbaki, a coastal village approximately 160 km west of Dorey (Wallace 1869). *P. albinus* apparently was described from more than one male and, as Dorey was not listed as a specific locality (unlike other instances), it is likely that Wallace had specimens from both Dorey and Amberbaki, but not from Humboldt Bay. Dorey (= Manokwari), West Irian, is therefore selected as the type locality. Rothschild (1895) also recorded *albinus* from Dorey and Amberbaki, and added Sekar (Onin Peninsula, north of Fak Fak) and Humboldt Bay to the distribution.

Subspecies and synonymy in *Princeps pitmani* (Elwes & de Niceville) and *P. hipponous* (C. & R. Felder)

Both Jordan (1908-10) and D'Abrera (1982) included *pitmani* and several other taxa as subspecies of *P. hipponous.* Hancock (1983a) recognized *pitmani* as a distinct species and accepted only two subspecies for each species. The synonymy and distribution of these subspecies are listed below:

Princeps pitmani pitmani (Elwes & de Niceville)

Papilio pitmani Elwes & de Niceville, 1886, *J. Asiat. Soc. Bengal* 54: 434. Type locality Tavoy (Tenasserim, S Burma).

Papilio hipponous pitmani Elwes & de Niceville; Jordan, 1909: 59.

Papilio hipponous siamensis Godfrey, 1916, *J. nat. Hist. Soc. Siam* 2: 110. Type locality Pak Jong, E Siam (= Thailand).

Recorded from S Burma and Thailand. The harpe has been illustrated by Racheli & Haugum (1983), who also recognized this species as distinct from *hipponous.*

Princeps pitmani duboisi (Vitalis de Salvaza)

Papilio hipponous duboisi Vitalis de Salvaza, 1921, *Faune ent. Indo-Chine fr.* 3: 12. Type locality Thado, Annam (= N Vietman).

Papilio pitmani duboisi Vitalis de Salvaza; Hancock, 1983a: 65. Recorded from Vietnam. The type locality is Thado, Vinh Province, not Tao as previously noted (Hancock 1983a), this being the collector's name.

Princeps hipponous hipponous (C. & R. Felder)

Papilio hipponous C. & R. Felder, 1862, *Wien. ent. Monatsschr.* 6: 283. Type locality Luzon, Philippines.

Papilio hipponous bazilanus Fruhstorfer, 1899, *Berl. ent. Z.* 43: 420. Type locality Bazilan, Philippines; **syn. nov.**

Papilio pitmani leptosephus Fruhstorfer, 1909, *Ent. Z.*, Stuttgart 22: 178. Type locality 'Assam', apparently erroneous; **syn. nov.**

Papilio hipponous leptosephus Fruhstorfer; Jordan, 1909: 59.

P. hipponous was described originally from Luzon and Mindanao but Felder & Felder (1865) re-described the species only from Luzon and this should therefore be regarded as the type locality. *P. h. bazilanus* was described from Bazilan I. but Fruhstorfer (1899) suggested that specimens from Palawan and Banguey (Banggi) also belonged with this taxon. Jordan (1908-10) also included specimens from Mindanao and Bohol, whereas Fruhstorfer (1899) had referred specimens from these islands to typical *hipponous*, following Rothschild (1895). The species appears to be somewhat variable, perhaps clinally, and *bazilanus* does not appear to represent a distinct subspecies. *P. h. leptosephus* was described from Assam but Fruhstorfer (1909) doubted the locality. Jordan (1908-10) noted its similarity to *bazilanus* and the description suggests that it really did come from the Philippines.

Recorded from all the major islands of the Philippines (Luzon, Mindoro, Panay, Negros, Cebu, Bohol, Leyte, Samar, Mindanao, Bazilan, Palawan) and Banggi I.

Princeps hipponous lunifer (Rothschild)

Papilio hipponous lunifer Rothschild, 1894, *Novit. zool.* 1: 687. Type locality Sangir I.

Recorded from Sangir and Talaud Is, NE of Sulawesi, Indonesia.

Populations of supposed *Princeps canopus* (Westwood) in the Solomon Islands and Vanuatu

Samson (1982) described and figured two new subspecies of *P. canopus* from San Cristobal, Solomon Islands and southern Vanuatu (New Hebrides). Hancock (1983a) regarded *P. hypsicles* from Vanuatu as a distinct species; thus the subspecies nomenclature in that species is as follows:

Princeps hypsicles hypsicles (Hewitson)

Papilio hypsicles Hewitson, 1868, *Exot. Butt.* 4: pl. 9, f. 29. Type locality New Hebrides (= Vanuatu).

Papilio canopus hypsicles Hewitson; Rothschild, 1895, *Novit. zool.* 2: 341.

Since two subspecies are now known to occur in Vanuatu, it seems advisable to restrict the type locality of the typical subspecies. Accordingly, Esperitu Santo is selected as the type locality. This subspecies occurs in northern and central Vanuatu (Esperitu Santo, Aoba, Malekula, Paama, Epi, Efate). *Micromelum* (Rutaceae) is an apparent larval foodplant (Samson 1982).

Princeps hypsicles burgessi (Samson); **comb. nov.**

Papilio canopus burgessi Samson, 1982, *Pacif. Ins.* 24: 230. Type locality Fatuna I., Vanuatu.

Recorded from southern Vanuatu (Fatuna, Erromango, Tanna, Aneityum). The larva has been recorded on *Citrus* (Samson 1982). This is a darker subspecies, with narrower pale bands and a blacker ground colour.

The status of the San Cristobal subspecies, *P. canopus cristobalensis* (Samson), is less clear. Described from a single female, it was separated from *P. fuscus xenophilus* (Mathew) on the basis of more clearly demarcated pale bands, that of the fore wing being straighter and yellower, than in the latter. However, since true *canopus* is not known from this region, it is unlikely that a subspecies attributable to it should occur on San Cristobal. *P. c. cristobalensis* does not have the more-or-less vertical fore wing band and narrow hind wing band characteristic of *P. hypsicles*, suggesting that it is not related to that species.

Since San Cristobal *P. fuscus xenophilus* is phenotypically close to *P. canopus* to begin with, it appears most likely that *cristobalensis* is merely a variety of *xenophilus*. In pattern details, the figure of *cristobalensis* (Samson 1982) agrees very closely with those of *xenophilus* illustrated by Racheli (1980). It should be noted that the curvature of the fore wing band is variable in *P. fuscus capaneus* (Westwood), and presumably in other subspecies as well. It is also possible that the yellowing of the pale areas in *cristobalensis* has occurred post-mortem. This example emphasises that care should always be taken when describing a new taxon from a single specimen, especially when it occurs sympatrically with a closely related species. *P. canopus cristobalensis* is placed here as a new synonym of *P. fuscus xenophilus,* which Racheli (1980) considered to be restricted to Ugi and San Cristobal (type locality Ugi).

Systematic position of *Graphium meeki* (Rothschild & Jordan)

Hancock (1983b) placed *G. meeki* in the *agamemnon* group on pattern characters, no information on the male genitalia being available at the time of writing. Both male and female genitalia were described and figured by Miller & Miller (1981) and these confirm that *meeki* is related to *G. agamemnon* (Linnaeus) and *G. macfarlanei* (Butler). Male and female genitalia of the latter two species were figured by Saigusa, *et al.* (1977) and, especially in the female, show great similarities to *meeki.* Characters of wing shape, number of red spots on the underside of the hind wing, and male genitalia (particularly the aedeagus), show that *meeki* is more closely related to *macfarlanei* than to *agamemnon*, contrary to the arrangement of Saigusa *et al.* (1977). This is supported by zoogeographic evidence where *agamemnon, macfarlanei* and *meeki* appear to have originated in Sundaland, New Guinea and the Solomon Islands, respectively.

A distinctive feature of the male genitalia in all three species is the submarginal rows of well developed, inwardly pointing setae towards the posterior margin of the inner surface of the valva.

Two subspecies of *G. meeki* have been described. *G. m. meeki* occurs on Santa Isabel and *G. m. inexpectatus* J. & L. Miller occurs on Bougainville. Records from Choiseul (Racheli 1980) possibly belong to the latter subspecies. There is a female from Bougainville in the Australian National Insect Collection, Canberra.

The *agamemnon* species-group: systematic position and synonymy of *Graphium mendana* (Godman & Salvin)

Hancock (1983b) placed *G. mendana* in a monotypic group close to the *wallacei* group, and noted that available information suggested that the male genitalia were similar to *G. eurypylus* (Linnaeus), since Munroe (1961) had included *mendana* in his *eurypulus* group without any indication of uncertainty. However, the genitalia have been described and figured by Miller & Miller (1981), and it is evident that they are not of the *eurypylus* type. They are close to those of the *agamemnon* group, being reminiscent of *G. agamemnon* in many respects, particularly the curved aedeagus. The apical region of the valva is serrate in *agamemnon, macfarlanei, meeki* and *mendana,* whereas in the *wallacei* group this part of the valva is obscured by an expansion of the harpe. The *wallacei* group appears to be closely related to the *agamemnon* group and to *mendana* in other characters and the similarities in structure between the harpes of the *wallacei* and *eurypylus* groups thus appear to be superficial.

Despite the great similarity between the aedeagi of *mendana* and *agamemnon*, the lack of the submarginal rows of inwardly directed setae on the valva of *mendana* suggests that it is not as closely related to *agamemnon, macfarlanei* and *meeki* as Saigusa *et al.* (1977) suggest. However, the overall similarities of the *agamemnon, mendana* and *wallacei* groups are now clear and I agree with Saigusa *et al.* (1977) that all these species should be placed in a single group.

The enlarged *agamemnon* species-group can be divided into three subgroups, viz: *agamemnon* subgroup–*agamemnon, macfarlanei, meeki; mendana* subgroup–*mendana*; *wallacei* subgroup–*wallacei* (Hewitson), *hicetaon* (Mathew), *browni* (Godman & Salvin). The *mendana* and *wallacei* subgroups are closely allied.

Four subspecies of *G. mendana* are recognized (Racheli 1980), viz: *G. m. mendana* from Guadalcanal, *G. m. neyra* (Rothschild) from New Georgia, *G. m. acous* (Ribbe) from Bougainville and *G. m. aureofasciatum* Racheli from Malaita. *G. mendana malaitae* J. & L. Miller, 1981, is a synonym of *G. m. aureofasciatum* Racheli, 1979.

The *agamemnon* species-group is closely related to the *sarpedon* group, which is also divisible into three subgroups, viz: *sarpedon* subgroup–*sarpedon* (Linnaeus), *monticolum* (Fruhstorfer), *cloanthus* (Westwood), *sumatranum* (Hagen), *sandawanum* Yamamoto; *codrus* subgroup–*codrus* (Cramer), *empedovana* (Corbet); *macleayanum* subgroup–*gelon* (Boisduval), *macleayanum* (Leach), *weiskei* (Ribbe), *stresemanni* (Rothschild), *batjanensis* Okano.

The occurrence of *Graphium macleayanum* (Leach) in Papua New Guinea

Sands & Fenner (1978) recorded two specimens of *G. macleayanum* from the Chimbu and West Sepik Provinces of Papua New Guinea. Whilst there is no doubt that these specimens were collected in the areas stated, some doubt does exist as to their origin, suggested by the following: The three mainland Australian–Tasmanian subspecies show a cline in pattern characters, with the northern race *wilsoni* Couchman having the fore wing basal areas mostly white and only suffused with green along the costa, and the postdiscal spots relatively small. The hind wing underside does not have the brown postdiscal band divided by a pale suffusion. In the southern (Tasmanian) race *moggana* Couchman, the fore wing basal areas are almost entirely green and the postdiscal spots are large. The hind wing shows strong pale suffusions in the brown postdiscal band. The typical race, from S Queensland to Victoria, is intermediate in these characters, with specimens from S Queensland and N New South Wales being a little closer to *wilsoni* in pattern than those from further south, especially in the extent of the green suffusion on the fore wing.

The Papua New Guinea specimens closely resemble those from these southern Queensland–northern New South Wales populations, not the northern *wilsoni* populations. They are not separable as a further subspecies, contrary to expectation on geographical grounds. The subspecies occurring in Papua New Guinea thus appears to be typical *macleayanum* and supports the suggestion by resident lepidopterists (see Haugum & Samson 1980) that the species has been artificially introduced to the region.

G. macleayanum occurs alongside the closely related *G. weiskei* at its known localities in Papua New Guinea (Sands & Fenner 1978) and it will be interesting to see whether these populations of *macleayanum* become established or die out as a result of competition from *weiskei.*

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References

D'Abrera, B., 1982. *Butterflies of the Oriental Region.* Part 1. Ferny Creek: Hill House.

Felder, C. and Felder, R., 1865. *Reise der Osterreichischen Fregatte "Novara" um die Erde . . .* Zool. Theil, Vol. 2, Part 2(1). Lepidoptera, Rhopalocera. Vienna.

Fruhstorfer, H., 1899. Neue *Papilio*-Formen aus dem Malayischen Archipel. *Berl. ent. Z.* 43: 419-430.

Fruhstorfer, H., 1909. Neue asiatische *Papilio*-Rassen. *Ent. Z., Stuttgart* 22: 177-179.

Hancock, D. L., 1983a. Phylogeny and relationships of the *Papilio fuscus* group of swallowtails (Lepidoptera: Papilionidae). *Aust. ent. Mag.* 9: 63-70.

Hancock, D. L., 1983b. Classification of the Papilionidae (Lepidoptera): a phylogenetic approach. *Smithersia* 2: 1-48.

Hancock, D. L., 1983c. *Princeps aegeus* (Donovan) and its allies (Lepidoptera: Papilionidae): systematics, phylogeny and biogeography. *Aust. J. Zool.* 31: 771-797.

Haugum, J. and Samson, C., 1980. Notes on *Graphium weiskei. Lepid. Group 1968, Suppl.* 8: 1-12.

Jordan, K., 1908-10. Family: Papilionidae, Swallowtails (part only). *In* Seitz, A. (ed.) *Die Gross-Schmetterlinge der Erde.* Vol. 9. Faune Indo-Australische. Alfred Kernen, Stuttgart.

Miller, J. Y. and Miller, L. D., 1981. Taxonomic notes on some *Graphium* species from the Solomon Islands. *Bull. Allyn Mus.* 65: 1-7.

Munroe, E., 1961. The classification of the Papilionidae (Lepidoptera). *Can. Ent.* Suppl. 17: 1-51.

Racheli, T., 1980. A list of the Papilionidae (Lepidoptera) of the Solomon Islands, with notes on their geographical distribution. *Aust. ent. Mag.* 7: 45-60.

Racheli, T. and Haugum, J., 1983. On the status of *Papilio heringi* Niepelt 1924. *Papilio International* 1: 37-45.

Rothschild, W., 1895. A revision of the papilios of the Eastern Hemisphere, exclusive of Africa. *Novit. zool.* 2: 167-463, pl. VI.

Saigusa, T., Nakanishi, A., Shima, H. and Yata, O., 1977. Phylogeny and biogeography of the subgenus *Graphium* Scopoli (Lepidoptera: Papilionidae, Graphium). *Cho* 1: 2-32, 6 pls. In Japanese.

Samson, C., 1982. Two new subspecies of *Papilio canopus* (Lepidoptera: Papilionidae) from the Solomons and Vanuatu. *Pacif. Insects.* 24: 228-231.

Sands, D. P. A. and Fenner, T. L., 1978. New butterfly records from the New Guinea region. *Aust. ent. Mag.* 4: 101-108.

Wallace, A. R., 1865. On the phenomena of variation and geographical distribution as illustrated by the Papilionidae of the Malayan region. *Trans. Linn. Soc. Lond.* 25: 1-71.

Wallace, A. R., 1869. *The Malay Archipelago: the land of the orang-utan and the bird of paradise.* London.

NEW RECORDS OF *POGONELLA BISPINUS* (STÅL) (HOMOPTERA: MEMBRACIDAE) FROM EASTERN AUSTRALIA AND BARROW ISLAND, WESTERN AUSTRALIA

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Abstract

This paper gives new locality records for *Pogonella bispinus* (Stål) (Membracidae) in eastern Australia and on Barrow Island, north-western Western Australia, and records *Plumbago zeylanica* as a host plant.

Introduction

Stål (1869) described *Acanthucus bispinus* from "New Holland". Funkhouser (1950) gave the following distribution for this species: Australia; Homebush, Tweed River, Sydney, Maitland (New South Wales); Clermont (Queensland); Victoria; Tasmania; Swan River (Western Australia). Evans (1966) included *A. bispinus* in his genus *Pogonella*, mentioned the type locality as "New Holland" and gave as the "known distribution elsewhere" –Blackheath, Mullaley (New South Wales); Fern Tree Gully, Timbertop (Victoria); Lord Howe Island". At the same time he placed in synonymy with it *A. euryone* Kirkaldy and *A. eurynomus* Kirkaldy but did not mention any localities for those species, the type localities for which are Sydney and Bundaberg respectively. Kirkaldy (1907), when describing *A. euryone* and *A. eurynomus*, also recorded *A. ?bispinus* from Cairns and Brisbane.

The species is thus recorded from scattered localities from northern Queensland to southern Victoria, with one record from the southwest of Western Australia.

New records

Between 2nd and 16th May 1982 I collected 4 ♂ and 5 ♀ of *P. bispinus* from *Plumbago zeylanica* on Barrow Island, off the north-western coast of Western Australia (20°46′S, 115°24′E). This material represents a considerable extension of known range and *P. zeylanica* appears to be the first host plant to be recorded for this species. *P. bispinus* was the only membracid found on Barrow Island.

Unrecorded material in the Australian Museum collections from within the previously known range is as follows: New South Wales: 2 ♀, Nandewar Rge., near Narrabri, 6-7.xi.1932, K. C. McKeown. 1 ♀, Iluka, Clarence R., 18.i.1971, D. K. McAlpine and A. Hughes. 1 ♀, Huonbrook, near Mullimbimbi, 2.iii.1965, D. K. McAlpine. 1 ♀, at m.v. lamp, Whian Whian State Forest, near Lismore, 25.ii.1965, D. K. McAlpine and R. Lossin. 1 ♀, same locality and collectors, 26.ii.1965. 1 ♀, Royal National Park, 12.iii.1927, A. Musgrave. 1 ♀, same locality, 6.xii.1958, D. K. McAlpine. 2 ♀, Walcha, 9.xi.1932, K. C. McKeown. 1 ♀, Brooklana, E. Dorrigo, ii.1929, W. Heron. 2 ♀, 1 ♂, Bogan R., J. Armstrong. Queensland: 1 ♀, National Park, Macpherson Range, xii.1926, A. Musgrave. 2 ♀, Cunnamulla, x.1943, N. Geary. 1 ♀, One Tree Hill, Brisbane, 12.xii.1925, A. Musgrave. 1 ♀, Bunya Mt; 20.xii.1937, N. Geary. 1 ♀, National Park, iii.1921, G. H. Hardy.

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References

Evans, J. W., 1966. The leafhoppers and froghoppers of Australia and New Zealand (Homoptera: Cicadelloidea and Cercopoidea). *Mem. Aust. Mus.* 12: 1-347, 48 figs.

Kirkaldy, G. W., 1907. Leaf-hoppers–supplement. (Hemiptera). *Bull. Hawaiian Sugar Planter's Assoc. Div. Ent.* 3: 1-186, 20 pls.

Stål, C., 1869. Bidrag till Membacidernas Kännedom. *Ofvers. VetenskAkad. Forh., Stockholm* 26: 231-300.

Funkhouser, W. D., 1950. Membracidae. *Genera Insectorum* 208: 383 pp., 14 pls.

ANTS ATTENDANT ON *OGYRIS AMARYLLIS AMATA* WATERHOUSE (LEPIDOPTERA: LYCAENIDAE)

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Ferguson (1983) recorded both *Iridomyrmex* and *Camponotus* ants attending *Ogyris amaryllis amata* larvae and pupae at Coppins Crossing, A.C.T. In the same area in October 1983 a single pre-pupa was found in a borer hole occupied by *Crematogaster* ants. No other ant genera were observed on this particular tree. *Iridomyrmex, Camponotus* and *Crematogaster* ants, were found on other trees in the area together with some unidentified ants, however no *Ogyris* larvae or pupae were found.

In the nearby Cotter area many pupal cases were found in borer holes occupied by *Iridomyrmex* ants. *Crematogaster* ants were present on some trees but no evidence of *Ogyris* larvae or pupae was found with them.

Ogyris amaryllis is rarely attended by ants other than *Iridomyrmex.* Atsatt (1981) has observed that the presence of ants (*Iridomyrmex*) stimulates *O. amaryllis* to oviposit. It is not known if *Crematogaster* or *Camponotus* ants also stimulate oviposition or if these ants assume attendant roles in the absence of *Iridomyrmex* ants.

References

Atsatt, P. R., 1981. Ant dependent food plant selection by the mistletoe butterfly *Ogyris amaryllis* (Lycaenidae). *Oecol.* 48: 60-63.

Ferguson, D. J., 1983. *Ogyris amaryllis amata* Waterhouse (Lepidoptera: Lycaenidae) tended by *Camponotus* ants. *Aust. ent. Mag.* 10(4): 58.

BOOK REVIEWS

A field companion to the butterflies of Australia and New Zealand by Bernard d'Abrera. 1984. 176 pp., illustrated in colour and black and white. Five Mile Press, Canterbury, Victoria. $14.95

When I received the copy of this well bound, compact field guide I was delighted to think that it would be a convenient, easily carried, sturdy field companion. I was disappointed to find that, even with a fairly cursory examination, there were at least a dozen errors or statements of doubtful validity in the first thirty pages. This is an unacceptable level of inaccuracy. While most of the illustrations could be used for identification some are badly reproduced and would be misleading to the uninitiated.

I find the lack of an index inconvenient in a reference work. There are some inconsistencies in presentation of the information on each species. In some cases the early stages are described under a separate heading, in others not. The spaces allocated in the text for the reader to record his own observations on each species become progressively fewer towards the back of the book and are, in any case, probably of little real use.

The book gives the impression of having been hastily compiled. Loose wording is probably responsible for some of the misleading imprecision in describing some of the concepts discussed in the introductory sections. Better checking would also have ensured, for example, that the discussion of 'races' and 'subspecies' would not have been omitted; I cannot find it under 'classification' as promised on page 14.

The names of authors of species are not placed in brackets in very many cases where scientific convention demands they should be. References for published work are given by author, date and often page in the text but there is no list of references to which a reader can refer to locate the original material. There are four pages of photographs of Australian habitats of which the significance is not apparent from the text. The introduction contains comments which, in my view, would have been better omitted.

Overall a disappointing and in several respects, an irritating book which had a great potential for usefulness which is not achieved. It is a book which could be misleading to the beginner and is of little value to the expert. I wonder if the publishers sought outside opinion from experienced entomologists before venturing to publish it. As it is, the book does credit to neither author nor publisher.

C. N. SMITHERS

Plant and Insect Nematodes edited by William R. Nickle. 1984. 944 pages, illustr. Marcel Dekker Inc., P.O. Box 5005, Cimarron Rd, Monticello, N.Y. 12701, U.S.A. Price US$174.00 ($145 in U.S. and Canada).

Thirty-five leading scientists from around the world (including Dr R. A. Bedding, CSIRO, Australia and Dr W. M. Wouts, DSIR, New Zealand) have combined to produce this comprehensive and authorative text. A selection of titles from the 24 chapters provides an idea of the scope of the work: Nematode parasites of cotton (20 pp.); Nematode parasites of citrus (40 pp.); Nematode parasites of sugarcane (18 pp.); History, development, and importance of insect nematology (28 pp.); Nematode parasites of Orthopterans (30 pp.), Hymenoptera (42 pp.) and mosquitoes (24 pp.). More than 3,000 literature references are included plus a comprehensive index of 27 pages.

Although chapters emphasise the major crops and insects affected by nematodes there is also extensive data concerning nematode biology and some taxonomy. It is a book that every nematologist and applied entomologist should consult; the high cost of the book will no doubt preclude many from purchasing a private copy but it should at the very least, be on the shelves of all agricultural libraries.

M. MOULDS

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

AIREY, Joan

1980. The birth of an adult cicada. *Wildlife Aust.* 17(4): 112-113, illustr.

ALLBROOK, Piers

1979. *Tasmanian Odonata.* Fauna of Tasmania Committee, University of Tasmania. 84 pp., 27 maps, 107 text-figs.

ANDERSON, J. M. E.

1981. Seasonal field analyses of fat content, live weight, dry weight and water content of the aphidophagous *Scymnodes lividigaster* (Mulsant) and mycophagous *Leptothea galbula* (Mulsant) (Coleoptera: Coccinellidae). *Aust. J. Zool.* 29(5): 679-689, tables 1-2, text-figs 1-5.

ATTIA, F. I.

1981. Insecticide resistance in pyralid moths of grain and stored products. *Gen. appl. Ent.* 13: 3-8, 1 table, 2 text-figs.

1982. Comparative studies on the biology of *Nysius vinitor* Bergroth and *N. clevelandensis* Evans (Hemiptera: Lygaeidae). *Gen. appl. Ent.* 14: 15-20, 5 tables.

ATTIA, F. I. and GREENING, H. G.

1981. Survey of resistance to phosphine in coleopterous pests of grain and stored products in New South Wales. *Gen. appl. Ent.* 13: 93-97, 3 tables.

AUSTIN, A. D.

1981. The types of Australian species in the tribes Idrini, Baeini and Embidobiini (Hymenoptera: Scelionidae: Scelioninae). *Gen. appl. Ent.* 13: 81-92.

BISHOP, A. L. and BLOOD, P. R. B.

1981. Interactions between natural populations of spiders and pests in cotton and their importance to cotton production in south-eastern Queensland. *Gen. appl. Ent.* 13: 98-104, 1 table, text-figs 1-3.

BISHOP, A. L. and HOLTKAMP, R. H.

1982. The arthropod fauna of lucerne in the Hunter Valley, New South Wales. *Gen. appl. Ent.* 14: 21-32, 2 tables.

BORCH, Harry

OBITUARY. *Victorian Ent.* 11(2): 20.

BROWN, Jean

1983. A study of Lepidoptera of the Manning River District NSW. *Victorian Ent.* 13(5): 59-61.
Lepidoptera: butterflies only

BUGEJA, Joseph and SUNDHOLM, Allen

1982. To rear a butterfly. *Koolewong* 11(3): 5-7, illustr.
Lepidoptera: *Papilio anactus*

CALLAN, E. McC.

1980. Erroneous record of the mud-dauber wasp, *Sceliphron laetum* (Hymenoptera: Sphecidae), in New Zealand. *N.Z. Ent.* 7(2): 134-135.

1984. Notes on a sleeping aggregation of *Prionyx globosus* (F. Smith) (Hymenoptera: Sphecidae). *Aust. ent. Mag.* 11(2): 38.

CANTRELL, B. K.

1981. Redescription of *Parasarcophaga reposita* Lopes (Diptera: Sarcophagidae). *Aust. ent. Mag.* 8(2, 3): 29-35, text-figs 1-13.

1983. Revision of the Australian species of *Euthera* Loew (Diptera: Tachinidae). *J. Aust. ent. Soc.* 22(1): 53-59, text-figs 1-23.

1984. Insects associated with *Alocasia macrorrhiza* (L.) G. Don (Araceae) in Queensland. *Aust. ent. Mag.* 10(6): 85-88, 1 table.

CARVER, Mary and HALES, Dinah F.

1983. Two new additions to the aphid fauna of Australia (Homoptera: Aphididae). *J. Aust. ent. Soc.* 22(4): 297-298, 1 table.

CARWARDINE, Peter
1981. Excursion to Cathedral Range. *Victorian Ent.* 11(3): 31.
Lepidoptera: *Jalmenus evagoras, Pieris rapae, Heteronympha merope*
CASIMIR, M.
1983. Locusts and grasshoppers in New South Wales. *Circ. ent. Soc. N.S.W.* 332: 15-16. [Summary of talk presented to the Society.]
CHADWICK, C. E.
1981. *Pittosporum* flies. *Koolewong* 10(4): 4, 18.
Diptera: *Phytobia pittosporophylli, P. pittosporocaulis*
1984. No title. *In* Notes and exhibits. *Circ. ent. Sect. R. zool. Soc. N.S.W.* 30: 24.
Hemiptera: Cicadidae: *Cyclochila australasiae*
CLARK, J. T.
1974. *Stick and leaf insects.* Barry Shurlock, Winchester, Hartshire. Pp. viii, 65, illustr.
CLIFT, A. D. and TOFFOLON, R. B.
1982. Laboratory screening of insecticides against larvae of the lawn armyworm, *Spodoptera mauritia* (Boisduval) (Lepidoptera: Noctuidae). *Gen. appl. Ent.* 14: 13-14, 1 table.
DALLWITZ, R.
1983. Apparatus for collecting blowfly larvae leaving struck sheep. *Gen. appl. Ent.* 15: 35-36, text-figs 1 & 2.
de LITTLE, D. W.
1982. Field parasitization of larval populations of the *Eucalyptus*-defoliating leaf-beetle, *Chrysophtharta bimaculata* (Olivier) (Coleoptera: Chrysomelidae). *Gen. appl. Ent.* 14: 3-6, 3 tables.
DOHERTY, R. L., CARLEY, J. G., KAY, B. H., FILIPPICH, Cheryl, MARKS, Elizabeth N. and FRAZIER, Christina L.
1979. Isolation of virus strains from mosquitoes collected in Queensland, 1972-1976. *AJEBAK* 57(5): 509-520, tables 1-4.
DOLVA, June M. and SCOTT, John K.
1982. The association between the mealybug, *Pseudococcus macrozamiae,* ants and cycad *Macrozamia reidlei* in a fire-prone environment. *J. R. Soc. West. Aust.* 65(2): 33-36, tables 1-7.
DUNN, K. L.
1983. New distribution records for some Queensland butterflies. *Aust. ent. Mag.* 9(6): 94.
1984. *Vanessa itea* (F.) (Lepidoptera: Nymphalinae) ovipositing on *Parietaria debilis* G. Forst. in Australia. *Aust. ent. Mag.* 11(1): 7.
DUNN, Kelvyn L. and HUNTING, Mark M.
1982. Butterfly species recorded from Mount Coramba, near Coffs Harbour, New South Wales. *Victorian Ent.* 12(4): 42-44, table 1.
1983. Butterflies of the Mount Buffalo National Park, Victoria. *Victorian Ent.* 13(4): 40-44, plus 8 maps on 45-48.
EDWARDS, Penelope B. and SUCKLING, D. M.
1980. *Cermatulus nasalis* and *Oechalia schellembergii* (Hemiptera: Pentatomidae) as predators of Eucalyptus tortoise beetle larvae, *Paropsis charybdis* (Coleoptera: Chrysomelidae), in New Zealand. *N.Z. Ent.* 7(2): 158-164, tables 1-4.
ELLIOTT, H. J., MADDEN, J. L. and BASHFORD, R.
1983. The association of ethanol in the attack behaviour of the mountain pinhole borer *Platypus subgranosus* Schedl (Coleoptera: Curculionidae: Platypodinae). *J. Aust. ent. Soc.* 22(4): 299-302, 2 tables.
EMMENS, R. L. and MURRAY, M. D.
1983. The effect of substrated pH on oviposition by *Lucilia cuprina* (Wiedemann), the Australian sheep blowfly. *J. Aust. ent. Soc.* 22(4): 343-344, 1 table.
ETTERSHANK, G., MACDONNELL, I. and CROFT, R.
1983. The accumulation of age pigment by the fleshfly *Sarcophaga bullata* Parker (Diptera: Sarcophagidae). *Aust. J. Zool.* 31(2): 131-138, text-figs 1 & 2.

EVENHUIS, Neal L.

1981. Studies in Pacific Bombyliidae (Diptera) VI. Description of a new anthracine genus from the western Pacific, with notes on some of Matsumura's *Anthrax* types. *Pacif. Insects* 23(1-2): 189-200, text-figs 1-15.
Diptera: *Brachyanax australensis* n. sp., p. 197.

1983. Studies in Pacific Bombyliidae (Diptera) IX. Systematic remarks on Australian Bombyliinae, with descriptions of new genera. *Inter. J. Ent.* 25(2-3): 206-214, text-figs 1-14.

FILMER, Ivor

1983. Excursion report: Peach Tree Creek–Easter camp 1-4 April. *QNC News* (Newsl. Qd Nat. Club): 134: 3-8.
Lepidoptera: Four-barred swordtail, *Agaristes agricola* (adults and larvae), p. 4.

HOPWOOD, Paul

1980. Fleas. *Koolewong* 9(1): 14, illustr.

HUNTING, Mark

1981. *Argynnina cyrila* W. & L. (Satyrinae) from south west Victoria. *Victorian Ent.* 11(6): 67.
Lepidoptera

HUTCHINGS, P. A. and RECHER, H. F.

1982. The fauna of Australian mangroves. *Proc. Linn. Soc. N.S.W.* 106(1): 83-121, text-figs 1-4.
Many orders and species mentioned.

KENNEALLY, K. F.

1981. Moths and caterpillars on *Chenopodium* at Perry Lakes. *West. Aust. Nat.* 15(1): 31-33, text-fig. 1.
Lepidoptera: *Hymenia recurvalis, Spodoptera litura*

KEY, K. H. L. and COLLESS, D. H.

1982. The genus *Geckomima* (Orthoptera: Eumastacidae: Morabinae). *Aust. J. Zool.* 30(6): 931-1026, tables 1-4, text-figs 1-85, plus text-figs 1-4 in appendix. (Primary text by Key, appendix by Colless)

KITCHING, R. L.

1981. Egg clustering and the southern hemisphere lycaenids: comments on a paper by N. E. Stamp. *Am. Nat.* 118: 423-425, tables 1-2.
Lepidoptera: Lycaenidae (several spp.)

KITCHING, R. L. and FILSHIE, B. K.

1974. The morphology and mode of action of the anal apparatus of membracid nymphs with special reference to *Sextius virescens* (Fairmaire) (Homoptera). *J. Ent.* (A)49(1): 81-88, text-figs 1-13.

KITCHING, R. L. and ZALUCKI, M. P.

1981. Observations of the ecology of *Euploea core corinna* (Nymphalidae) with special reference to an overwintering population. *J. Lepid. Soc.* 35(2): 106-119, tables 1-3, text-figs 1-4.

KLOCKENHOFF, Heinrich F.

1980. *Myrsidea karyi* (Mallophaga: Menoponidae), a new species from *Corvus orru* (Passeriformes: Corvidae). *Pacif. Insects* 22(1-2): 115-122, tables 1-3, text-figs 1-8.

Le SOUËF, John Cecil ("Zoo")

1979. A social trip to Cooktown. *Victorian Ent.* 9(5): 51-54.
Lepidoptera: many species of butterflies and the moth *Alcides zodiaca*

1981. A spring visit to Cobar, New South Wales. *Victorian Ent.* 11(1): 6-9.
Lepidoptera: several butterfly species mentioned

1981. Excursion to Eildon. *Victorian Ent.* 11(3): 30-31.
Lepidoptera: *H. penelope, G. klugii, O. latoniella*

1981. To Broken Hill in the winter. *Victorian Ent.* 11(6): 68-69.
Lepidoptera: several butterfly species mentioned.

OBITUARY. *Aust. ent. Mag.* 9(6): 99. *Victorian Ent.* 12(4): 46.

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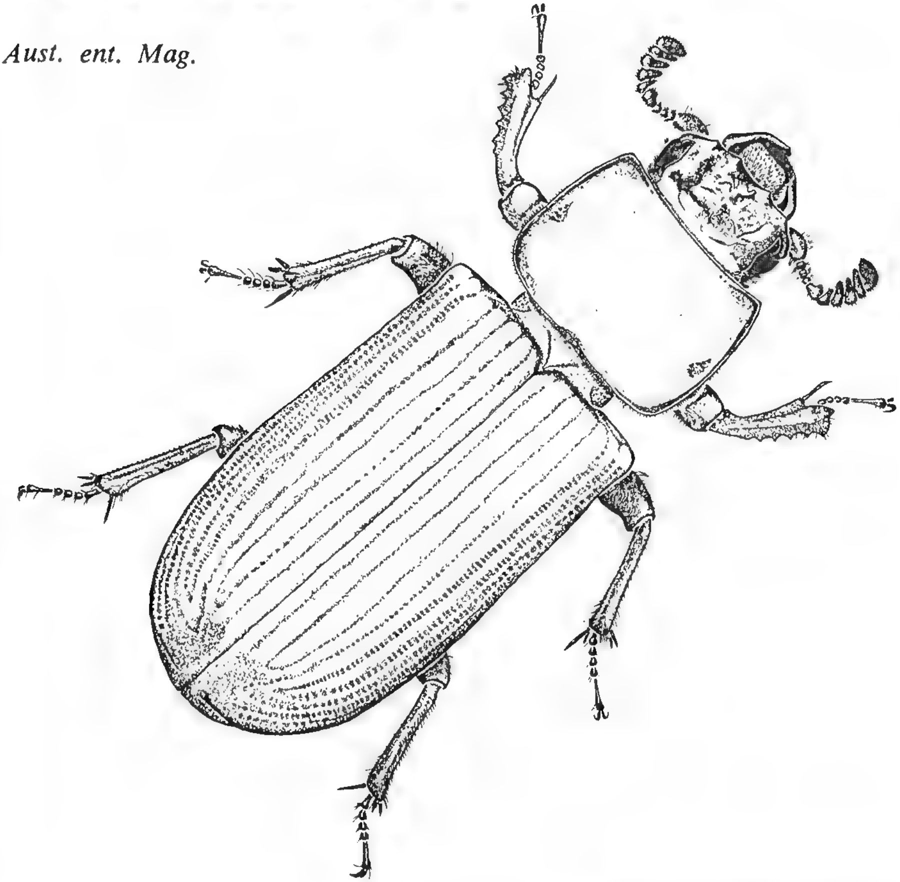

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COVER

Illustrated by Marnie Holmes

Pharochilus dilatus Dalm. (length 28-36 mm) is a common species in forested areas of eastern Australia. Like other Passalidae the larvae and adults live together in groups feeding on rotting logs. Both larvae and adults can stridulate; the larvae by rubbing their hind legs against a file and the adults by scraping their abdomen against their underwings.

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NEW LARVAL FOOD PLANTS FOR SOME AUSTRALIAN BUPRESTIDAE AND CERAMBYCIDAE (COLEOPTERA)

By Geoff Williams
c/- Post Office, Lansdowne via Taree, N.S.W. 2430

Abstract

Previously unrecorded larval food plant data are presented for forty three cerambycid and eight buprestid species.

Introduction

Recent reviews of known larval food plants for Australian Cerambycidae (Duffy 1963) and Buprestidae (Hawkeswood and Peterson 1982) illustrate the paucity of larva/host relationship data presently available for our extensive cerambycid and buprestid beetle faunas.

The records listed below constitute new food-plant records resulting from breeding undertaken by the author. Unless otherwise stated in the list branches were collected dead, either attached to trees or broken off but still suspended in foliage. The condition of the wood stated briefly with each record relates to the wood condition at the time of collection only; varying degrees of drying out, decay or fungal activity occurred during storage of the wood samples. Diameters of branches from which the food-plant records are listed did not exceed 7 cm and most frequently were within the range of 2-3 cm.

Larval food plant records

Family Buprestidae

Agrilus deauratus Macleay. Harrington, N.S.W., emerged 19.xii.1982, from dead, dry branch of ?*Drypetes australasica* (J. Muell.) Pax et Hoffm. (Euphorbiaceae) ex littoral rainforest.

Halliday's Point, SE of Taree, N.S.W., emerged 17.i.1983, from dead, dry branch of *Acacia* sp. (Mimosaceae) ex littoral rainforest.

Redhead, SE of Taree, N.S.W., emerged 20.iii.1983, from dead, dry branch of *Acacia ?longifolia* (Andrews) Willd. (Mimosaceae) ex eucalypt woodland/littoral rainforest interface.
3 km N of Lansdowne, N.S.W., emerged 22.xi.1982-4.ii.1983, from dead, dry branchlet of *Eucalyptus paniculata* Sm. (Myrtaceae) ex wet sclerophyll forest.

Chrysobothris simplicifrons Kerremans. S base of Cape Hawke via Forster, N.S.W. Adults were seen ovipositing, in February 1982, on a fallen dying branch of *Rapanea variabilis* (R. Br.) Mez (Myrsinaceae) in littoral rainforest. Larval activity was subcortical and adults emerged 7.xii.1982 to 1-2.i.1983.

Melobasis hypocrita Erichson. Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged 18.i.-5.ii.1984, from dying branch of *Nothofagus moorei* (F. Muell.) Krasser (Fagaceae) ex cool temperate rainforest.
Dingo Tops Forest Park, Dingo State Forest, NW of Wingham, N.S.W., emerged 7.ii.-3.iii.1984, from dying, fallen branch of *Doryphora sassafras* Endl. (Monimiaceae) ex rainforest.

Nascioides ?multesima (Olliff). Dingo Tops Forest Park, Dingo State Forest, N W of Wingham, N.S.W., emerged 18-28.iv.1983, from a dying fallen branch of *Doryphora sassafras* Endl. (Monimiaceae), ex rainforest.

Nascioides tillyardi (Carter). Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged ix.1983-31.x.1983, from dying branch of *Nothofagus moorei* (F. Muell.) Krasser (Fagaceae) ex cool temperate rainforest.

Pseudanilara cupripes (Macleay). 3 km N of Lansdowne, N.S.W., emerged 30.xi.1981, from dead, dry trunk wood of *Rhodomyrtus psidioides* (G. Don) Benth. (Myrtaceae) ex wet sclerophyll forest.
3 km N of Lansdowne, N.S.W., emerged 3-20.xii.1982, from dead dry branches of *Syzygium floribundum* F. Muell. (Myrtaceae), ex wet sclerophyll forest.

Stigmodera praetermissa Carter. 3 km N of Lansdowne, N.S.W., emerged 8-10.xii.1982, from a dead, dry and fallen branch of *Eucalyptus microcorys* F. Muell. (Myrtaceae), ex wet sclerophyll forest. Larva tunnelled along old heartwood where it also pupated.

Torresita cuprifera Kirby. 3 km N of Lansdowne, N.S.W., emerged 5.xi.1982-1.xii.1982, from dead, dry trunk wood of *Rhodomyrtus psidioides*, ex wet sclerophyll forest. Two colour forms emerged from the same trunk wood section; *T. cuprifera* var. *chrysochloris* L. & G. and *T. cuprifera* var. *dilatata* Redt. (1 specimen only).

Family Cerambycidae

Amphiroe decora Newman. 3 km N of Lansdowne, N.S.W., emerged 5.xi.1982-2.xii 1982, from a dead dry branch of *Acacia melanoxylon* R.Br. (Mimosaceae), ex gully restricted rainforest and wet sclerophyll forest, and wet/dry sclerophyll forest interface. Larvae tunnel mainly in the subcortex.

Anastetha raripila Pascoe. Yarratt State Forest, N E of Wingham, N.S.W., emerged 17.xi.1982, from a dead, dry *Acacia* branch, ex depauperate rainforest.

Ancita marginicollis (Boisduval). Redhead, approximately 20 km S E of Taree, N.S.W., emerged 21.xi.1982-19.xii.1982, from a dead, dry branch of *Acacia longifolia* (Andrews) Willd. (Mimosaceae), ex littoral rainforest/*Eucalyptus* woodland margin.

Laurieton, N.S.W., emerged 15-21.i.1983, from a dead, dry *A. longifolia* branch, ex *Eucalyptus* woodland.

3 km N of Lansdowne, N.S.W., emerged from dead, dry wood of *Acacia melanoxylon*, ex wet sclerophyll forest.

3 km N of Lansdowne, N.S.W., emerged 28.xii.1982, from a dead branch of *Eucalyptus paniculata* Sm. (Myrtaceae), ex wet/dry sclerophyll forest interface. In *Acacia* the larvae are mainly active subcortically.

Athemistus pubescens Pascoe. 3 km N of Lansdowne, N.S.W., emerged 24.x.1982, from a damp, rotting branch of *Eucalyptus grandis* W.Hill ex Maiden (Myrtaceae) collected on ground (fungal hyphae prominent in wood), ex rainforest/wet sclerophyll forest interface.

Bethelium signiferum (Newman). 3 km N of Lansdowne, N.S.W., emerged 15.ix.1982-14.xi.1982, from dead, dry branches of *Acacia melanoxylon*, ex wet/dry sclerophyll forest interface.

3 km N of Lansdowne, N.S.W., emerged 6.x.1982-18.xi.1982, from dead, dry *Eucalyptus paniculata* branches, ex wet/dry sclerophyll forest interface. Larval activity subcortical.

Ceresium australe Carter. 3 km N of Lansdowne, N.S.W., emerged i.1984, from dead, dry cane of *Lantana camara* L. (Verbenaceae) ex rainforest.

Cyclocranium swierstrae Poll. 3 km N of Lansdowne, N.S.W., cut from heartwood of a dead, dry and fallen branch of *Eucalyptus grandis*, 30.vi.1982, ex wet sclerophyll forest.

Cyrtillus albofasciatus Aurivillius. Harrington, N.S.W., emerged 3.ix.1982, from a dead, dry branchlet of *Maclura cochinchinensis* (Lour.) Corner (Moraceae), ex littoral rainforest.

Demonisis ?filum Pascoe. 3 km N of Lansdowne, N.S.W., emerged 26.ix.1982-24.x.1982, from dead, dry branch of *Syzygium floribundum* F.Muell. (Myrtaceae), ex wet sclerophyll forest.

Didymocentrus foveatus Aurivilius. 3 km N of Lansdowne, N.S.W., emerged 15.iii.1983-iv.1983, from a dead, dry branch of *Croton* sp., (Euphorbiaceae), ex wet sclerophyll forest; larvae active subcortically.

Disterna bifasciata Pascoe. 3 km N of Lansdowne, N.S.W., emerged 13.xii.1983, from dying branch of *Ficus macrophylla* Desf. (Moraceae) ex rainforest/wet sclerophyll association.

Distichocera superba Poll. 3 km N of Lansdowne, N.S.W., cut from dying branch of *Syzygium floribundum* F. Muell. (Myrtaceae), 10.xii.1983, ex rainforest/wet sclerophyll association.

Ectinope spinicollis Pascoe. Laurieton, N.S.W., emerged 20.xii.1982-21.i.1983, from a dead, dry branch of *Acacia longifolia*, ex *Eucalyptus* woodland.

Yarratt State Forest, N E of Wingham, N.S.W., emerged 4.i.1983-18.ii.1983, from a dead, dry *Acacia decurrens* (Wendl.) Willd. (Mimosaceae) branch, ex dry sclerophyll forest.

Homaemota tricolor Lea. Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged 20.i.1983, from dying fallen branches of *Nothofagus moorei* (F.Muell.) Krasser (Fagaceae), ex cool temperate rainforest.

Illaena inconspicua (Pascoe). Halliday's Point, N.S.W., emerged 14.xi.1982-4.i.1983, from dry, dead branches of *Acacia* sp., ex littoral rainforest.
3 km N of Lansdowne, N.S.W., emerged 19.ix.1982-28.x.1982, from dead, dry branches of *Acacia melanoxylon*, ex wet sclerophyll forest.
3 km N of Lansdowne, N.S.W., emerged 29.x.1982-3.xii.1982, from dead, dry branches of *Eucalyptus paniculata*, ex wet/dry sclerophyll forest interface.

Mesolita antennalis Carter. Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged 11.x.1983, from dying branch of *Nothofagus moorei* ex cool temperate rainforest.

Notoceresium setistriatus McKeown. 5 km W of Comboyne, N.S.W., emerged 22.-30.x. 1983, from dead, dry canes of *Cissus antarctica* Vent. (Vitidaceae) ex subtropical rainforest margin.

Pentacosmia scoparia Newman. Harrington, N.S.W., emerged 1-4.ii.1983, from a dead, dry branch of ? *Drypetes australasica* (J.Muell.) Pax et Hoffm. (Euphorbiaceae), ex littoral rainforest.
Halliday's Point, N.S.W., emerged 19.ix.1982-8.xi.1982, from a dead, dry *Acacia* branch, ex littoral rainforest.
3 km N of Lansdowne, N.S.W., emerged 3.ix.1982, from a dead, dry branch of *Glochidion ferdinandii* (J.Muell.) F.M. Bail (Euphorbiaceae), ex regenerating wet sclerophyll forest.
Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged ix.-xii.1983, from dying branch of *Nothofagus moorei* ex cool temperate rainforest.
Dingo Tops Forest Park, Dingo State Forest, NW of Wingham, N.S.W., emerged 22.x.1983-xii.1983, from fallen, dying branches of *Doryphora sassafras* ex rainforest.
Manning Point, E of Taree, N.S.W., emerged 13-18.xii.1983, from dead, dry branch of *Alectryon coriaceus* (Benth.) Radlk. (Sapindaceae) ex littoral rainforest.

Phaeapate ?albula Pascoe. 3 km N of Lansdowne, N.S.W., emerged 28.x.1982, from a dead, dry *Acacia melanoxylon* branch, ex gully rainforest.

Phaeapate denticollis Pascoe. approximately 5 km W of Comboyne, N.S.W., 12.xi.1982, cut from dead, dry *Solanum mauritianum* Scop. (Solanaceae) stem, ex subtropical rainforest margin.
5 km W of Comboyne, N.S.W., emerged 26.x.1983-30.xi.1983, from dead, dry canes of *Cissus antarctica* ex subtropical rainforest margin.
3 km N of Lansdowne, N.S.W., emerged 5-13.xii.1983, from dead branchlet of *Ficus obliqua* Forst. f. (Moraceae) ex wet sclerophyll forest-pasture margin.
5 km NE of Harrington, N.S.W., emerged 2-8.i.1984, from dead, dry branch of *Alphitonia excelsa* (Fenzl) Benth. (Rhamnaceae) ex littoral rainforest.
3 km N of Lansdowne, N.S.W., emerged 25.i.1983-8.iv.1983, from dead, dry branchlets and twigs of *Amylotheca* sp. (Loranthaceae), collected on ground in wet sclerophyll forest.

Phylctaenodes pustulatus (Hope). approximately 5 km W of Comboyne, N.S.W., emerged 6.ii.1982, from dead, dry branches of *Lantana camara* L. (*sens. lat*) (Verbenaceae). ex subtropical rainforest margin. Larvae tunnelled through heartwood.

Piesarthrius marginellus Hope. Halliday's Point, SE of Taree, N.S.W., emerged 27.ii.1984, from dying branchlet of *Acacia ?maidenii* F. Muell. (Mimosaceae) ex littoral rainforest margin. Larva tunnelled through heartwood killing branch.

Platyomopsis nigrovirens (Donovan). approximately 6 km S E of Laurieton, N.S.W., emerged 10.xii.1982, from live lateral branch of *Alphitonia excelsa* (Fenzl.) Benth. (Rhamnaceae), ex littoral rainforest, larva tunnelled downwards through heartwood progressively killing branch.

Harrington, N.S.W., emerged 11.xi.1982, from a dead, dry branch of ? *Drypetes australasica,* ex littoral rainforest, larva tunnelled through old heartwood.

Rhagiomorpha exilis Pascoe. 3 km N of Lansdowne, N.S.W. emerged 8.ix.1981, from a dead, fallen dry branchlet of *Eucalyptus ? microcorys* F.Muell. (Myrtaceae), ex wet/dry sclerophyll forest interface. Larvae tunnelled through heartwood.

Rhinophthalmus nasutus (Shuckard). 3 km N of Lansdowne, N.S.W., emerged 12-14.xi. 1982, from a dry, dead, branch of *Acacia melanoxylon,* ex wet/dry sclerophyll forest interface.

Halliday's Point, N.S.W., emerged 2.xii.1982, from a dead, dry *Acacia* branch, ex littoral rainforest.

Ropica exocentroides Pascoe. 3 km N of Lansdowne, N.S.W., emerged 3.xi.1982-3.xii.1982, from dead, dry branchlets of *Eucalyptus paniculata,* ex wet/dry sclerophyll forest interface.

Sisyrium ibidionoides (Pascoe). 3 km N of Lansdowne, N.S.W., emerged 23-24.xi.1982, from dead, dry branchlets of *Eucalyptus acmenioides* (Myrtaceae), ex wet/dry sclerophyll forest interface. Larvae tunnelled through old heartwood.

Stenellipsis cruciata Breuning. 3 km N of Lansdowne, N.S.W., emerged 26-31.x.1983, from dead branchlet of *Ficus obliqua* ex wet sclerophyll forest/pasture margin.

Strongylurus cretifer (Hope). Dingo Tops Forest Park, Dingo State Forest, N W of Wingham, N.S.W., emerged 25.xii.1982, from a dying, fallen branch of *Doryphora sassafras* Endl. (Monimiaceae), ex rainforest. Larva tunnelled through heartwood.

Sybra acuta (Pascoe). Halliday's Point, N.S.W., emerged 14-17.xi.1982, from a dead, dry *Acacia* branch, ex littoral rainforest.

Sybra centurio Pascoe. 3 km N of Lansdowne, N.S.W., emerged 12-14.x.1981, from dead, dry fronds of *Lepidozamia peroffskyana* Regel (Zamiaceae), ex wet forest complex. Larvae occupy basal half of rachis and distal half of frond petioles only.

Syllitosimilis aberrans McKeown. Yarratt State Forest, N E of Wingham, N.S.W., emerged 4-10.xi.1982, from dead, dry branches of *Acacia decurrens,* ex dry sclerophyll forest.

3 km N of Lansdowne, N.S.W., emerged 22-29.x.1983, from dead, dry branch of *Acacia irrorata* Sieb. ex Spreng. (Mimosaceae) ex wet sclerophyll forest margin.

Temnosternus planiusculus White. 3 km N of Lansdowne, N.S.W., emerged 7.ix.1981-21.x.1982, from dead, dry fronds of *Lepidozamia peroffskyana*, ex wet forest complex. Larvae present in basal half of frond petioles only (for possible frond partitioning see *Sybra centurio* above).

Tessaromma nanum Blackburn. 5 km W of Comboyne, N.S.W., emerged 22.x.1983-29.xii.1983, from dead, dry canes of *Cissus antarctica* on subtropical rainforest margin.

Tessaromma sordida McKeown. South slope of Cape Hawke via Forster, N.S.W., emerged approximately 7.xii.1982, from a dying, fallen branch of *Rapanea variabilis* (R.Br.) Mez (Myrsinaceae), ex littoral rainforest.

Tessaromma undatum Newman. Moppy Lookout Rest Area, Barrington Tops State Forest via Gloucester, N.S.W., emerged 1-6.vi.1983 and ix.1983, from fallen, dying branch of *Nothofagus moorei* ex cool temperate rainforest.

Thyada barbicornis Pascoe. 3 km N of Lansdowne, N.S.W., emerged 27.xi.1983-13.xii. 1983, from dying branch of *Ficus macrophylla* ex rainforest/wet sclerophyll forest association.

Tragocerus spencei Hope. Approx. 24 km SW of Ebor, N.S.W., cut from dying and dead stems of *Banksia* sp. (Proteaceae), 12.xii.1983, ex dry sclerophyll forest margin. Adults had girdled the stems of young *Banksia* plants growing on roadsides. The larvae bored downwards in these dying sections.

Tryphocaria mitchelli (Hope). 3 km N of Lansdowne, N.S.W., emerged 15.xi.1982 from a living branch of ? *Rapanea howittiana* F.Muell. ex Mez (Myrsinaceae), ex wet sclerophyll forest margin. Larva tunnelled through heartwood of stem.

Uracanthus cryptophagus Olliff. Starr's Creek, approx. 23 km N of Taree, N.S.W., cut from dying lateral branch of *Acradenia euodiiformis* (F. Muell.) Hartley (Rutaceae), 27.ii.1984, ex subtropical rainforest. Larva had tunnelled along centre of branch.

Uracanthus insignis Lea, Harrington, N.S.W., emerged 15-20.iii.1983, from a dying branch of *Endiandra sieberi* Nees (Lauraceae), ex littoral rainforest. Larva tunnelled downwards through heartwood of lateral branchlet progressively killing branch.

Wahn zonulitis McKeown. Yarratt State Forest, N E of Wingham, N.S.W., emerged 12-14.xii.1982, from a dead, dry branch of *Acacia irrorata* Sieb. ex Spreng. (Mimosaceae), ex depauperate rainforest.

Zoedia longipes Poll. 5 km W of Comboyne, N.S.W., emerged 22-29.x.1983, from dead, dry canes of *Cissus antarctica* ex subtropical rainforest margin.

Acknowledgements

The assistance of Terry Evans (Taree) and Bill Chapman (Forestry Commission) in confirmation of the *Amylotheca* determination is gratefully acknowledged. Dr B. Levey kindly compared *Chrysobothris simplicifrons* material with types in the British Museum (Nat. Hist.). Colleen Pyne (Aust. Mus.) has given regular help with literature searches and the staff of the Entomology Dept. (Aust. Mus.) kindly allowed access to the Coleoptera collection.

References

Duffy, E. A. J., 1963. *A monograph of the immature stages of Australasian timber beetles (Cerambycidae).* British Museum (Natural History). London. 235 pp.

Hawkeswood, T. J. and Peterson, M., 1982. A review of larval host records for Australian jewel beetles (Coleoptera: Buprestidae). *Victorian Nat.* 99(5): 240-251.

A NEW SPECIES OF AULACIGASTRIDAE FROM PAPUA NEW GUINEA AND CHARACTERISATION OF SPECIES GROUPS IN THE GENUS *NEMO* (DIPTERA, SCHIZOPHORA)

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Abstract

A new species of the aulacigastrid genus *Nemo* from Papua New Guinea is described. Three allopatric species groups in *Nemo* are defined.

Introduction

The minute nobody flies form the subfamily Neminінae of the family Aulacigastridae (McAlpine, 1983). Of the two genera, *Nemo* McAlpine has only been recorded from eastern Australia, and *Ningulus* McAlpine only from South Africa. In describing these new forms, I stated that the available records probably indicated only a small part of the world distribution of the subfamily. The extension of the known distribution to New Guinea is not, therefore, surprising.

Nemo arbelos n.sp

(Figs 1, 2)

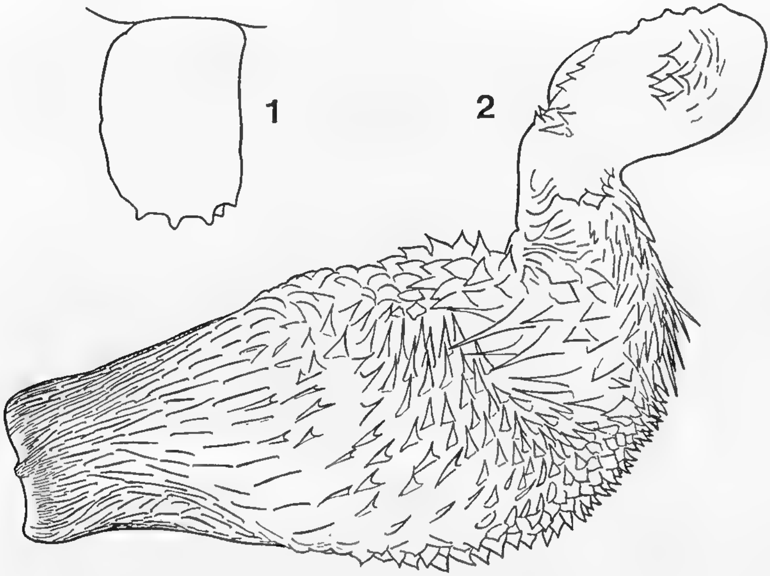
MALE

Coloration. Head brownish, with grey pruinescence; vertex with pale yellowish mark on each side; face entirely pruinescent, yellowish brown, paler below, with dark grey spot near middle covering upper part of median carina; postgena with yellowish mark next to eye. Antenna fulvous; arista dark brown. Mesoscutum dark greyish with dull yellowish blotch covering notopleural and supra-alar regions and smaller one between dorsocentral bristle and scutellum on each side; scutellum dark greyish with apex broadly pale yellow; postscutellum yellowish brown; postnotum dark grey; a creamy white stripe covering humeral callus, upper margin of mesopleuron, and basalare; thoracic pleura otherwise greyish brown with yellowish markings. Legs pale yellowish with ill-defined brownish suffusion on tibiae and femora, darkest on hind ones. Wing with pale zone at extreme base slightly differentiated from smoky zone commencing near humeral crossvein. Haltere creamy white. Abdominal tergites 1 to 4 brown-black, with their free margins narrowly pale yellow; remainder of abdomen pale yellowish except for brownish sclerites of protandrium and genital segment.

Head, in profile shaped somewhat as in *N. centriseta* McAlpine (1983: fig. 2), except for the facial carina and narrower eye; eye distinctly setulose; face narrower than in *N. centriseta* from encroachment of eyes, with short, sharp, narrow median carina on lower part of anterior surface, not continued on to ventral surface; no inclinate bristle present behind inner vertical bristle; several minute, pale setulae situated in front of anterior fronto-orbital bristle; interfrontal bristles as in other species of genus, but small and difficult to discern in dried material.

Thorax. Anterior notopleural and humeral bristles minute; intra-alar bristle distinct, with series of intra-alar setulae extending in front of it to before transverse suture; one dorsocentral bristle present posteriorly; series of dorsocentral setulae extending from near that bristle to in front of transverse suture; acrostichal setulae short in a short irregular, partly double series. Hind femur scarcely longer than mid femur; fore tarsus with no segment noticeably thickened. Wing with veins 3 and 4 slightly convergent for some distance beyond level of discal cell, becoming parallel to slightly divergent for a short distance apically; discal crossvein more oblique than in other species of genus; basal crossvein reduced to a minute stump; costal index 0.53-0.69; vein 4 index 3.1-3.6.

Abdomen. Tergite 5 desclerotized; surstylus (Fig. 1) elongate-oval, with marginal teeth; aedeagus (Fig. 2) somewhat resembling that of *N. lossini* McAlpine, but much stouter on about distal two-thirds of length, with many of the spines short, triangular, and scale-like with short mucronate apices, other spines, particularly near middle of length of aedeagus, with broad bases and variably long bristle-like apices; apical part of aedeagus, as in other species, devoid of erect spines, but with complex pattern of sclerotized ridges.



Figs 1, 2. *Nemo arbelos*, paratype: (1) left surstylus; (2) aedeagus, to *c.* half scale of Fig. 1.

Dimensions. Total length 0.77-0.79 mm; length of thorax 0.36-0.42 mm; length of wing 0.92-1.02 mm.

Distribution. Papua New Guinea–Central province, near coast.

Holotype ♂. 20 km south-east of Port Moresby, 9.i.1982 (Australian Museum), J. W. Ismay.

Paratypes. Same locality, 27.xii.1981 and 9.i.1982 (1 ♂, Department of Primary Industry, Konedobu, 1 ♂, Australian Museum), J. W. Ismay.

Notes. The pale zone on the wing referred to in the above description does not correspond to that mentioned in my description for *N. centriseta* and *N. lossini.* In these two species the pale zone lies largely between the levels of the humeral crossvein and the apex of the subcosta, whereas in *N. arbelos* it lies on the basal side of the humeral crossvein.

The type series of this species consists of well-preserved, mature specimens, but, because of the light sclerotization of the cuticle characteristic of many minute flies, the head has collapsed in all three specimens. One specimen was rehydrated in dilute detergent, and this enabled a more accurate interpretation of head shape, chaetotaxy, and some points of coloration, as well as examination of postabdominal characters.

The collection data indicate that two of the specimens of *Nemo arbelos* were swept from bushes, while the third is simply labelled "bushes". This contrasts with the experience of my colleagues and me with the Australian species. The latter have not been taken by sweeping, all the specimens having been found on tree trunks or on the large leaves of *Alocasia* (McAlpine, 1983).

The specific epithet *arbelos* is from the Greek *αρβηλος*, a rounded knife as used by a shoemaker, and refers to the facial carina.

Discussion

This new species is closely related to the six described Australian species of *Nemo.* In my table of characters differentiating the two genera of Nemininae (McAlpine, 1983: 75), *N. arbelos* agrees with *Nemo* rather than *Ningulus*, except in the inconspicuous costal break. This and the further reduction of the basal crossvein relative to other species of *Nemo* are probably due to the smaller size of *N. arbelos*, a condition which is often accompanied by simplification in wing structure.

N. arbelos further differs from other species of *Nemo* in the presence of a blade-like median carina on the lower part of the face. Despite its peculiar characters, it is possible that this species is phylogenetically closer to some of the Australian species of *Nemo* than to others, and, therefore, not the sister group of those species as a whole. The first couplet of my key to (Australian) species of *Nemo* differentiates a tropical group of species (anterior notopleural bristle very small; mesoscutum with extensive yellowish markings; 2 strong dorsocentral bristles with no intervening setulae; eye densely setulose) from a temperate group (anterior notopleural bristle only slightly shorter than posterior one; mesoscutum grey to blackish, with at most the humeral callus paler; dorsocentral bristles generally otherwise, anterior ones, if present, usually relatively short; eye with sparse, inconspicuous setulae). As might be expected, *N. arbelos* more closely resembles the tropical group, but has the yellow zones on the mesoscutum less extensive and only one (posterior) dorsocentral bristle with a well developed series of dorsocentral setulae in front of it. The strongly toothed margin of the surstylus in *N. arbelos* is also more typical of the tropical group of Australian species.

I consider that the most appropriate way of classifying the species of *Nemo* on the available evidence of relationships is in three species groups, as in the following key.

Key to species groups of *Nemo*

1. Face with sharp, blade-like carina on lower part; costa without definite break; New Guinea . . . . *arbelos* group.
— Face without carina; costa with obvious break at end of subcosta; Australia 2
2. Anterior notopleural bristle very small; mesoscutum with extensive yellowish markings; 2 strong dorsocentral bristles present with no intervening setulae; tropical Queensland. . . . . *centriseta* group.
— Anterior notopleural bristle only slightly shorter than posterior one; mesoscutum grey to black, with at most the humeral callus paler; dorsocentral bristles generally otherwise, anterior ones, if present, usually relatively short; temperate south-eastern Australia. . . . . *corticeus* group.

The *corticeus* group is possibly paraphyletic, as there are no clearly apomorphic characters shared by all its species. On the other hand the species of the group are all very similar structurally and occupy a distinct geographic zone from that of other species groups. The assignment of species within the groups is as follows.

Corticeus group. *Nemo kentae* McAlpine, *N. dayi* McAlpine, *N. corticeus* McAlpine, *N. phaeotylos* McAlpine.

Centriseta group. *Nemo lossini* McAlpine, *N. centriseta* McAlpine.

Arbelos group. *Nemo arbelos* McAlpine.

Acknowledgements

I am indebted to Dr J. W. Ismay for collecting and forwarding material of the new species here described and for many other interesting flies from Papua New Guinea.

Reference

McAlpine, D. K., 1983. A new subfamily of Aulacigastridae (Diptera: Schizophora), with a discussion of aulacigastrid classification. *Aust. J. Zool.* 31: 55-78.

A NEW GENUS OF SARCOPHAGIDAE (DIPTERA) BASED ON AN AUSTRALIAN SPECIES LIVING ON SPIDER EGG CASES

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Abstract

Baranovisca n. gen. is described to accommodate *B. arachnivora* sp. n. known from a male and female taken at Hornsby Heights, New South Wales, while emerging from the egg sac of a magnificent spider, *Dicrostichus magnificus.*

Introduction

Mr M. R. Gray, Arachnologist of the Australian Museum, Sydney, sent to me for identification, a male and a female of a fly "found emerging from the egg sac of the Magnificent Spider, *Dicrostichus magnificus.* These spiders have large, conspicuous, spindle-shaped egg sacs and are probably ideal targets for parasitism." The above notes were communicated by Mr Gray. In 1959 I described *Parasarcophaga reposita*, also reared from an egg sac of a spider.

Baranovisca n. gen.

Type species: *arachnivora* n. sp. (Australia).

Predorsocentral and preacrostichal bristles differentiated; four long postdorsocentrals; arista short plumose, vibrissa near oral margin, not approximated; episternum bare; only R_{4+5} with hairs, apical cell largely open; male genital segments brown, first without marginal bristles; second abdominal sternite with long, third and fourth with short hairs, fifth with few bristles internally (Fig. 1); cerci more or less parallel; theca of penis well sclerotized, large; styli of glans slender; female syntergite VI-VII entire. The genus differs from *Pterophalla* Rohdendorf, 1965, by the well sclerotized ventralia.

Besides the type species, *Parasarcophaga (Rosellea) reposita* Lopes, 1959, from New South Wales; *Parasarcophaga (Rosellea) praelibera* Lopes, 1959, from Rabaul, New Britain; *Sarcophaga banksi* Senior-White, 1924, from Luzon, Philippine Islands, and *Pierretia litsingeri* Shinonaga and Barrion, 1980, from Philippine Islands, belong to this genus. *Johnstonimyia fatua* Lopes, 1967, from Manus Is., Bismarck Archipelago, shows most of the external characters referred for the genus but the apical plate is very different and the ventralia is spinous, elongate.

The type species, *B. reposita* (Lopes) and *B. litsingeri* (Shinonaga and Barrion) were reared from spider egg cases. The genus was named after N. Baranov in honour of his significant work.

Baranovisca arachnivora n. sp.

(Figs 1-9)

Types.–Holotype ♂ and *paratype* ♀, Hornsby Heights, New South Wales, Australia, M. R. Gray, 10.ii.1980 (KS 6986-Aust. Mus.), parasite in egg sacs of *Dicrostichus magnificus*, in Australian Museum, Sydney.

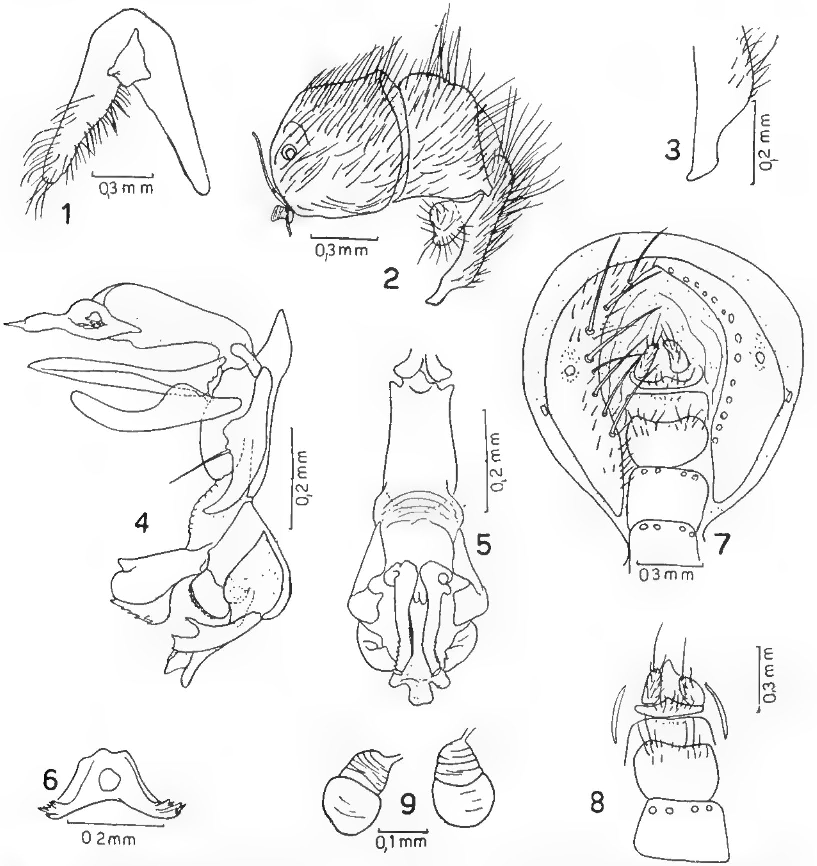
Male.–Length: 9 mm. Head yellow, back of head yellowish grey; front about 0.17 of head width; 12 frontal bristles, all but two superior ones directed inwards; ocellar bristles very small; reclinate frontorbital bristle shorter than biggest frontal; outer vertical not differentiated; parafrontalia and parafacialia with some black hairs, the latter with a row of long hairs near eyes; back of head with 2 - 3 series of black hairs besides the post-ocular setae, remaining hairs yellow; gena with black hairs; facialia hairy on little less than inferior half; cheek grooves yellow pollinose; antenna grey, basal segments darkened, somewhat reddish on apex of second segment, reaching about 0.87 of the distance to vibrissal level, second segment about 0.54 length of third.

Thorax yellowish grey, humeral region more yellowish, four small preacrostichal bristles; four to five scarcely differentiated post-acrostichals; prescutellar pair long: four pre-dorsocentrals; four post-dorsocentrals, posterior two very long; 2:3 intra-alars; 2:3 supra-alars; two strong and some small lateral scutellar bristles, long preapical and crossed apical bristles; three bristles, median one inserted a little below others, on katepisternum; nine bristles on meron. Wings with brown and yellow veins, costal spine scarcely differentiated; R_{4+5} hairy for a little more than half of the distance from base to transverse vein; legs black, ventral side of femora, especially the base of middle femur, with some long hairs; middle and hind tibiae with ventral bristles, the latter with a series of bristles on anterior side, like *B. reposita* (Lopes, 1959: Fig. 94).

Abdomen grey, slightly yellowish, fourth tergite with an almost complete row of short bristles; first and second sternites with long hairs; third and fourth with short hairs, all black; fifth sternite with internal small bristles (Fig. 1). Genital segments brown, sixth tergite represented by a slender stripe near spiracle; first genital segment without differentiated marginal bristles, having long dorsal hairs; second with long hairs; cerci somewhat sinous, surstylus almost triangular (Figs 2, 3); theca well individualized, membrane between theca and paraphallus largely membranous, apical plate with sclerotized apophysis and three apical membranous lobes; lateral plates small; ventralia conspicuous, apically with sharp points (Figs 4, 6); styli long, almost parallel (Fig. 5).

Female.—Length: 9 mm. Front about 0.25 of head width, outer vertical bristles about four fifths length of inner one; anterior proclinate frontorbital bristles conspicuously longer than superior and reclinate ones; antenna reaching about 0.9 of the distance to vibrissae, second segment about 0.37 length of third; parafacialia about 0.37 of the distance between vibrissae. Scutellum without apical bristles; costal spine a little longer than in male; besides the series of bristles on anterior side, the hind tibia presents three ventral bristles; genital syntergite VI-VII with strong marginal bristles, tergite VIII represented by slender plates; sternite VI-VII with four strong marginal bristles, sternite VIII with concave hind margin and two groups of hairs; sternite IX mostly membranous with marginal small hairs (Figs 7, 8). Spermathecae with almost smooth distal part (Fig. 9).

Note.—*B. arachnivora* n. sp. is very near *reposita* (Lopes) showing well different genital structures especially the apical membranous lobes of the apical plate.



Figs 1-9. *Baranovisca arachnivora* n. sp. Male: (1) fifth sternite; (2) genital segments; (3) apex of cercus; (4) phallic organs; (5) penis, ventral view (without ventralia); (6) ventralia, ventral view. Female: (7) genitalia; (8) genital sternites; (9) spermathecae.

Acknowledgement

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References

Lopes, H. S., 1959. A review of Australian Sarcophagidae (Diptera). *Studia Entomologica, Petropolis* (n.s.) 2: 33-67.

Lopes, H. S., 1967. Some Sarcophagidae (Diptera) from the Bismarck Islands and the Philippines. *Entom. Meddel.* 35: 143-176.

Senior-White, R., 1924. A revision of the subfamily Sarcophaginae in the Oriental Region. *Rec. Ind. Mus.* 26(3): 193-283.

EMERGENCE OF *AUSTROMANTISPA IMBECILLA* (GERSTAECKER) (NEUROPTERA: MANTISPIDAE) FROM THE RETREAT WEB OF *MOPSUS PENICILLATUS* (KARSCH) (ARANEAE: SALTICIDAE)

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A female of the mantispid *Austromantispa imbecilla* (Gerstaecker) was observed resting after emergence from a retreat web of the salticid spider *Mopsus penicillatus* (Karsch) in Townsville. The web was constructed on 16 December 1983 and the host eggs laid on 21 December. The spider was seen to emerge briefly from the web on only one occasion between then and 13 January, by which time the eggs had hatched. First sighting of the mantispid, facing vertically upward on the centre surface of the web, was at 9.35 pm (E.S.T.) on 14 January; the temperature was 29.5°C and the humidity high. It flew from the web at 9.45 and the web and its contained egg sac were collected at 10.40. Three living spiderlings were discovered; at least five others had emerged earlier.

The parent spider, ordinarily an active predator, had remained motionless 1 m from the web since the first sighting of the mantispid, and was still unmoved at 11.45 pm.

When the remnants of the web were re-examined on 21 January a living male *A. imbecilla* was found. Examination of the web contents revealed the two empty mantispid pupal cases, one 4.5 mm, the other 6.0 mm in diameter. The cast pupal skins were 5.5 and 7.0 mm in length, while the adult mantispids were 9.0 mm (male) and 12.0 mm (female) in length. The presence of undeveloped and uneaten eggs inside the web, along with dead spiderlings and spider egg shells, showed that the mantispids had faced no food shortage. However, since a number of eggs had successfully hatched, the mantispids may have spun cocoons earlier than necessary and not attained maximum possible size (Redborg, 1983).

Of particular interest is the fact that *M. penicillatus* relies relatively strongly on vision in its predation. Yet the mantispid larvae were able to consume the spider's eggs and spin pupal cases in close proximity to the adult spider within the web, and the adult insect emerged from the web without interference from the nearby parent spider. Twenty previous personal observations of the emergence of *A. imbecilla* from spider egg sacs all involved theridiid spiders, which do not share a retreat web with their egg sacs and do not rely on vision to nearly the same extent as salticids.

Acknowledgement

I thank Dr Kevin Lambkin for confirming the identification of the mantispids.

Reference

Redborg, K. E., 1983. A mantispid larva can preserve its spider egg prey: evidence for an aggressive allomone. *Oecologia* 58: 230-231.

NEW HOST RECORDS OF *AMBLYPELTA LUTESCENS LUTESCENS* (DISTANT) (HEMIPTERA: COREIDAE) IN NORTH-WESTERN AUSTRALIA

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Abstract

Recent records of *Amblypelta lutescens lutescens* (Distant) (Hemiptera: Coreidae) from the Ord River area of Western Australia confirm its presence in that area.

The insect was observed feeding on six plant species not previously known to be hosts, three of which supported breeding.

Introduction

Amblypelta lutescens lutescens (Distant) (banana-spotting bug) is regarded as a major pest of macadamia nut, banana and pawpaw in the coastal belt of Queensland (Ironside 1978, Donaldson 1983). Donaldson (1983) reported that the insect was distributed "from Brisbane to the Torres Strait islands but not very far inalnd" and also in the Northern Territory near Katherine and Darwin. In April 1982, a breeding population was found on ornamental cassava (*Manihot esculenta* Crantz., Fam. Euphorbiaceae) at Lake Argyle village (Lat. 16°12′S; Long. 128°45′E) some 435 km WSW of Katherine (Lever 1982).

This paper records the species on other host plants and at other locations in the Ord River area of Western Australia.

New host plant records

Alphitonia exelsa (Fenzl.) Benth. (soapbush) (Fam. Rhamnaceae). 2 ♂♂, Packsaddle Creek, 16 km SSW of Kununurra, Western Australia; September 1983. Adults were collected while feeding on hardened flush shoots of this native tree but no damage was noted.

Anacardium occidentale L. (cashew nut) (Fam. Anacardiaceae). 2 ♀♀, 1 ♂, 3 nymphs, Kimberley Research Station, 14 km NNE of Kununurra, Western Australia; September/October 1983. Adults and nymphs were observed to feed on soft flush shoots and the developing cashew apple and nut. Subsequently, flush tissue withered and died while the apples became severely distorted.

Eucalyptus camaldulensis Dehn. (river gum) (Fam. Myrtaceae). 2 ♀♀, 2 ♂♂, Kununurra, Western Australia; November 1983. Mating pairs of adults were collected from soft flush tissue of a tree 3 m high. Feeding damage was subsequently noted.

Glycine max L. (Merrill) (soybean) (Fam. Fabaceae). 2 ♀♀, Kimberley Research Station, Kununurra, Western Australia; July 1983 and March 1984. Adults were collected by sweepnetting soybean plots at the full-pod stage.

Pedilanthus tithymaloides (L.) Poit. (zigzag plant) (Fam. Euphorbiaceae). 1 ♀, 1 ♂, 2 nymphs, Lake Argyle village, 39 km S of Kununurra, Western Australia; November 1982. Adults and nymphs were collected from damaged shoots of this widely grown ornamental plant.

Plumeria rubra L. (frangipani) (Fam. Apocynaceae). 2 ♀♀, 1 ♂, 1 nymph, Lake Argyle village, Kununurra, Western Australia; November 1982. Adults and nymph were observed on severely damaged shoots of trees which also showed dieback and proliferation of new shoot growth.

Psidium guajava L. (guava) (Fam. Myrtaceae). 1 ♂, Kimberley Research Station, Kununurra, Western Australia; November 1982. Feeding punctures were noted on developing fruit and one feeding adult was collected.

Discussion

Feeding damage by *Amblypelta* spp. to fruit, stems and petioles was described by Brown (1958), who stressed that the effects were "out of proportion" to the physical damage done by feeding or to the numbers of insects involved. Brown (1958) reported a total of 23 host plants of *A. l. lutescens* of which three were breeding records and 10 others were for feeding. However, Donaldson (1983), who provided further morphological characters for the separation of the three Australian species in this genus, reduced this list to 13 plant species based on label data for the 184 specimens examined. Of these, only four were feeding and/or breeding records and only one (*Morus nigra* L., mulberry) was new. The information reported here indicates the polyphagous nature of *A. l. lutescens* by adding six new feeding records and endorses Brown's (1958) findings for cassava and frangipani. *A. l. lutescens* has now been confirmed to breed or feed on 10 plant species from eight families but it is likely that many other plants are attacked. For example, although no feeding damage has been observed, it would be surprising if the genus *Ficus* does not contain host plants since the banana-spotting bug has now been associated with *Ficus* sp. (rough leaved fig) by Brown (1958), *F. carica* L. (fig) (Donaldson 1983) and I have recorded a single adult on a leaf of *F. leucotricha* Miq. (rock fig).

More importantly, the pest has now been recorded from the Ord River area where horticultural tree crop industries, particularly banana, mango and cashew, are being developed. A single specimen of *A. l. lutescens* was collected from the Ord River area (Richards 1968) some three years before commercially grown crops were produced indicating that the present population is probably not due to a recent introduction. It is likely that the species was not detected or collected between 1961 and April 1982 because of its low population density as evidenced by the small numbers reported in these observations.

Acknowledgements

I am grateful to Mr J. F. Donaldson for identification of this insect, Mr C. Done of the W.A. Forests Department for identification of several host plant species, Mr S. E. Learmonth for the *E. camaldulensis* record and to Mr K. T. Richards for information on the first collected specimen in the Ord River area.

References

Brown, E. S., 1958. Injury to cacao by *Amblypelta* Stal (Hemiptera, Coreidae) with a summary of food plants of species of this genus. *Bull. ent. Res.* 49: 543-554.

Donaldson, J. F., 1983. The Australian species of *Amblypelta* Stal (Hemiptera: Coreidae). *J. Aust. ent. Soc.* 22: 47-52.

Ironside, D. A., 1978. Macadamia pests . . . fruit spotting bug and banana-spotting bug. *Qd agric. J.* 104(3): xiii-xvi.

Lever, R. A., 1982. *Amblypelta* spp. (Hem.: Coreidae), new Australian records. *Proc. Trans. Brit. ent. nat. Hist. Soc.* 15(3/4): 88.

Richards, K. T., 1968. A study of the insect pest complex of the Ord River Irrigation area. MSc. thesis, Univ. of Western Australia. 165 pp.

Aust. ent. Mag. 12(3, 4), June, 1985

SOME NOTES ON THE OCCURRENCE AND SEASONALITY OF *AUSTROMEROPE POULTONI* KILLINGTON (MECOPTERA) IN WESTERN AUSTRALIA

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Abstract

Forty-five individuals of the primitive mecopteran, *Austromerope poultoni*, have recently been collected during systematic sampling near Boddington and Worsley in south-west Western Australia.

The data indicate that the species is probably univoltine with a peak of adult activity in winter and extending into spring. It shows no apparent preference for vegetation association and occurs throughout a wide rainfall range in south-west Western Australia. The sampling programme suggests that the adult spends most of its time on the ground.

Introduction

Austromerope poultoni Killington is a primitive mecopteran belonging to the Meropeidae, a small family known only from North America and south-west Western Australia, and *A. poultoni* is the only known Australian representative (Riek, 1954). The immature stages of *A. poultoni* are unknown.

Until recently, *A. poultoni* was known from only two specimens: the male holotype which was collected near Yallingup (Killington, 1933) and a female which was collected by Dr E. S. Ross at Darlington (Penniket, 1977). In 1974, two females and one male were recorded from near Manjimip, W.A. and in 1976, two adults were taken east of Busselton, W.A. by officers of the W.A. Department of Agriculture (Penniket, 1977).

Worsley Alumina Pty Ltd has recently carried out a base-line biological survey prior to bauxite mining and alumina refining in the Darling Range, W.A. The project areas are near Boddington (32°48′S, 116°28′E) and Worsley (33°19′S, 116°00′E). Invertebrates were sampled in the period March 1980-June 1981 (Phase One Studies) and throughout 1982 (Phase Two Studies). Samples were taken in a systematic manner to facilitate interhabitat comparisions and to provide information on seasonality. *A. poultoni* was collected during both the Phase One and Phase Two studies and the data presented provide information on its habitat preferences, seasonality and sex ratio.

Sampling sites and procedure

The Boddington area (mean annual rainfall approximately 760 mm) comprises a number of vegetation associations surrounded by extensive farmland. In the broadest sense, these may be described as jarrah (*Eucalyptus marginata*) woodland and forest, wandoo (*Eucalyptus wandoo*) woodland and proteaceus heath, often with emergent *Eucalyptus drummondii* (Worsley Alumina Pty Ltd and Dames and Moore, 1981). The Worsley area has a higher annual rainfall of about 1270 mm per year and is dominated by jarrah forest. Yarri (*Eucalyptus patens*) and bullich (*Eucalyptus megacarpa*) forests occur in moister areas adjacent to creeks.

In the 1980-81 Phase One studies 11 Principal Investigation Locations (PIL's) were sampled for invertebrates by systematic light-trapping, pitfall-trapping (5.5 cm diameter jars containing 70% ethanol), foliage sweep-netting and log, rock and bark searching. Locations included all of the representative vegetation associations mentioned above. PIL's were sampled during July, 1980 or during October-November, 1980.

For the 1982 Phase Two studies 14 quadrats were established for invertebrate sampling by the authors: 10 near Boddington and 4 near Worsley. Plots comprised 7 jarrah, 2 wandoo, 3 heath, 1 bullich and 1 yarri habitat. Each of the Boddington quadrats was sampled during each of the major seasons by systematic pitfall trapping (1.8 cm diameter tubes containing 70% ethanol and glycerol), tree-beating and foliage sweep-netting. Twenty samples were taken from each quadrat for each sampling method. The Worsley quadrats were sampled only during autumn and spring.

Results

Three specimens were collected by pitfall-trapping only during the Phase One Studies. These were a female from a heath near Boddington during July, 1980, a male specimen from the same location in October, 1980, and a third (sex unspecified) specimen from jarrah woodland during October 1980.

The results of the Phase Two Studies are shown in Table 1. Only pitfall-trapping yielded specimens. No specimens were collected during

TABLE 1

Numbers of *Austromerope poultoni* sampled by pitfall trapping during the Worsley Alumina's Phase Two biological studies. No individuals were obtained during the mid February (Summer) or late April (Autumn) sampling periods.

Location	Vegetation Association	Sampling Date	
		mid July (Winter)	late Oct. (Spring)
Boddington	jarrah forest	0	0
	jarrah forest	2♂ 10♀	1♀
	jarrah forest	1♀	0
	jarrah forest	4♂ 4♀	0
	jarrah forest	4♂ 3♀	0
	heath	1♀	0
	heath	0	0
	heath	2♂ 7♀	1♀
	wandoo woodland	1♀	0
	wandoo woodland	0	0
Worsley	jarrah forest	*	1♀
	jarrah forest	*	0
	yarri forest	*	0
	bullich forest	*	0
	Total	12♂ 27♀	3♀

* Not sampled at this time.

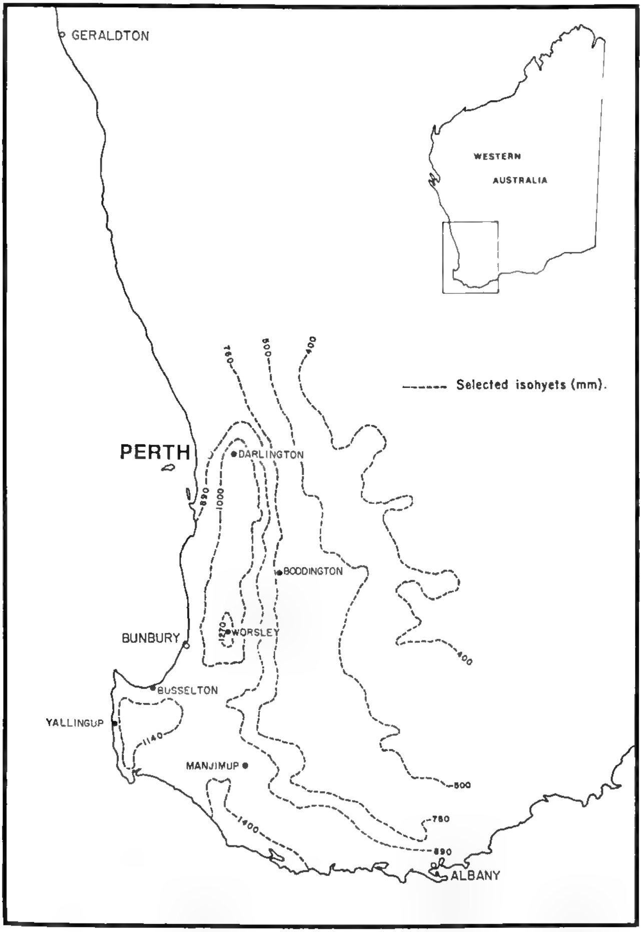

Fig. 1. Map of south-western Western Australia showing selected isohyets and also the known distribution (●) of *Austromerope poultoni.*

summer or autumn, but 39 were collected in winter and 3 in spring. In winter specimens were trapped in all major habitats: jarrah, wandoo and heath. The sex ratio was 1 male: 2.25 female. It is uncertain whether this indicates a real ratio or trappability.

Discussion

The times when specimens were sampled during Worsley Alumina's Phase One and Two studies corresponded closely. The animal appears to have a peak of adult activity during winter, declining through spring. The presence of only one peak indicates that the life cycle is probably univoltine. The absence of adult specimens from the extensive tree-beating and foliage-sweeping samples suggests that the adult spends most of its time on the ground. This is in keeping with earlier reports of the animal being found under logs or rocks (Killington, 1933). The larval stage is presumably active during summer and/or autumn, although no evidence is available to confirm precisely when, or where, the larva is found.

The recording of specimens from Boddington, Worsley, Darlington, Yallingup, Busselton and Manjimup indicates that this species is widespread throughout the southern half of the Darling Botanical District (Beard, 1980) (Fig. 1). Furthermore, the wide variation of rainfall at these sites indicates that the species can tolerate a wide range of habitat moisture regimes. This might also indicate that the species is cryptic, living in conditions of more stable moisture such as within or below the litter layer.

In addition to being geographically widespread, the species occurs in a wide range of vegetation associations. The associations of jarrah forest, wandoo woodland and heath (Table 1) represent a very wide range of structural and micro-habitat variation. The species is clearly not dependent on plant physiognomy or vegetation composition.

The observed sex ratio may be a sampling artifact. If it is a genuine value, no explanation is readily apparent. The existence of large numbers of this species in pitfall traps which are of smaller diameter than the length of the animal may indicate that the animal has made a deliberate attempt to enter the traps. Possibly, it was attracted to the alcohol preservative, as are many other insects (Greenslade and Greenslade, 1971). Thus, *A. poultoni* may normally feed on material where alcohol may provide a detection cue. Plant nectar may be one such food-source or alternatively the adult animal may feed on a decomposition product.

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References

Beard, J. S., 1980. A new phytogeographic map of Western Australia. *West. Aust. Herb. Res. Notes* 3: 37-58.

Greenslade, P. and Greenslade, P. J. M., 1971. The use of baits and preservatives in pitfall traps. *J. Aust. ent. Soc.* 10: 253-260.

Killington, F. J., 1933. A new genus and species of Meropeidae (Mecoptera) from Australia. *Entomologist's mon. Mag.* 69: 1-4.

Penniket, J. G., 1977. The primitive protomecopteran *Austromerope poultoni*. In: *Western Australian Entomology Workshop. Proceedings of a workshop held at the WA Institute of Technology, Bentley.* Pp. 20-21.

Riek, E. F., 1954. The Australian Mecoptera or scorpionflies. *Aust. J. Zool.* 2: 143-168.

Worsley Alumina Pty Ltd and Dames and Moore, 1981. *Worsley Alumina Project. Flora and Fauna studies. Phase I.* Worsley Alumina Pty Ltd, Perth, 251 pp.

REDEFINITION OF *COPOSTIGMA* ENDERLEIN (PSOCOPTERA: PSOCIDAE)

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Abstract

The genus *Copostigma* Enderlein is redefined. Four species of *Mecampsis* Enderlein from New Guinea and eight species of *Ptycta* Enderlein from Fiji and one from Tonga are transferred to *Copostigma*.

Introduction

Increases in the number of species of Psocoptera described in the past two decades have resulted in the limits of some genera becoming somewhat obscure. This is particularly so in a group of genera of the Psocidae which Badonnel (1967) referred to as the *Copostigma–Clematostigma–Ptycta–Maheella* complex. These, and some related genera, such as *Mecampsis* Enderlein were originally defined on the basis of a few venational features and subsequent allocation of species to them has become increasingly difficult. Part of the problem of recognizing these genera was solved by the redefinition of *Clematostigma* Enderlein (Smithers 1983), but the definition of *Copostigma* Enderlein remained a problem. The type species, *C. dorsopunctatum* Enderlein, was based on a single New Guinea specimen which has been destroyed by fire. Professor I. W. B. Thornton is at present studying *Ptycta* Enderlein and a redefinition of *Copostigma* would go a long way towards preventing further confusion in this group of genera.

Data and Discussion

Mecampsis and *Copostigma* were both defined as having a crossvein between veins Rs and M in the fore wing and a spurvein arising from the hind angle of the pterostigma. In *Copostigma* the first section of Cu_{1a} is shorter than the second and at an angle to it whereas in *Mecampsis* it is longer and in a straight line with it. Smithers and Thornton (1981) when dealing with the Psocidae of New Guinea, described and referred four species to *Mecampsis*. These species have a distinct Rs-M crossvein but the pterostigmal spurvein is variable and there is a slight angle between the two basal sections of Cu_{1a}. Thornton (1981) when dealing with the Psocidae of Fiji placed eight species with similar features in *Ptycta*. He pointed out that the Rs-M crossvein was an unusual feature in *Ptycta* but was present in all Fijian species except *P. bebea* Thornton. One species from Tonga (Thornton 1981a) also has an Rs-M crossvein.

The pterostigmal spurvein is frequently a variable character in the Psocoptera; even intraspecific variation is common. Judging by the illustration of the type specimen of *C. dorsopunctatum* it appears to have been well developed as was the Rs-M crossvein (Enderlein 1903, pl. iv, fig. 17b). In the Fijian, Tongan and New Guinea species referred to above the Rs-M crossvein is constant and well developed. As was usual at the time of its description, details were not given of the genitalia of *C. dorsopunctatum*.

In all four New Guinea species described in *Mecampsis* the male paraprocts have an unusual, strongly developed, frequently rugose basal lobe on the upper side (Smithers and Thornton 1981 figs 115, 119, 125) and the females have the sclerification of the ninth sternite in the form of a large broad plate (*loc. cit.* fig. 106). Thornton (1981) did not describe nor illustrate male paraprocts or female ninth sternites of the Fijian species but he has now kindly provided me with drawings by Mrs J. Browning which show that the Fijian species with an Rs-M crossvein agree with the New Guinea species in these other features. Also, the first section of Cu_{1a} is in all cases shorter than the second and at an angle to it.

This combination of venational, paraproct and genitalic features unites the species from New Guinea, Tonga, those from Fiji and others at present being studied from the Melanesian areas in a compact, recognizable generic group to which the name *Copostigma* must be applied.

Copostigma can now be redefined so as to permit comparison with the genera of the complex as previously set out (Smithers 1983).

Redefinition of *Copostigma*

Psocinae in which the pterostigma is broad, concave basad of the hind angle; pterostigmal spurvein usually present, variable; Rs and M joined by a distinct crossvein; first section of Cu_{1a} shorter than second and at an angle to it; male paraprocts with a distinct basal lobe on upper side; ninth sternite of female with a large, broad sclerotized plate. Type species: *D. dorsopunctatum* Enderlein. The only other currently included species is *C. trimaculatum* (Hagan) of which genitalia have not been described. To these are now added the following species, all in *new combination: C. montanum* (Sm. and Th.), *C. major* (Sm. and Th.), *C. bilineata* (Sm. and Th.) and *C. hyalinum* (Sm. and Th.) from New Guinea, *C. collina* (Th.), *C. dispersa* (Th.), *C. mara* (Th.), *C. natewa* (Th.), *C. tora* (Th.), *C. sitivanum* (Th.), *C. vitiensis* (Karny)'and *C. marosticum* (Th.) from Fiji and *C. insularum* (Th.) from Tonga.

There is no need to modify the key to genera provided in Smithers (1983) with which *Copostigma* can still be satisfactorily keyed out.

The zoogeography of the Psocidae in the south western Pacific will be dealt with more fully elsewhere, but it can be noted here that *Copostigma* appears to be a genus which occurs only from New Guinea, through the Melanesian arcs to Fiji.

References

Badonnel, A., 1967. Insectes Psocopteres. *Faune de Madagascar 23*: 1-238, figs 1-496.

Enderlein, G., 1903. Die Copeognathen des indo-australischen faunengebietes. *Ann. hist.-nat. Mus. hung.* 1: 179-344, 12 figs, pls. ii-xiv.

Smithers, C. N., 1983. A reappraisal of *Clematostigma* Enderlein, with notes on related genera (Psocoptera: Psocidae). *Aust. ent. Mag.* 9(5): 71-79, 8 figs.

Smithers, C. N. and Thornton, I. W. B., 1981. The Psocidae (Insecta: Psocoptera) of New Guinea, including a new coleopteriform genus from high on Mount Wilhelm. *Aust. J. Zool.* 29: 921-969, 125 figs.

Thornton, I. W. B., 1981. Psocoptera of the Fiji Islands. *Pacific Insects Monographs* 37: 1-105, 295 figs.

Thornton, I. W. B., 1981a. Psocoptera of the Tongan Archipelago. *Pacific Insects Monographs* 37: 106-135, 55 figs.

LIFE HISTORY AND HABITS OF THE WOOD MOTH *XYLEUTES LITURATA* DON. (LEPIDOPTERA: COSSIDAE) IN TASMANIA

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Abstract

The life history of *X. liturata* is discussed. Food plants are listed and factors which make individual trees more prone to damage than others are described. The egg laying process of the adult female is described as well as larval development and duration of larval cycle. Particular attention is given to the construction and form of the pupal gallery.

Introduction

Xyleutes liturata Donovan is a large, greyish, *Acacia*-feeding cossid, common and widespread in Tasmania where it lives in a variety of habitats from coastal sand dunes and heathland to wet sclerophyll forest.

Dodd (1916) and Littler (1904) write of great damage caused by *X. eucalypti* Herrich-Shaeffer (a misidentification as *X. eucalypti* does not occur in Tasmania) to wattles in Tasmania. Dodd (1916) stated "I understand that *Xyleutes eucalypti*, or a closely related species, has become so plentiful in Tasmania that large numbers of wattle trees are killed by the caterpillars". This is somewhat of an exaggeration as I have never seen a tree killed by the activities of *X. liturata* alone, and healthy trees suffer no serious effects, and the sap wood grows over old emergence holes.

Littler (1904) writing from Launceston states "It is hardly possible to find a tree that has outgrown the sapling stage without one or more–most frequently more–tunnels formed by the larvae of this moth". This is certainly the case today in some areas of wattle-dominated country which are infested with larvae of *X. liturata,* many trees having two, three or more larvae boring in them, often of the same age.

Food plants

In my experience *X. liturata* will oviposit on any suitably sized tree in the *Acacia* genus. The usual food plants in Tasmania are the common and widely distributed black wattle *Acacia mearnsii* De wild, silver wattle *Acacia dealbata* Link, blackwood *Acacia melanoxylon* R. Br. and the narrow-leaved wattle *Acacia mucronata* Willd. ex H. Wendl. *X. liturata* also infests a species of small shrub-like *Acacia* that grows behind sand dunes in coastal regions.

A variety of introduced acacias are also food plants for this species, the most commonly grown and thus the most commonly infested are the cootamundra wattle *Acacia baileyana*, F. Muell, and the Sydney golden wattle *Acacia longifolia* (Andr.) Willd.

Sickly and damaged trees are more prone to attack than healthy ones and are usually covered in suitable sites for egg laying through the activities of other insects such as beetles which leave emergence holes and cause bark to crack and peel. Old, badly damaged wattles often have several dozen larvae of *X. liturata* of various ages boring in them.

Oviposition and egg

The eggs are pale yellow, oviod in shape and approximately 1 mm long and are accompanied by a glutinous secretion which hardens. Common (1970) states that *Xyleutes* larvae live beneath this hardened secretion for some days before dispersing.

Female moths lay their eggs in cracks and depressions in the bark of the food plant. Another common site for oviposition is the depression formed where a small branch leaves the trunk.

The female moth generally alights on the lower trunk and commences to probe the bark with its long brown ovipositor, (some 20-25 mm long) seeking out suitable cracks in which to deposit the eggs. The moth makes its way up the trunk of the tree in this manner. When a suitable crack or hole is located the ovipositor is pushed inside and the eggs pumped into the depression until it is full.

Eggs are laid in this fashion all over the tree as high as the trunk is at least 12 cm thick. *X. liturata* larvae bore in the heartwood of trees and so in climax wattle scrub where trees often have trunks 92 cm thick the moths oviposit on branches that are between 8 and 30 cm thick. In northern Tasmania large silver wattles *Acacia dealbata* grow in rainforest gulleys. These trees are very large and in this habitat *X. liturata* larvae live high up in the canopy among the thinner branches. Their presence was only discovered when branches blown down in storms were examined and found to contain larvae.

Larva

The habits of the newly emerged larvae were described by Littler (1904) who thought he had discovered a spiders web in his study but on closer examination proved to be "a vast number of minute larvae of this moth suspended by threads, which from their intermingling had formed a web". I have never seen this behaviour in the wild and no doubt it can be attributed somewhat to the alien environment of a setting board on which the larvae Littler described emerged. My own observations have led me to believe that the larvae disperse over the trunk of the tree and crawl into minute cracks and then start their wood boring existence.

The small larva was further described by Littler (1904) who gave the colour as being "dark fawn, head black, with a few hairs projecting along the sides and a greater number on the anal segment". The larva at this stage is approximately 2 mm long.

In the same article Littler goes on to describe the habits of the tiny larvae, stating that they were "extremely active, both when making progress on a level surface, and when suspended over the edge of the table and letting themselves down by threads".

The first few instars are generally spent in the sap wood near the bark. When the larva has reached about 30 mm in length it begins to bore inwards towards the heartwood. Once the heartwood is reached the bore is then continued vertically up the tree. Littler (1904) states "Their tunnels commence some distance up the trunk of a tree and are pushed down towards the roots". However, I have examined hundreds of bores and not one has ever bored down in the direction of the roots.

From its earliest stages until it is 50-60 mm long the larva is often colourful, it can be any of several shades of reddish pink or yellowish brown with dark brown spots and speckles. When the larva is approximately 60 mm it will generally begin to lose its colouring until it is a creamy white. Some adult larvae however retain a pinkish flush or small brown speckles.

Once inside the heartwood the larva lengthens and widens its bore to accommodate its increasing bulk, the frass ejection hole is likewise enlarged, but rarely does it get much larger than 4 mm in diameter. Much frass is ejected which piles up sometimes several centimetres deep at the base of some trees during the several years of the larva's life. As the larva grows it begins to bore out horizontally away from the heartwood. Here it obtains much of its nutriment from the sap flow of the tree by feeding at the top and bottom ends of its bore on the constantly forming young wood and sappy matter. With eighteen months or so to go before the emergence of the adult the larva bores all the way out to the bark and then begins to widen the centre of its tunnel in order to accommodate the cocoon. The wood chewed out in this widening process, as well as all excreta, is used to seal off the frass ejection hole and the bottom half of the tunnel, thus no frass is ejected for a considerable period before the emergence of the moth. Frass and wood scrapings pushed into the lower bore are very densely packed, effectively sealing it off from any predators. The bore at this stage is usually about 300 mm long and some 25 mm wide in the centre of the tunnel. The longest bore I have encountered was 400 mm long and the widest bore was some 30 mm across in its middle.

In its last year the larva begins to construct the coccoon in August or September, as soon as the weather starts to warm up after winter. The cocoon is constructed with a tough outer layer of silk and flakes of wood. Inside it is padded with soft, but strong, yellowish brown silk, its opening as Dodd (1916) states "is a broad felt like ring meeting but only slightly closed in the centre".

When the cocoon is almost completed the larva chews the bark over the emergence hole almost through, leaving a circular piece of bark about card-paper thickness, this dried and cracks in the sun and so the larva usually strengthens the perimeter with strands of silk so it does not blow off or dislodge before emergence; some however do fall.

At this stage a female larva may be 125 mm long and just over 20 mm in diameter. I have never seen a larger one than this but I have heard unconfirmed reports of larvae exceeding 150 mm in Tasmania. Froggatt (1864) reported larvae of *X. liturata* reaching 200 mm but this would appear to be an exaggeration. A male larva is considerably smaller with some being only 40 mm long immediately prior to pupation.

After chewing the bark over the emergence hole cardpaper thin the larva retreats to the cocoon. Some larvae spin a criss-cross network of silken strands across the tunnel walls as they retreat. Once inside the cocoon the larva closes the cocoon opening and enters the pre-pupa stage; this usually takes place in October. Several weeks later the last larval skin is shed and a soft, white pupa appears, the cuticle of which hardens over several days.

Pupa

(Fig. 1.)

The thoracic segments are hard and shiny black, the rest of the pupa being a dark brown colour. Most abdominal segments of the pupa are equipped with a ring of blunt spines to assist the pupa in making its way up the bore at emergence. A large female pupa may be 90 mm long and 20 mm in diameter. The adult is usually ready to emerge by mid December.

Various times of emergence have been attributed to *X. liturata* by researchers over the years. Littler (1904) states "The perfect insect emerges generally during the night". Dodd (1916) states "There are several forms of *X. liturata*, perhaps they will in time be separated into species; one form emerges as early as 10 or 11 a.m., another as late as 5 or 6 p.m." All my *X. liturata* emerged in the late afternoon and early evening. The majority emerged at around 5-6 p.m. with some as late as 7.40 p.m. Emergence seems to be associated with hot, windless days, and the great majority of moths in a given area emerge on the same evening.

The pupa first forces its way out of the cocoon which is no mean feat as the exit is very narrow and the surrounding silk and wood flakes, very tight indeed. Dodd (1916) states that this structure is "so thick and tough that the pupa must possess great strength to force its way through". It is even difficult to push a little finger through the cocoons' opening after the emergence of the pupa. Once free of the cocoon the pupa then makes its way along the bore with the aid of the blunt spines (this is probably done in a spiral motion because if a naked pupa is agitated its squirming causes it to rotate) and stops at the thin bark covering the emergence hole, or it may push it out and then protrude for a short distance. Here the pupa stops and the moth inside engages in a pumping action. I have seen pupae keep this up for up to an hour. After this the pupa protrudes further from the emergence hole and stops when the wing cases are visible.

The moth inside now moves up through the pupal sheath and pushes against the line of fracture along the top of the thorax. I have held emerging pupae in my fingers and the force exerted is considerable. Eventually the line of fracture splits, the moth moves up, further widening the split as well as going through similar wing beat movements as when flying which rips the end of the pupal sheath right open. The moth now slowly draws out its antennae and immediately afterwards the fore legs. The moth at this stage is facing the ground so it grasps the tree trunk with its fore legs and twists around, facing vertically up the tree. The rest of the body is drawn out leaving the empty pupal sheath protruding.

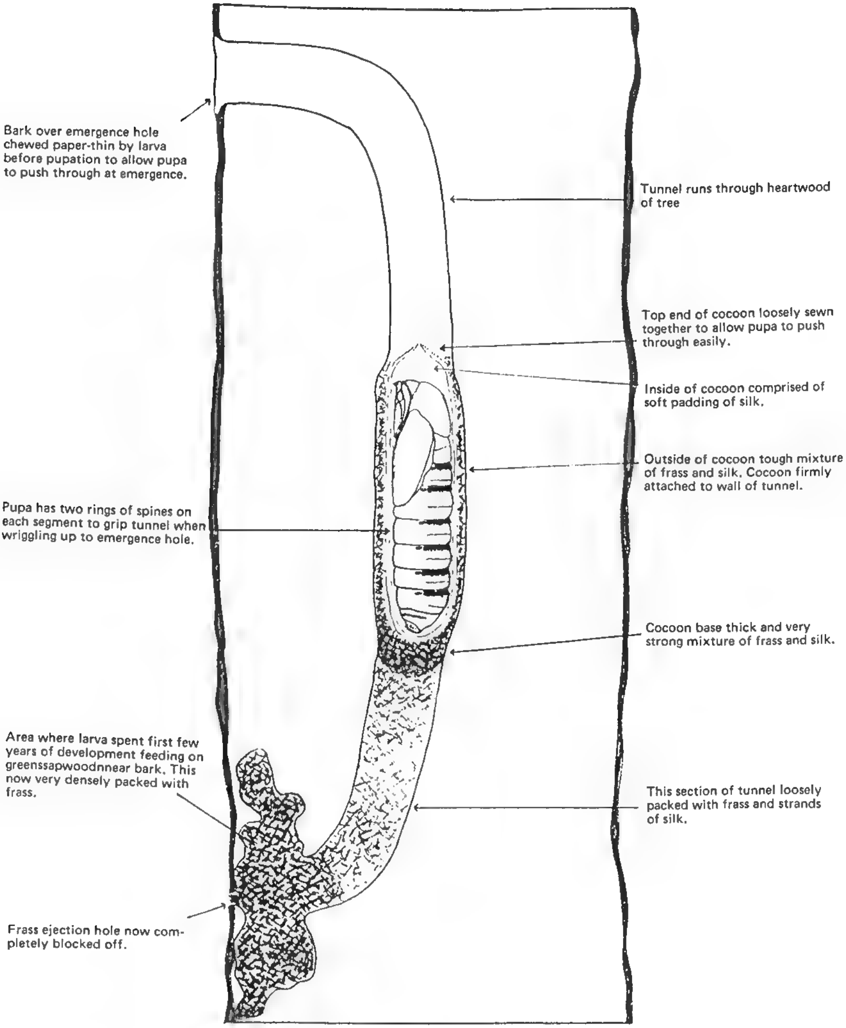

Fig. 1. Pupa, pupal chamber and cocoon of female *Xyleutes liturata.*

Adult

As soon as the moth is free of the pupal sheath it starts to crawl up the tree or around the trunk, at the same time expanding the wings. After several minutes of scrambling about the moth finds a secure perch where it continues to expand its wings which are now raised vertically over the body. When the wings are fully expanded they are lowered into the normal position. The wings take several hours to harden before the moth can fly.

Females appear to attract males with a powerful pheromone. I once placed a newly emerged female on a wattle in our garden and left her there all night. The following morning the moth, to my surprise, was still there and was now accompanied by two males. No moths of either sex had previously been seen in or around the property in twelve years of residence and the only suitable acacia scrub was 2 km away.

Both sexes are strong flyers; gravid females are at first somewhat slow and cumbersome but can nonetheless fly quite well.

Adults vary tremendously in size, more so in females than in males. The smallest female I have collected has a fore wing length of 39 mm and the largest female 75 mm with an abdomen 60 mm long and 24 mm in diameter. The smallest male had a fore wing of 33 mm and the largest 51 mm. The largest female specimen in Australian National Insect Collection, Canberra, has a fore wing length of 92 mm (E. D. Edwards, pers. comm.). Tasmanian specimens occasionally reach this size.

Duration of life cycle

From my observations the life cycle of *X. liturata* varies from 2-4 years, depending on the sex of the larva and the quality of the timber in which it is boring. Male larvae often pupate after two years in the timber but females can take considerably longer. Froggatt (1894) reported claims that the cycle of *X. liturata* occupied "upwards of nine years" but I have not encountered such long periods. After collecting a large number of larvae I have found their growth rate to be slower than I expected. One such larva collected in late September, 1983 was only 15 mm long and 3 mm in diameter. As the adult moths are only active in November and December, at the very youngest this small larva was almost twelve months old.

Acknowledgement

My sincere thanks to Mr Ted Edwards of C.S.I.R.O., Canberra for identifying the moth, for supplying copies of old and obscure references and offering sound advice.

References

Common, I. F. B., 1970. Lepidoptera. Chapter 36 in: *The insects of Australia.* Melbourne University Press, Melbourne. Pp. 765-866.

Dodd, F. P., 1915. Notes on the great Australian Cossidae. In Oberthur, C., Houlbert C. and Dodd, F. P., *Contributions à l'Etude des Grandes Lépidoptères d'Australie. Eludes de Lépidoptèrologie Comparée* Fasc. 11: 33-37.

Froggatt, W. W., 1894. Wood moths: with some account of their life histories. *Proc. Linn. Soc. N.S.W.* (2) 9: 375-383.

Littler, F. M., 1904. Note on *Zeuzera eucalypti. Entomologist* 37: 114.

Aust. ent. Mag. 12(3, 4), June, 1985

NOTES ON THE OCCURRENCE OF *OLIGONYCHUS MILLERI* (McGREGOR) AND *O. COFFEAE* (NIETNER) (ACARI: TETRANYCHIDAE) IN AUSTRALIA

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Abstract

Previously known only from the U.S.A. and Jamaica, *Oligonychus milleri* (McGregor) was found for the first time in Australia near Armidale (N.S.W.) in 1982. *O. coffeae* (Nietner), which has been recorded in Queensland since 1955 and in N.S.W. since 1981, was collected on *Eucalyptus globulus* at Bicheno (Tasmania) in 1983.

Oligonychus milleri (McGregor)

(Figs 1-2)

Paratetranychus milleri McGregor, 1950: 343.
Oligonychus milleri (McGregor), Pritchard and Baker, 1955: 280-281.

This mite described from California on *Pinus ponderosa*, was only known from North America and the Caribbeans. It was collected on various species of pines from the following localities: California, Arizona, Utah, Idaho, Wisconsin, Louisiana, Florida, North Carolina, Virginia, Delaware (Pritchard & Baker, 1955), and from pines and spruce in New York by Reeves (1963). In California, it was collected by Charlet and McMurtry (1977) on six different pine species (*Pinus quadrifolia, P. balfouriana, P. aristata, P. ponderosa, P. coulteri, P. attenuata*), at 1800 to over 3000 m, and on three other ornamental plantings of *P. radiata, P. pinea* and *P. halepensis.* Tuttle & Baker (1964) mentioned in Arizona several other host plants: *Photinia arbutifolia, Evonymus* sp., *Olea europaea, Asclepias speciosa* and *Antennaria arida.*

O. milleri has been reported damaging nursery seedlings of *Pinus caribaea* in Jamaica (Muma and Apeji, 1970). Damage includes yellowing and bronzing of the needles on seedlings and sometimes leads to the death of young trees.

In N.S.W., where the most common spider mite on conifers is *Oligonychus ununguis* (Jacobi) (Gutierrez and Schicha, 1983), *O. milleri* was identified for the first time on *Pinus radiata* at Uphill near Armidale, 7-XII-1982, from a small sample collected by A. J. Campbell; the specimens were causing yellowing and browning of the needles.

The aedeagus of the male (Fig. 1), is very distinctive: it is bent downwards at an acute angle, and has a long distal end. The dorsum of the female (Fig. 2) has short hysterosomal setae, the dorsocentrals D_1 to D_4 increasing in length progressively.

Tibia I bears 5 ordinary setae, one bothridial seta and one solenidion; tarsus I has one proximal ordinary seta and one solenidion.

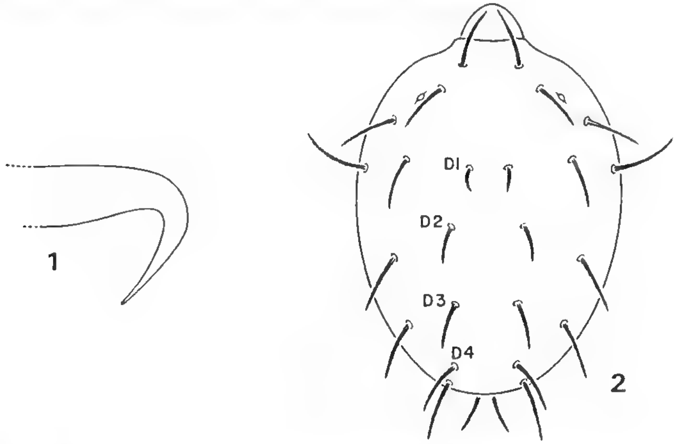
Tibia II has 4 ordinary setae, tarsus II one proximal ordinary seta.

Oligonychus coffeae (Nietner)

Acarus coffeae Nietner, 1861.
Oligonychus coffeae (Nietner), Pritchard and Baker, 1955: 315.

Known in Queensland on *Quisqualis indica* (Pritchard & Baker, 1955), this species was then collected on several other crops in the same state and recorded in N.S.W. on litchi and avocado (Rand & Schicha, 1981).

O. coffeae was recently detected in Tasmania on leaves of *Eucalyptus globulus*, Bicheno, 11-III-1983 (Coll. J. Gutierrez). This record indicates that, extending south of latitude 40° south, the range of distribution of the tea red spider mite is probably very wide in Australia.



Figs 1-2. *Oligonychus milleri* (McGregor): (1) aedeagus of the male; (2) dorsum of the female.

References

Charlet, L. D. and McMurtry, J. A., 1977. Systematics and bionomics of predaceous and phytophagous mites associated with pine foliage in California. I. Survey of mites on native pines, including a description of a new species of Phytoseiidae. *Hilgardia* 45(7): 173-210.

Gutierrez, J. and Schicha, E., 1983. The spider mite family Tetranychidae (Acari) in New South Wales. *Intl. J. Acarol.* 9(3): 99-116.

Landwehr, V. R. and Allen, W. W., 1982. Life history of *Oligonychus subnudus* and *O. milleri* (Acari: Tetranychidae) and influence of temperature on development, survival, and oviposition. *Ann. ent. Soc. Am.* 75(3): 340-345.

McGregor, E. A., 1950. Mites of the family Tetranychidae. *Amer. Midl. Nat.* 44(2): 257-420.

Muma, M. H. and Apeji, S. A., 1970. *Oligonychus milleri* on *Pinus caribaea* in Jamaica. *Florida Ent.* 53(4): 241.

Pritchard, A. E. and Baker, E. W., 1955. A revision of the spider mite family Tetranychidae. *Pac. Coast Ent. Soc. Mem. Ser.* 2: 472 pp.

Rand, J. and Schicha, E., 1981. The tea red spider mite *Oligonychus coffeae* (Nietner) (Acari: Tetranychidae) as an avocado pest in Australia. *Gen. appl. Ent.* 13: 9-10.

Reeves, R. M., 1963. Tetranychidae infesting woody plants in New York State, and a life history study of the elm spider mite *Eotetranychus matthyssei* n.sp. *Cornell Univ. Agr. Expt. Sta. Mem.* 380: 99 pp.

Tuttle, D. M. and Baker, E. W., 1964. The spider mites of Arizona (Acarina: Tetranychidae). *Univ. Arizona Techn. Bull.* 158: 1-41.

BOOK REVIEWS

A field companion to the butterflies of Australia and New Zealand by Bernard d'Abrera. 1984. 176 pp., illustrated in colour and black and white. Five Mile Press, Canterbury, Victoria. $14.95

According to the introduction in Bernard D'Abrera's latest book on Australian butterflies this volume "is meant to be a highly portable and up-to-date field companion to the true butterflies". This claim reflects the isolation of D'Abrera from the highly active mainstream of Australian butterfly studies today, and my overall response is a mixture of sorrow and anger. It is sad to see such an attractive appearing book so poorly supported by data and so lacking in careful attention to detail (poor layout, poor reproduction, extremely poor editing and numerous errors). My anger is directed at D'Abrera's hypocrisy in claiming (page 5) that the book challenges the lay lepidopterist to make new records and consequently "make a practical contribution to the advance of entomology". Such a comment is difficult to accept from the pen of one who so frequently in this volume ignores the published observations of numerous amateur and professional entomologists (e.g. the life history of *Argyreus hyperbius* was published in 1977–D'Abrera is still claiming that it is unknown).

On the positive side it can be said the volume is indeed compact and rugged and for a large number of butterfly species the illustrations [almost entirely coloured photographs of set (dead) specimens] are quite adequate. Unhappily this is not true for many species in the family Lycaenidae–the family with the greatest number of species in Australia (130). Several species are totally unrecognizable due to poor photographs or poor reproduction: for example both *Anthene* species; *Hypochrysops miskini*–males are purple not blue as shown–and this is true for *H. pythias* and *H. ignitus* males also. Similarly the *Ogyris barnardi* male is shown as bright blue (they are purple) while the bright blue male of *Ogyris zosine* seems more like *O. genoveva* as *zosine* males are a distinct dull purple above. The three large *Arhopala* species are quite unlike the illustrations presented also and one could go on with many more examples. Even more serious is the confusion by D'Abrera of two very different species. *Candalides xanthospilos* is illustrated as *Megisba strongyle* and vice versa!

An unfortunate practice of D'Abrera is to illustrate the Australian species with a subspecies not found in Australia and often quite differently coloured–not a particularly useful approach for a field companion. For example the Australian subspecies of *Delias aruna* (page 42) has nowhere near as much red colour beneath the wings as the New Guinea subspecies illustrated and its most distinctive feature is the orange-yellow colour above, a fact well concealed by D'Abrera.

The habitat illustrations included in this volume, while perhaps welcome, also reflect the general geographical bias in knowledge and interest on southern Australia. Despite the fact that Queensland is the richest area for Australian butterflies only one photograph represents that vast and varied state, while seven photos illustrate D'Abrera's home state of Victoria. The comments on *Appias ada* also reflect the author's lack of recent experience in north Queensland and are quite misleading. Not only is this species well known in the Iron Range and Cape Tribulation area, but its life history has also been recorded in Australia. Further evidence of D'Abrera's armchair approach come from his reference to the Johnstone River as Cape York Peninsula (Innisfail folk please note!). *Catopsilia scylla* is well known from Townsville north and the doubt cast by D'Abrera on Dodd's Kuranda label for this species (p. 53) is quite unwarranted.

Much of the deficiency in this volume may be due to D'Abrera's peculiar reluctance to consult the most recent and authoritative work on Australian butterflies (Common and Waterhouse, 1982). But there are additional weaknesses in the utility of this volume as a field companion. For example on only few occasions is the preferred habitat of a species identified. There are no illustrations of the juvenile stages despite at least one reference to such an illustration!

Overall this is a clumsily assembled volume of recycled photographs and much irrelevant and misleading material. Despite superficial appearances to the contrary it is not nearly as useful as the field edition of Common and Waterhouse. There remains scope for a thoroughly competent and well designed field guide to the butterflies of Australia to be published.

PETER S. VALENTINE

The Rothschild collection of fleas. The Ceratophyllidae. By Robert Traub, Miriam Rothschild and John Haddow. Published June 1984. 288 pp., plus 151 species distribution maps, 90 plates and 205 figures. Distributed by Academic Press, 24-28 Oval Rd, London NW1 7DX. Price Stg. £60.

Little did Melville realise just how wrong he would be when he wrote "No great and enduring volume can ever be written on the flea, though many there be who have tried it" (*Moby Dick*, Ch. 104). The current volume is essentially a continuation of the 5 volumes of the *Illustrated Catalogue of Fleas (Siphonaptera)*. Researchers have long been aware that the most eagerly awaited part of this Catalogue related to the family Ceratophyllidae. Some 470, or 20%, of the known fleas belong to this family. An urgent need for a revised classification and ready means of identifying these insects necessitated a different approach in this volume from the previous five. The first 36 pages, written by F. G. A. M. Smit, concern classification and constitute extensive taxonomic notes on the family, descriptions of six new genera and eight new subgenera, and a detailed key to all genera and subgenera together with 205 figures. A major section on distribution follows in which are summarised, not only distributions but also host and ecology data under genera and species. Then comes a separate detailed chapter on hosts, another on medical importance of the Ceratophyllidae, and finally five appendices and an index.

Truely, this is a schollarly work of major significance to all seriously interested in fleas. It is, indeed, a text that will endure the passing of time and I commend Miriam Rothschild and Robert Traub for their willingness to privately publish this work. But, perhaps I should add for the benefit of Australian enthusiasts, that I could find no specific listings for Australia. Every other major landmass in the world (including New Guinea and New Zealand) is included in the distribution of at least one species. Do not let this fact, however, deter you from adding it to your library; the importance of its content for Australia is significant.

Advances in insect physiology, Volume 17, edited by M. J. Berridge, J. E. Treherne and V. B. Wigglesworth. Published January 1984. 318 pp., text-figs, tables. Academic Press, 24-28 Oval Rd, London NW1 7DX. Price Stg. £30.

This latest volume contains four major papers: (1) Mechanisms of sclerotization in dipterans, (2) The physiology of insect tracheoles, (3) The endocnine control of flight metabolism in locusts and (4) The neurosecretory-neurohaemal system of insects, plus the usual subject index, and cummulative author and chapter title lists. Following the high standard of preceeding volumes these papers have been written by world authorities in their field and represent essential reading for all scientists interested in these fields of endeavour. Recent research is summarized along with an invaluable synopsis of the primary literature; several hundred key references are listed. If your work involves insect physiology and you are not familar with this Series you should become so without delay.

M. S. MOULDS

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

AMOS, T. G., SEMPLE, R. L., WILLIAMS, P. and SCHWARZ, M.

1982. Compounds related to juvenile hormone: activity of selected terpenoid compounds on *Rhyzopertha dominica* (Coleoptera: Bostrichidae), *Sitophilus oryzae* and *S. granarius* (Coleoptera: Curculionidae). *Gen. appl. Ent.* 14: 63-68, 4 tables.

DEARN, John M. and DAVIES, Richard A. H.

1983. Natural selection and the maintenance of colour pattern polymorphism in the Australian plague locust *Chortoicetes terminifera. Aust. J. biol. Sci.* 36(4): 387-401, 7 tables, text-figs 1 & 2.

DEBENHAM, M. L.

1983. Australasian species of the blood-feeding *Forcipomyia* subgenera, *Lasiohelea* and *Dacnoforcipomyia* (Diptera: Ceratopogonidae). *Aust. J. Zool. Suppl. Ser.* 95: 1-61, text-figs 1-188.

DOMROW, Robert

1983. A new species of *Ornithonyssus* Sambon from Tasmania (Acari: Dermanyssidae). *J. Aust. ent. Soc.* 22(1): 69-73, text-figs 1-8.

DONALDSON, J. F.

1983. The Australian species of *Amblypelta* Stål (Hemiptera: Coreidae). *J. Aust. ent. Soc.* 22(1): 47-52, 3 tables, text-figs 1-16.

1983. Revision of the Australian Asiracinae (Homoptera: Fulgoroidea: Delphacidae). *J. Aust. ent. Soc.* 22(4): 277-285, text-figs 1-42.

DOUBE, B. M.

1984. The effect of breed and coat colour on numbers of the buffalo fly *Haematobia irritans exigua* De Meijere, (Diptera, Muscidae) on bovine hosts. *J. Aust. ent. Soc.* 23(1): 39-45, 5 tables.

GALLOWAY, I. D. and FRANZMAN, B. A.

1983. A new species of *Perilampus* Latreille (Hymenoptera: Pteromalidae) from Australia with notes on its biology. *J. Aust. ent. Soc.* 22(2): 109-112, text-figs 1-10.

HILL, L.

1981. The immature stages of *Euplexia iorrhoa* (Meyrick) (Lepidoptera: Noctuidae). *Aust. ent. Mag.* 8(4): 48-54, 2 tables, text-figs 1-11.

1982. Eggs of some Tasmanian Noctuidae (Lepidoptera). *Aust. ent. Mag.* 9(4): 49-59, 2 tables, text-figs 1-20.

HOUSTON, Terry F.

1981. Alimentary transport of pollen in a paracolletine bee (Hymenoptera: Colletidae). *Aust. ent. Mag.* 8(4): 57-59.

JAMES, David G.

1982. A transient non-breeding population of *Danaus plexippus* (L.) (Lepidoptera: Nymphalidae) near Picton, New South Wales. *Aust. ent. Mag.* 8(6): 96-99, 1 table.

JOHNSON, S. J. and JOHNSON, I. R.

1984. First record of *Philiris azula* Wind and Clench (Lepidoptera: Lycaenidae) from Australia. *Aust. ent. Mag.* 10(6): 89-90, text-figs 1-6.

JOHNSON, S. J. and VALENTINE, P. S.

1983. Notes on the biology and morphology of *Hesperilla sarnia* Atkins (Lepidoptera: Hesperiidae). *Aust. ent. Mag.* 10(1): 6-8, text-figs 1-5.

KITCHING, R. L. and CALLAGHAN, C.

1982. The fauna of water-filled tree holes in box forest in south-east Queensland. *Aust. ent. Mag.* 8(5): 61-70, text-figs 1-3.

Le SOUËF, J. C.

OBITUARY, *Aust. ent. Mag.* 9(6): 99.

McQUILLAN, P. B.

1983. Observations on *Scaraphites rotundipennis* (Dejean) (Coleoptera: Carabidae) a pest of golf courses on Flinders Island. *Aust. ent. Mag.* 10(4): 41-44, text-figs 1-6.

MORRISON, N. H.

1981. Fly mimicry by a jumping spider (Salticidae). *Aust. ent. Mag.* 8(2, 3): 22.

1983. A food gathering strategy of the black jumper ant *Myrmecia pilosula* (Smith) (Hymenoptera: Formicidae). *Aust. ent. Mag.* 9(6): 96.

MORTON, S. R. and RENTZ, D. C. F.

1983. Ecology and taxonomy of fossorial, granivorous gryllacridids (Orthoptera: Gryllacrididae) from arid central Australia. *Aust. J. Zool.* 31(4): 557-579, 4 tables, text-figs 1-30.

MOULDS, M. S.

1983. A new species of *Langia* Moore (Lepidoptera: Sphingidae) from northern Australia. *Aust. ent. Mag.* 10(5): 75-79, text-figs 1-3.

MOULDS, M. S. and d'APICE, J. W. C.

1982. Butterflies of the upper Jardine River, Cape York Peninsula. *Aust. ent. Mag.* 9(2, 3): 21-26, 1 text-fig.

NAUMANN, I. D.

1983. The systematic position of *Dasyproctus verutus* Rayment (Hymenoptera: Sphecidae: Crabroninae). *J. Aust. ent. Soc.* 22(4): 349-351, text-figs 1-3.

NAUMANN, I. D. and SANDS, D. P. A.

1984. Two Australian *Elasmus* spp. (Hymenoptera: Elasmidae), parasitoids of *Pectinophora gossypiella* (Sanders) (Lepidoptera: Gelechiidae): their taxonomy and biology. *J. Aust. ent. Soc.* 23(1): 25-32, 1 table, text-figs 1-9.

NEBOISS, Arturs

1983. *Checklist and bibliography of the Australian caddis-flies (Trichoptera).* Australian Society for Limnology, Special Publication 5. 132 pp.

1984. Four new caddis-fly species from Victoria (Trichoptera: Insecta). *Victorian Nat.* 101(2): 86-91, text-figs 1-15.

NGUYEN, N. T.

1984. The acquisition of aerial U.L.V. sprays by Australian plague locust nymphs, *Chortoicetes terminifera* (Walker). *J. Aust. ent. Soc.* 23(1): 75-80, 4 tables, text-fig. 1.

O'FLYNN, M. A.

1983. The succession and rate of development of blowflies in carrion in southern Queensland and the application of these data to forensic entomology. *J. Aust. ent. Soc.* 22(2): 137-148, 8 tables, 1 text-fig.

1983. Notes on the biology of *Chrysomya nigripes* Aubertin (Diptera: Calliphoridae). *J. Aust. ent. Soc.* 22(4): 341-342.

OLDROYD, B. and MORAN, C.

1983. Heritability of worker characters in the honeybee (*Apis mellifera*). *Aust. J. biol. Sci.* 36(3): 323-332, 1 table, text-fig. 1.

PAGE, F. D.

1983. Biology of *Austroasca viridigrisea* (Paoli) (Hemiptera: Cicadellidae). *J. Aust. ent. Soc.* 22(2): 149-153, 3 tables, text-fig. 1.

PETNEY, T. N., ANDREWS, R. H. and BULL, C. M.

1983. Movement and host finding by unfed nymphs of two Australian reptile ticks. *Aust. J. Zool.* 31(5): 717-721, 1 table, 1 text-fig.

REEVES, D. M.

1982. Excursion report: Mt. Tamborine, 14/15 November, 1981. QNC News 127: 7-8.
Odonata: *Diphlebia lestoides*
Lepidoptera: *Jalmenus evagoras, Ornithoptera richmondia, Euschemon rafflesia, Graphium macleayanus, Hesperilla ornata*

RENTZ, D. C. F. and CLYNE, Densey

1983. A new genus and species of pollen- and nectar-feeding katydids from eastern Australia (Orthoptera: Tettigoniidae: Zaprochilinae). *J. Aust. ent. Soc.* 22(2): 155-160, 2 tables, text-figs 1-12.

RIDSDILL SMITH, T. J., WEIR, T. A. and PECK, S. B.

1983. Dung beetles (Scarabaeidae: Scarabaeinae and Aphodiinae) active in forest habitats in southwestern Australia during winter. *J. Aust. ent. Soc.* 22(4): 307-309, 2 tables.

ROBERTSON, L. N.

1984. An extraction method used to study vertical and lateral distribution of soldier fly *Inopus rubriceps* (Diptera: Stratiomyidae) in sugar cane soil. *J. Aust. ent. Soc.* 23(1): 21-24, 2 tables.

ROSSBACH, M. H. and MAJER, J. D.

1983. A preliminary survey of the ant fauna of the Darling Plateau and Swan Coastal Plain near Perth, Western Australia. *J. R. Soc. West. Aust.* 66(3): 85-90, 2 tables, text-figs 1 & 2.

ROTHSCHILD, G. H. L.

1983. Monitoring of pinkspotted bollworm, *Pectinophora scutigera* (Holdaway) Lepidoptera: Gelechiidae) with sex attractant traps. *J. Aust. ent. Soc.* 22(2): 161-166, 1 table, text-figs 1-2.

RUSSELL, R. C.

1979. A study of the influence of some environmental factors on the development of *Anopheles annulipes* Walker and *Anopheles amictus hilli* Woodhill & Lee (Diptera: Culicidae). Part 1. Influence of salinity, temperature and larval density on the development of the immature stages. *Gen. appl. Ent.* 11: 31-41, 14 tables.

1979. A study of the influence of some environmental factors on the development of *Anopheles annulipes* Walker and *Anopheles amictus hilli* Woodhill & Lee (Diptera: Culicidae). Part 2. Influence of salinity, temperature and larval density during the development of the immature stages on adult fecundity. *Gen. appl. Ent.* 11: 42-45, 6 tables.

SCHICHA, Eberhard

1983. New species, new records, and redescription of phytoseiid mites from Australia, Tahiti and the African region (Acari: Phytoseiidae). *Int. J. Ent.* 25(2-3): 103-126, text-figs 1-70.

SELMAN, B. J.

1983. The naming of the Tasmanian species of *Paropsis* Olivier (Coleoptera: Chrysomelidae). *J. Aust. ent. Soc.* 22(4): 333-339, text-figs 1-7.

SELMAN, B. J. and LOWMAN, M. D.

1983. The biology and herbivory rates of *Novascastria nothofagi* Selman (Coleoptera: Chrysomelidae) a new genus and species of *Nothofagus moorei* in Australian temperate rain forests. *Aust. J. Zool.* 31(2): 179-191, 4 tables, text-figs 1-17.

SHAW, Dorothy E. and CANTRELL, B. K.

1983. A study of the pollination of *Alocasia macrorrhiza* (L.) G. Don (Araceae) in southeast Queensland. *Proc. Linn. Soc. N.S.W.* 106(4): 323-335, 6 tables.
Hymenoptera, Coleoptera, Thysanoptera, Diptera

1983. Further notes on seed set in *Alocasia macrorrhiza* (Araceae) and occurrence of *Neurochaeta inversa* (Diptera: Neurochaetidae) in Queensland. *Qd Nat.* 24(1-4): 71-75, 2 tables.

SMITHERS, C. N. and BUTLER, W. H.

1983. The butterflies (Lepidoptera: Hesperioidea and Papilionoidea) of Barrow and nearby islands, Western Australia. *West. Aust. Nat.* 15(6): 141-145, 2 tables.

SPRADBERY, J. P., POUND, A. A., ROBB, J. R. and TOZER, R. S.

1983. Sterilisation of the screw-worm fly, *Chrysomya bezziana* Villeneuve (Diptera: Calliphoridae), by gamma radiation. *J. Aust. ent. Soc.* 22(4): 319-324, 5 tables, 1 text-fig.

SUTHERST, R. W.

1983. Variation in the numbers of the cattle tick, *Boophilus microplus* (Canestrini), in a moist habitat made marginal by low temperatures. *J. Aust. ent. Soc.* 22(1): 1-5, text-figs 1-2.

TANTON, M. T. and EPILA, J. S. O.

1984. Parasitization of larvae of *Paropsis atomaria* Ol. (Coleoptera: Chrysomelidae) in the Australian Capital Territory. *Aust. J. Zool.* 32(2): 251-259, 4 tables, text-figs 1 & 2.

THWAITE, W. G. and MADSEN, H. F.

1983. The influence of trap density, trap height, outside traps and trap design on *Cydia pomonella* (L.) captures with sex pheromone traps in New South Wales apple orchard. *J. Aust. ent. Soc.* 22(2): 97-99, 1 table, 1 text-fig.

VALENTINE, Peter S.

1982. *Ogyris genoveva gela* Waterhouse (Lepidoptera: Lycaenidae) feeding at sapflow, and the first record of this subspecies from Victoria. *Aust. ent. Mag.* 8(6): 92.

VALENTINE, P. S. and JOHNSON, S. J.

1982. New records of Lycaenidae and Hesperiidae (Lepidoptera) from northern Queensland. *Aust. ent. Mag.* 9(1): 1-3.

VATTANAKUL, Jiraporn and ROSE, H. A.

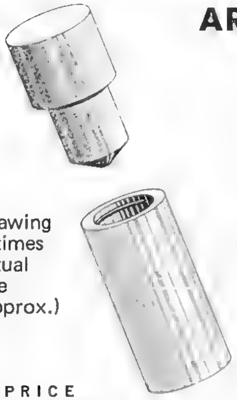
1982. The culture of the grey cluster bug, *Nysius clevelandensis* Evans under laboratory conditions. *Aust. ent. Mag.* 8(5): 71-72, 1 table.

WALKER, P. L.

1981. Laboratory rearing of the garden weevil, *Phlyctinus callosus* Boheman (Coleoptera: Curculionidae), and the effect of temperature on its growth and survival. *Aust. J. Zool.* 29(1): 25-32, 2 tables, text-figs 1-4.

WEBB, M. D.

1983. Revision of the Australian Idiocerinae (Hemiptera: Homoptera: Cicadellidae). *Aust. J. Zool. Suppl. Ser.* 92: 1-147, text-figs 1-675.



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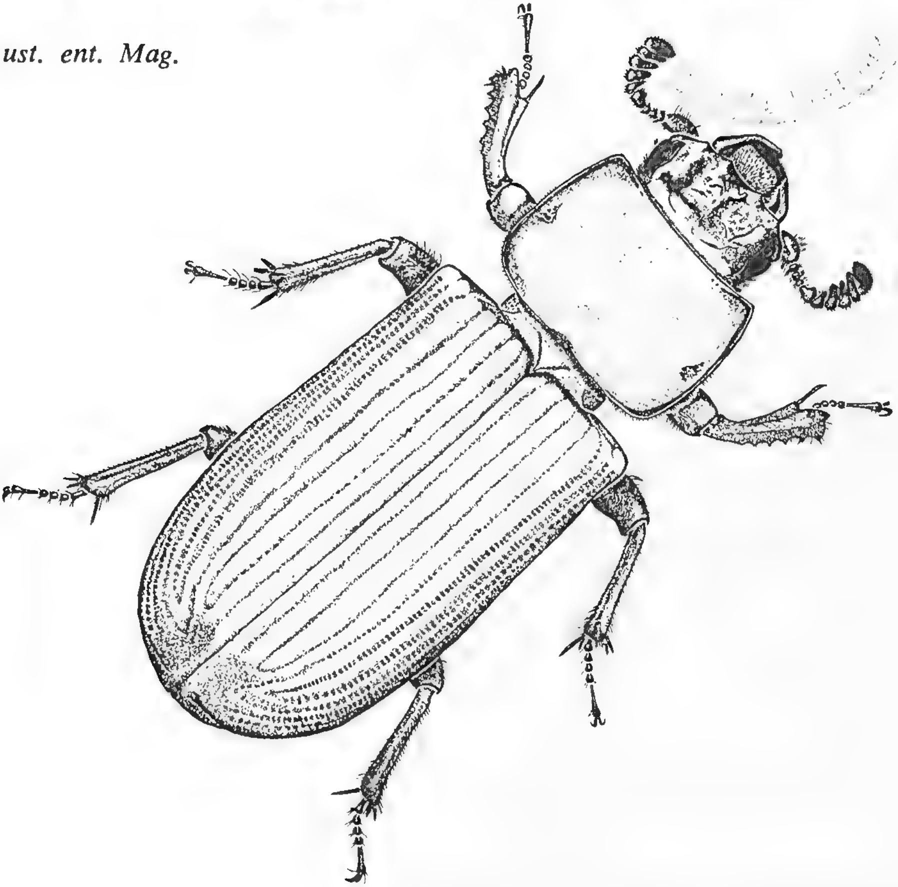

Edited by M. S. Moulds

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COVER

Illustrated by Marnie Holmes

Pharochilus dilatus Dalm. (length 28-36 mm) is a common species in forested areas of eastern Australia. Like other Passalidae the larvae and adults live together in groups feeding on rotting logs. Both larvae and adults can stridulate; the larvae by rubbing their hind legs against a file and the adults by scraping their abdomen against their underwings.

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NOTES ON THE BIOLOGY AND DISTRIBUTION OF SOME QUEENSLAND BUTTERFLIES

By D. A. Lane
11 Maunds Road, Atherton, Qld. 4883

Abstract

New and interesting distribution records are detailed for several species of Lycaenidae and Hesperiidae and two species of Satyrinae. A new food plant, *Faradaya splendida* F. Muell. (Verbenaceae) is recorded for the lycaenid *Hypochrysops miskini* (Waterhouse) and communal association between the larvae and pupae of this butterfly and those of the butterfly *Pseudodipsas eone iole* Waterhouse and Lyell is noted.

Introduction

I record below a number of new or interesting localities and some biological notes for several Queensland butterfly species belonging to the Hesperiidae, Satyrinae and Lycaenidae. All specimens referred to are in the author's collection, unless otherwise stated.

Hesperiidae

Hesperilla sarnia Atkins

G. Wood and I took specimens of this species on the summit of Walsh's Pyramid, near Gordonvale, Queensland, during November, 1982 and November, 1983. This locality extends the known distribution of the species further north from the Paluma district (Johnson and Valentine 1983).

Trapezites symmomus sombra Waterhouse

I collected several specimens and observed others on and near the summit of Walsh's Pyramid, near Gordonvale, Queensland, during November, 1983. It is interesting to find this species in a coastal district (although at altitude) and isolated from the Atherton Tableland area.

Netrocoryne repanda expansa Waterhouse

Many specimens have been bred by both G. Wood and myself from numerous localities both on the Atherton Tableland and in the coastal district between Mossman and Innisfail, from September to January. The coastal records are of interest as the species is considered to be found principally at an altitude on the Atherton Tableland. The species has also been recorded from Cooktown and Coen (Common and Waterhouse 1981).

We have also taken specimens at Iron Range during September and October, 1982. On the Atherton Tableland, and in the Mossman/Innisfail district, the principal food plant is *Neolitsea* sp.

Chaetocneme porphyropis (Meyrick and Lower)

Specimens have been bred by G. Wood and the author from many localities both in coastal districts from near Daintree to Innisfail and on the Atherton Tableland from near Julatten to the Herberton district and near Ravenshoe. Wood (1984) lists three foodplants; I have also found larvae feeding on camphor laurel *Cinnamomum camphora* (Lauraceae), at Lake Eacham.

Nymphalidae

Satyrinae

Heteronympha penelope penelope Waterhouse

I took females of this species 10 km north of Tannymorel, southern Queensland, on 6 April, 1980. Specimens have been taken in the same district by S. J. Johnson (pers. comm.). These records extend the known distribution further north from Stonehenge and Ebor in New South Wales.

Hypocysta euphemia Westwood

A series of this species was collected during February, 1982, 10 km north of Tannymorel, southern Queensland. This extends the known distribution further north from the Stanthorpe district.

Lycaenidae

Hypochrysops miskini (Waterhouse)

The only recorded food plant of *H. miskini* is *Smilax australis* (Smilacaceae) (Common and Waterhouse 1981). Larvae of *H. miskini* and of *Pseudodipsas cephenes* Hewitson are recorded as having been found together in the same situations and attended by the same species of ant, *Iridomyrmex gilberti* (Common and Waterhouse 1981).

During October and November, 1981, larvae and pupae of *H. miskini* and *P. eone iole* Waterhouse and Lyell were found together on and near the food plant *Faradaya splendida* (Verbenaceae). The food plant was growing adjacent to a watercourse in a rainforest area, 20 km SSW of Kuranda, Queensland. The ant, *Iridomyrmex gilberti* was in obvious attendance of larvae and pupae of both species, and were often a good guide to the location of larvae and pupae, due to their concentrated activity in the immediate vicinity.

Immature larvae of *H. miskini* and *P. eone iole* were on and near young juvenile leaves especially between leaves that overlapped or in other convenient shelters nearby, including fallen leaves trapped within the immediate foliage. Final instar larvae and pupae of both species were together in situations that offered more shelter, including curled leaves of the food plant or adjacent foliage, hollow stems of adjacent shrubs and under debris at the base of the food plant. The hollowed out stems of adjacent shrubs left by larvae of *Aenetus* sp. (Hepialidae) were particularly favoured.

Near Atherton, Queensland, *H. miskini* has also been found breeding in communal association with *P. eone iole*, on the food plant *Smilax australis.* This locality is one of a more open habitat, with eucalypt species intermixed with numerous rainforest trees. *Smilax* vines are a significant composition of the understorey growth.

At this locality, immature larvae of *P. eone iole* have been observed to feed openly on juvenile foliage of *S. australis* during the day, with numerous ants (*Iridomyrmex gilberti*) in attendance. Mature larvae and pupae of *P. eone iole* sheltered together with larvae and pupae of *H. miskini* in situations that offered convenient shelter, some situations being rolled bark, under bark, borer holes, rolled leaves, or between overlapping leaves. A few final instar larvae and pupae of *P. cephenes* have also been found together with larvae and pupae of *H. miskini* in pieces of rolled bark.

Hypochrysops apollo apollo Miskin

A search of *Myrmecodia* plants in the immediate vicinity of Cooktown during May, 1982, revealed several first and second instar larvae and numerous emerged pupae. Comparison of the emerged pupal cases with those of specimens bred from the Ingham district (author's collection), confirmed their identification. *H. apollo apollo* has previously not been recorded north of Cairns, while *H. apollo phoebus* (Waterhouse) is recorded from Cape York to the Claudie River (Common and Waterhouse 1981).

A simple and reliable guide to the location of final instar larvae and pupae of *H. apollo* is the exit hole made by the larva. This hole serves as a means for ejecting frass and allows free movement for the larva from its internal cavity to the external plant. I have seen larvae feeding on the leaves of the *Myrmecodia* plant as well as on the internal tissue both near Ingham and at Iron Range. The leaves are "skeletonised" in a typical lycaenid larval feeding manner. Larvae of early instars also adopt this feeding habit but the exit hole is not as obvious as that of final instar larvae. Pupation always takes place within the internal cavity created by the larva, and emergence is executed through the exit hole.

Ogyris iphis iphis Waterhouse and Lyell

Numerous males of this species have been collected on a hilltop 3 km north of the Palmer River crossing, Cooktown road, during October, 1982, and November, 1983. A series of specimens has also been collected from Pinnacle Mt, 12 km SW of Dimbulah, on the western Atherton Tablelands, during all months from September to April. Larvae were also found feeding on *Amyema miquellii* (Loranthaceae) growing on a eucalypt near the base of Pinnacle Mt. These records confirm the occurence of *O. iphis* considerably to the north of the Kuranda/Mareeba district, as well as its occurence further to the west of its previously known range.

Acrodipsas hirtipes Sands

Four males of this species were taken by G. Wood and the author on a hilltop 3 km north of the Palmer River crossing, Cooktown road, on 6 October, 1982. On a subsequent visit on 26-27 November, 1983, I took three females and numerous males. These records extend the known distribution some 350 km south of the Coen district, the former most southern known locality.

Comparison of the Palmer River specimens with a lengthy series of specimens I had taken on Mt. White, Coen, during mid November, 1978, and September/October, 1982, showed close similarity with no discernable differences.

Acrodipsas brisbanensis (Miskin)

A lengthy series of this species has been collected from Pinnacle Mt, 12 km SW of Dimbulah, Queensland, from September to April during 1982 and 1983, and from a hilltop 8 km E of Mt. Garnet, Queensland, during October, 1983. This species has recently been recorded from the Paluma district (Valentine and Johnson 1982). The extent of the blue coloration on the upper surface of females is quite pronounced. Comparison of these specimens with a series of specimens I had taken from Toowoomba and from near Esk, southern Queensland, shows close similarity. At Toowoomba, *A. brisbanensis* and *A. cuprea* (Sands) fly on the same hilltop.

Acknowledgements

Thanks are extended to Max Moulds for constructive criticism of the manuscript and to G. Wood for permission to refer to his unpublished records.

References

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia*, Second edition. Angus and Robertson, Sydney.

Johnson, S. J. and Valentine, P. S., 1983. Notes on the biology and morphology of *Hesperilla sarnia* Atkins (Lepidoptera: Hesperiidae) *Aust. ent. Mag.* 10(1): 6-8.

Valentine, P. S. and Johnson, S. J., 1982. New records of Lycaenidae and Hesperiidae (Lepidoptera) from northern Queensland. *Aust. ent. Mag.* 9(1): 1-3.

Wood, G. A., 1984. The life history of *Chaetocneme porphyropis* (Meyrick and Lower) (Lepidoptera: Hesperiidae: Pyrginae). *Aust. ent. Mag.* 11(1): 11-12.

A REVIEW OF THE AUSTRALIAN HAWK MOTHS OF THE GENUS *MACROGLOSSUM* SCOPOLI (LEPIDOPTERA: SPHINGIDAE)

By M. S. Moulds
c/- Entomology Department, Australian Museum, 6-8 College St, Sydney 2000

Abstract

The nomenclature of the 13 *Macroglossum* species occurring in Australia is reviewed, lectotypes are designated for *Macroglossa approximata* Walker, and *M. micaceum* Walker, and detailed distributions given for the first time. A key to species is provided and each species illustrated.

Introduction

Remarkably little has been published on the Australian hawk moths; the literature is scattered and fragmentary with few detailed data. This is particularly so in the genus *Macroglossum* Scopoli, possibly because most of the Australian species are usually rare or uncommon in collections. In this paper I review the systematics of the 13 species found in Australia and list synonymies and detail distributions.

Very few life-history details for Australian *Macroglossum* species appear in the literature. Food plants have been recorded for only one species, *M. hirundo* Boisduval (Moulds 1984) and there is no description of any early stage based on Australian material. There is, however, some data available for four wide-ranging species, *M. corythus* Walker, *M. insipidum* Butler, *M. heliophilum* Boisduval [= *fringilla* Boisduval] and *M. prometheus* Boisduval, from researches undertaken in China, India and Java by Mell (1922), Bell and Scott (1937) and Dupont & Roepke (1941). I have in preparation life-history descriptions for an additional four species.

The following abbreviations are used below: AH Anthony Hiller collection; AJG A. J. Graham collection; AM Australian Museum, Sydney; ANIC Australian National Insect Collection, C.S.I.R.O., Canberra; BCRI Biological and Chemical Research Institute, N.S.W. Department of Agriculture, Rydalmere; BMNH British Museum (Natural History), London; CMNH Carnegie Museum of Natural History, Pittsburgh; DANT Department of Agriculture, N.T. Administration, Darwin; DL David Lane collection; DPI Department of Primary Industries, Brisbane; DPIM Department of Primary Industries, Mareeba; EJH E. J. Harris collection in James Cook University; EP E. Porteus collection; JO John Olive collection; MC Michael Cermak collection; MNP Museum National d'Histoire naturelle, Paris; MSM author's collection; HOPE Hope Department of Entomology, University Museum, Oxford; MV Museum of Victoria, Melbourne; QM Queensland Museum, Brisbane; RM Raymond Manskie collection; SAM South Australian Museum, Adelaide; UQ University of Queensland, Brisbane; WAM Western Australian Museum, Perth; WFG W. F. Gibb collection; WNBQ W. N. B. Quick collection.

When listing published distribution records below, those given in the literature as "Australia" or "New Holland" have been omitted.

The types of all species recorded as having come from Australia have been examined either directly or, in the case of those housed in BMNH and HOPE from colour transparencies. Some, but not all, types of species never recorded as Australian but synonymised by Rothschild and Jordan (1903) with species occurring in Australia have also been examined.

Key to adults

1. Hind wing above clearly marked by a broad unbroken bright yellowish orange transverse patch 2
— Hind wing above not so marked 10

2. Fore wing above with two transverse whitish bars, one median and almost straight, the other subterminal and gently curved . . . . *M. dohertyi* Rothschild
— Fore wing above not so marked 3

3. Yellowish orange band on hind wing above with outer margin distinctly angled at about 90° (not angled by a broad sweeping curve); maximum fore wing length approximately 21 mm; hind wing below with edge of yellow orange zone against inner margin clearly defined 4
— Not with above combination of characters 5

4. Fore wing with basal ⅓ mostly blackish, the outer margin of this blackish area distinct and adjoined by a narrow pale transverse band, remainder of wing brownish with distinct blackish markings; abdomen without lateral yellowish orange bars . . . . *M. heliophilum queenslandi* Clark
— Fore wing above more or less even in tone, usually brownish or greyish, markings subtle with the principal ones appearing as curved transverse lines or bars at ⅓ and ⅔ distance from base; abdomen with 3 lateral yellowish orange bars (usually, but not always, distinct) . . . . *M. alcedo* Boisduval

5. Fore wing above with a distinct single transverse pale band at about mid point, this often constricted or broken at centre 6
— Fore wing above without a transverse pale band at mid point. 7

6. Hind wing above with yellowish orange band more or less regular in width and greater in area than blackish outer portion of wing . . . . *M. hirundo errans* Walker
— Hind wing above with yellowish orange band irregular in width, broadest near tornal angle, this band less in area than blackish outer portion of wing . . . . *M. rectans* R. & J.

7. Small insects with fore wing length rarely exceeding 18 mm; hind wing below with edge of yellowish orange zone against inner margin clearly defined . . . . *M. insipidum papuanum* R. & J.

– Medium to large insects with fore wing length approaching 18 mm only in stunted specimens, mostly greater than 20 mm; hind wing below with edge of yellowish orange zone against inner margin very distinct 8

8\. Fore wing above with apical area darkened, a broad greyish transverse subapical band constricted at centre by darkened apical area; yellowish orange on hind wing above clearly less than ½ wing area . . . . *M. nubilum* R. & J.

– Not with above combination of characters 9

9\. Fore wing above usually with a greyish patch against costa at about mid point and with a similar patch opposite against inner margin; abdomen sometimes with one, or occasionally two, lateral yellowish orange patches, the distal one the larger . . . . *M. hirundo errans* Walker

– Fore wing above never with a greyish patch against inner margin similar to and opposite any such patch against costa; usually, however, with a greyish costal patch at about ⅓ distance from wing apex, this patch roughly triangular in shape; abdomen usually with two distinct lateral yellowish orange patches, the distal one the smaller . . . . *M. prometheus lineatum* Lucas

10\. Hind wing above suffused russet brown across basal half, the pigmentation more or less even in its distribution, the margins very blurred. . . . . *M. vacillans* Walker

– Hind wing above not so marked 11

11\. Hind wing above with bluish white suffusion on basal half, sometimes with a slight greenish hue . . . . *M. tenebrosum* Lucas

– Hind wing above with streaks or blotches of either brownish cream or yellowish orange on basal half (in some specimens appearing as a vestigal band) 12

12\. Hind wing above with blotches of bright yellowish orange arranged more or less as a broken transverse bar across base of wing . . . . *M. corythus pylene* C. Felder

– Hind wing above with streaks (usually two) of brownish cream near base 13

13\. Fore wing above without distinct darkened transverse bands; hind wing below usually distinctly suffused whitish or pale brownish on basal half; abdomen with two pale yellowish to creamish lateral patches, one each on segments 3 and 4, these patches often indistinct, that on segment 3 clearly the larger. . . . . *M. micaceum micaceum* Walker

– Fore wing above with darkened transverse bands at about ⅓ and ⅔ distance from base (usually distinct, but sometimes obscured); hind wing below not suffused whitish, always suffused brownish yellow to reddish brown on basal half; abdomen with four deep orange lateral bars, one each on segments 2-5, those of 3-5 nearly always distinct, that of 2 narrower but longer than the other 3 . . . . *M. joannisi* R. & J.

Genus *Macroglossum* Scopoli

Macroglossum Scopoli, 1777, *Intr. Hist. Nat.*: 414. Type species: *Sphinx stellatarum* L.

Macroglossa Boisduval, 1833, *Nouv. Annls Mus. Hist. nat. Paris* 2: 226 (an unjustified emendation of *Macrolgossum*).

For full synonomy of the genus see Wagner (1915), Fletcher and Nye (1982).

M. vacillans Walker

(Figs 1, 9)

Macroglossa vacillans Walker, 1864: 27 (Timor).

TYPE (examined):– HOPE; holotype ♀ (not ♂ as stated in original description), bearing seven labels as follows: 1) Tim.; 2) Wallace; 3) coll Saunders; 4) 30; 5) Timor, Ex Coll. (1830-73) W. W. Saunders. Presented 1873 by Mrs. F. W. Hope. m.s. locality by W.W.S.; 6) TYPE, WALKER, Brit. Mus. Cat. Vol. 31. (1864), page 27, Coll. Hope Oxon.; 7) TYPE LEP.: No. 34, Macroglossa vacillans Walker, HOPE DEPT. OXFORD.

Macroglossa approximata Walker, 1864 (*non* Miskin, 1891): 27-28 (North Australia).

TYPES (examined):– BMNH; syntype series of seven specimens; four specimens traced. *Lectotype here designated*, ♀, which bears a circular label on which is handwritten "North Austral", a rectangular label on which is handwritten "approximata" and another circular label edged red on which is printed "Type" and now also carrying a red rectangular label stating "LECTOTYPE Macroglossa approximata Walker, Moulds 1985".

Macroglossa pseudogyrans Rothschild, 1894: 68, pl. 5, fig. 23 (Dili and Flores, Indonesia).

TYPES (not examined):– BMNH; type series.

Macroglossa similis Rothschild, 1894: 68 (Oinanisa, Timor).

TYPES (not examined):– BMNH; type series.

DISTRIBUTION

From Koolan Island, north-western Australia, across the northern third of Northern Territory and northern Queensland from the Torres Strait islands to Paluma; at times common, primarily at the beginning of the wet season. The occurrence of specimens in such a contrasting variety of habitats (lush rain forest to dry inland areas) and on arid off-shore islands (Koolan Is, Rimbija Is) suggests that the species is migratory.

Range beyond Australia: New Guinea and eastern Indonesia.

Published records (Australia only). Queensland (Rothschild and Jordan 1907, Wagner 1915); Cardwell (Miskin 1891).

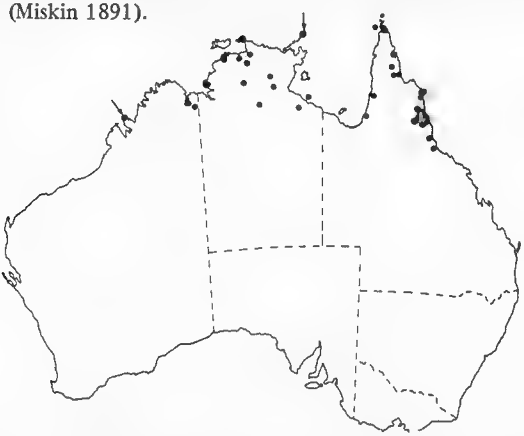


Fig. 1. Distribution of *M. vacillans* Walker.

Records from material examined. WESTERN AUSTRALIA: Koolan Islands (near Derby), Feb.; Wyndham, Nov.-Jan., Mar.; Kununurra, Sep., Dec.-Mar. (ANIC, AM, MSM, WAM). NORTHERN TERRITORY: Darwin, Feb.-Apr., June, Aug., Nov.; Cobourg Peninsula, Jan.; Rimbija Is., Wessel Islands, Jan.; Koongarra (Kakadu Nat. Park), Nov.; Wildman River, Arnhem Highway, Nov.; East Aligator River area, May, June; Daly River Mission, Jan.; Mainoru (ENE of Katherine), Dec.; Katherine/Katherine Gorge, Mar., Oct.; Roper River, Apr.; 80 km S of Larrimah, Jan.; Borroloola area, Oct., Nov.; Horn Islet. Pellew Group, Gulf of Carpentaria, Feb. (ANIC, DANT, DPIM, MSM, MV, SAM, UQ). QUEENSLAND: Booby Is., Torres Strait, Dec.; Cape York, May; Iron Range, Apr., May; Archer R. crossing, N of Coen, Dec.; Kowanyama (formerly Mitchell River Mission), Jan.; Kelso Inlet, N of Normanton, Dec.; Silver Plains, Jan., Mar.; Port Stewart, Jan.; Stewart River, Jan.; 57 km ESE of Coen, Dec.; McIvor River, July; Cooktown, Apr., May, Dec., Jan.; Mt Windsor Tableland, NW of Mossman, Jan.; Whyanbeel Ck, 8 km NNW of Mossman, Mar.; Cairns, May; Holloways Beach (near Cairns), Dec., Jan.; Kamerunga (near Cairns), Sep.; Kuranda, Jan., Feb., Apr., Dec.; Yungaburra, Apr.; Atherton, Jan., Mar.; Stannary Hills (near Herberton); Almaden, Chillago dist., Jan.; Gordonvale, Jan.; Meringa (near Gordonvale), Feb.; Paluma, Jan. (AH, AM, ANIC, DL, DPIM, MSM, MV, QM, SAM).

There is a specimen in DPI labelled "Brisbane". The absence of other records south of Paluma strongly suggests that the labelling of this specimen is erroneous and consequently the locality is here excluded from the distribution of the species.

M. alcedo Boisduval

(Figs 2, 8)

Macroglossa alcedo Boisduval, 1832: 188-189 (Dorey; now Manokwari, Irian Jaya).

TYPE (examined):– CMNH; holotype ♀ (in worn condition bearing five labels as follows: 1) Alcedo. B., Nther. Guinea; 2) EX-MUSAEO, Dris. BOISDUVAL; 3) 9931; 4) TYPE; 5) CMNH HOLOTYPE # 737, Macroglossum alcedo Boisd.

REMARKS

The specimen figured under this name by D'Abrera (1974) is *M. insipidum.*

DISTRIBUTION

North-eastern Queensland from Darnley Island and Cape York to Etty Bay near Innisfail; sometimes common locally.

Range beyond Australia: New Guinea and Key Islands.

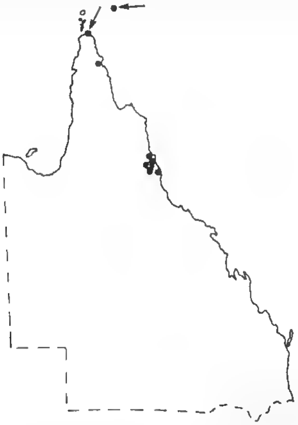


Fig. 2. Distribution of *M. alcedo* Boisduval.

Published records (Australia only). North Queensland (Rothschild and Jordan 1903, Seitz 1928-30).

Records from material examined. QUEENSLAND: Darnley Island, Dec.; Cape York, Apr.; Iron Range, Apr., May, Aug., Sep., Dec.; Cairns district; Kuranda, Feb.; Yungaburra, Apr.; Atherton, Jan., Mar.-May, Dec.; Tolga Scrub, Apr.; Malanda, Apr.; Meringa (near Gordonvale) June, July, Dec.; Etty Bay (near Innisfail), Feb. (AM, ANIC, DPIM, MSM, MV, QM, SAM, UQ, WFG).

M. insipidum papuanum Rothschild and Jordan

(Figs 3, 12)

Macroglossum insipida papuanum Rothschild and Jordan, 1903: 642-643, pl. 3, fig. 9 (Fergusson Island, Papua New Guinea).

TYPE (examined):– BMNH; holotype ♂, bearing five labels as follows: 1) Fergusson I., x.xi.94, (A.S. Meek); 2) M. insipida papuanum. Type. R. & J. 1903; 3) type; 4) Nov. Zool., pl 3, Fig. 9, 1903; 5) Rothschild Bequest, B.M. 1939-1.

Macroglossum alcedo Boisduval: D'Abrera, 1974: 67, illustr. (Australia). [Misidentified as *M. alcedo.*]

REMARKS

Care should be taken not to confuse this species with *M. alcedo.* The outer margin of the yellowish orange band of the hind wing above is clearly angled in *M. insipidum* whereas in *M. alcedo* the outer margin curves without a point of angulation: in addition *M. insipidum* is a little smaller with a fore wing length rarely exceeding 18 mm.

DISTRIBUTION

Eastern Queensland from the islands of Torres Strait to Mackay; usually rare.

Range beyond Australia: Southern Papua to the Louisiade Archipelago. Other subspecies occur from India to the Andaman Islands, Sri Lanka, Malaysia, through Indonesia to China.

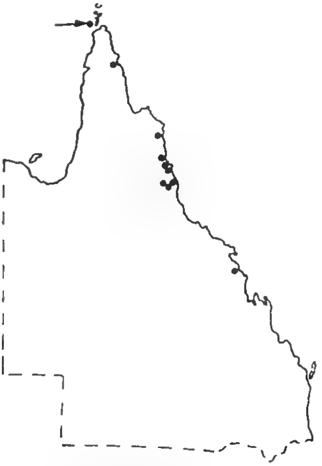


Fig. 3. Distribution of *M. insipidum papuanum* Rothschild and Jordan.

Published records (Australia only). Queensland (Rothschild and Jordan 1903, Seitz 1928-30).

Records from material examined. QUEENSLAND: Booby Island, Torres Strait, Dec.; Iron Range, May; Cooktown, Apr., May; 16 km S of Daintree, Apr.; Cairns, Aug., Sep.; Kuranda, Oct.-Aug.; Ravenshoe, Mar.; Etty Bay (near Innisfail), Feb.; Kareeya Power Stn (near Carstone), Jan.; Mackay (AJG, ANIC, DL, MSM, MV, QM, WNBQ).

There are two specimens in AM and two in SAM labelled "Warra" (near Chinchilla, SE Qld). Having regard to the confirmed distribution as above, and the apparent close association of the species with rainforest, this is considered a doubtful locality which is here excluded when listing the distribution of the species.

M. heliophilum Boisduval

Macroglossa Heliophila Boisduval, 1875: 354-355 (Halmeira, =Halmahera Is., Indonesia).

TYPE (examined):– CMNH; holotype ♀ bearing four labels as follows: 1) Macroglossa sp.?, Jarva; 2) Macroglossum heliophila Boisd; 3) Carn. Museum, Donat. by Dr. Clark, Unique; 4) CMNH HOLOTYPE #739, Macroglossa heliophila Boisd.

The conflict of locality data suggest that this specimen is, in fact, not the holotype. However, no other specimen could be found in CMNH, BMNH or MP bearing locality data corresponding to that of the original description.

Macroglossum heliophila Boisduval: Rothschild and Jordan, 1903: 645-646.

Macroglossa Fringilla Boisduval, 1875: 352-353 (India).

TYPE (examined):– MP; holotype bearing five labels as follows: 1) M. fringilla Boisd, Bengale, MM. Diard et Duvancel [a large yellow label]; 2) Diard et Duvancel [very old round label–names of the collectors]; 3) HOLOTYPE; 4) type de Bdv [probably writted by F. Le Cerf]; 5) [reference to the original description placed on specimen by P. Viette, pers. comm.].

A specimen in CMNH (examined by me) is also labelled as the holotype of *M. fringilla* but it does not have type status. It is labelled as being "ex. Musaeo Dris Boisduval" but bears a locality label "Java". At the end of the original description Boisduval writes that the species is described from *one specimen* collected in *India* by the late Duvancel, traveller for the Government. Boisduval also adds the abbreviation "M.N." to indicate that the type was in Museum national. The label data of the specimen in MP agree with Boisduval's statement and there is no reason to doubt that it is not the true type.

Macroglossum melas Rothschild and Jordan, 1903: 646, pl. 3, fig. 19 (Key Islands, N. Guinea, Woodlark I., Queensland). **Syn. nov.**

TYPE (transparencies examined):– BMNH; holotype ♀ bearing five labels as follows: 1) Little Kei, (H. Kühn); 2) Macroglossum melas, Type, R. & J. 1903; 3) Type; 4) Nov. Zool., Pl. 3, Fig. 19, 1903; 5) Rothschild Bequest, B.M. 1939-1.

Macroglossa nigrifasciata Butler, 1881 (*non* Butler, 1875): 670 (Formosa).

TYPE (not examined):– BMNH.

Macroglossa kanita Swinhoe, 1892: 5, pl. 1, fig. 2 (Sumatra).

TYPE (not examined):– HOPE.

Macroglossa loochooana Rothschild, 1894: 67 (Loochoo Islands).

TYPE (not examined):– BMNH.

REMARKS

The name *M. fringilla* has been widely used for this species during much of this century. Boisduval (1875) described both *M. fringilla* and *M. heliophilum* on pages 352 and 354 respectively. Rothschild and Jordan (1903) synonymised the two names and chose *M. heliophilum* as the valid one. But five years later (Rothschild and Jordan 1907) they reversed their selection of name and used *fringilla* in preference to *heliophilum*, a decision followed by Jordan (1911), Wagner (1915), Mell (1922), Seitz (1928-30) and other more recent authors. However, as first revisers, Rothschild and Jordan's 1903 selection of *heliophilum* as the valid name must stand following current rules of nomenclature.

Examination of the types of *Macroglossa heliophilum, Macroglossa fringilla, Macroglossa melas* and *Macroglossum melas queenslandi* and other material in ANIC, BMNH and MV shows that *melas queenslandi, melas, heliophilum* and *fringilla* are all the one species, *viz. heliophilum.*

The orange band on the hind wing upperside is variable between individuals. Its outer margin can be either sharply defined or ragged to varying degrees, there is also some variation in its width, and the lobe-like extension of the orange along the inner margin towards the tornus is variable in its form. In addition the tonal intensity and size of markings on the fore wing upperside is also variable to some degree.

There is no justification for retaining *melas* as a distinct species as currently placed; the colour differences mentioned by Rothschild and Jordan (1903) fall within the range of variation and the very minor genitalia differences they discussed by which they partly justified the specific status of *melas* are insufficient, a fact which they more or less recognised when they state "Sexual armature not essentially different from that of *heliophila* . . . ." and at the end of the species description "This may be the Papuan representative of *heliophila.* Further material is necessary to decide the question". It is interesting to note that the figures of *heliophilum* genitalia included in Inoue (1973) show characters which fall almost midway between those of *melas* and *heliophilum* as figured by Rothschild and Jordan.

M. heliophilum queenslandi Clark *Comb. nov.*
(Figs 4, 7)

Macroglossum melas Rothschild and Jordan, 1903 (*partim.*: only Queensland): 646.
Macroglossum melas queenslandi Clark, 1927: 108 (Kuranda).

TYPE (examined):– CMNH; holotype ♂ bearing six labels as follows: 1) Australie, Queensland, Kuranda, Dodd, 1910; 2) M. melas queenslandi, type, B. P. Clark (1926); 3) TYPE; 4) 10557; 5) No. 3; 6) CMNH HOLOTYPE # 736, Macroglossum melas queenslandi Clark.

Macroglossum heliophilum (Boisduval): D'Abrera, 1974: 67, illustr. (Australia).

REMARKS

The three Australian examples of *queenslandi* seen are similar and differ slightly from specimens from Indonesia and beyond essentially in having the median transverse band on the fore wing upperside almost white rather than off white or greyish and the dark postmedian band across the fore wing prominent, almost black, and similar in width to the whitish band rather than greyish or reduced in width. The subspecific status of the Australian material is therefore retained.

DISTRIBUTION

Known only from Kuranda, north-eastern Queensland; rare.

Range beyond Australia: Papua New Guinea. *M. heliophilum* also ranges from Sri Lanka and India to Malaysia and Indonesia, through the Philippines, Taiwan, Japan and S. China but to what extent subspecific separation is warranted is unclear.

Published records (Australia only). Queensland (Rothschild and Jordan 1903, Seitz 1928-30); Kuranda (Clark 1927).

Records from material examined. QUEENSLAND: Kuranda, July, Dec. (ANIC, CMNH, MV).

Fig. 4. Distribution of *M. heliophilum queenslandi* Clark.

M. prometheus lineatum **Lucas** *Stat. nov.*

(Figs 5, 11)

Macroglossa lineata Lucas, 1891: 834 (Mackay).

TYPE (examined):– SAM; holotype ♀, bearing only two handwritten labels, the smaller reading "Macroglossa lineata Lucas, Mackay, probable type, I 13812", and in red ink across the right hand end the word "Type"; the other label has identical wording but without the words "probable type". This is the only representative of this species in the Lucas Collection and the original description leaves no doubt that this is the species Lucas was describing.

Macroglossa inusitata Swinhoe, 1892: 6 (Dorey; now Manokwari, Irian Jaya).

TYPE (examined):– HOPE; holotype ♂, bearing five labels as follows: 1) Dor.; 2) Wallace; 3) 20; 4) TYPE, SWINHOE, Cat. East. Lep. Het. Oxford, 1892. Vol. 1, page 6. Coll. Hope Oxon.; 5) TYPE LEP.: No. 37, Macroglossa inusitata Swinhoe, HOPE DEPT. OXFORD.

Macroglossum prometheus inusitata Swinhoe: Rothschild and Jordan, 1903: 651.

Macroglossa approximata Miskin, 1891 (*non* Walker, 1864): 7 (Cardwell).

TYPE:– location unknown.

Macroglossa insonspicua Rothschild, 1894: 68 (New Guinea).

TYPE (not examined):– BMNH.

REMARKS

Rothschild and Jordan (1903) used the name *inusitata* concluding that the name *lineata* was unavailable. The principal they used for making this decision is, however, not in accordance with the current *Code of Zoological Nomenclature.* Contrary to the statement of Rothschild and Jordan (1903: 652) that Lucas' description of *lineata* applies in part to *corythus pylene* (abdomen) and *prometheus inusitata* (wings) the type of *lineata* is clearly the latter.

DISTRIBUTION

Cape Wessel, Northern Territory, and north-eastern Queensland from Cape York to Mackay; uncommon.

Range beyond Australia: this subspecies occurs also in New Guinea and adjacent islands. The nominal subspecies ranges from Sri Lanka and India, through Malaysia, Indonesia and the Philippine Islands. There are no other subspecies.

Published records (Australia only). Queensland (Kirby 1894, Rothschild and Jordan 1903, Seitz 1928-30, Wagner 1915); Cardwell (Miskin 1891); Mackay (Lucas 1891, Miskin 1892, Rothschild and Jordan 1903).

Records from material examined. NORTHERN TERRITORY: Cape Wessel (Rimbija Is.), Jan. (ANIC). QUEENSLAND: Cape York, Apr.; Lizard Island (NNE of Cooktown), Nov.; Cooktown; Kamerunga (near Cairns), Aug.; Cairns, Apr.; Kuranda, Mar., July, Aug.; Meringa (near Gordonvale), Feb.; Babinda, Aug.; Bramston Beach (near Babinda), Mar.; Rockingham Bay (near Tully and Cardwell); Cardwell; Mackay. (AJG, ANIC, DL, EJH, MSM, MV, QM, SAM).

Fig. 5. Distribution of *M. prometheus lineatum* Lucas.

M. joannisi Rothschild and Jordan
(Figs 6, 10)

Macroglossum joannisi Rothschild and Jordan, 1903: 656-657, pl. 3, fig. 2 (Queensland).
TYPE (transparency examined):– MP; holotype ♀.

?*Macroglossum tenebrosum* Lucas: D'Abrera, 1974: 68, illustr.
The specimen figured by D'Abrera under the name *M. tenebrosum* is not that species and is almost certainly a slightly discoloured *M. joannisi.*

DISTRIBUTION

King River in Northern Territory, Torres Strait islands, near Cooktown and Willis Island in the Coral Sea. The species is almost certainly migratory, especially considering the records from the rather isolated Willis Island.

Range beyond Australia: not known beyond Australia but probably also occurs in New Guinea and Indonesia.

Published records. Queensland (Rothschild and Jordan 1903, 1907, Seitz 1928-30, Wagner 1915).

Records from material examined. NORTHERN TERRITORY: King River, 133°30′E, 12°S, 7.i.1916 (MV). QUEENSLAND: Sue (= Warraber) Is., Torres Strait, Jan.; Booby Is., Torres Strait, Jan.; Blad Hills Stn. (=Louisiana Stn), 30 km N of Cooktown, Feb.; Willis Is., Coral Sea, Jan. (ANIC, MSM).

Fig. 6. Distribution of *M. joannisi* Rothschild and Jordan.

M. nubilum Rothschild and Jordan

(Figs 13, 22)

Macroglossum nubilum Rothschild and Jordan, 1903: 652, pl. 4, fig. 17 (Milne Bay). *TYPE (examined)*:– BMNH; holotype ♂, bearing five labels as follows: 1) Milne Bay, Brit. N.G., I.99, (A. S. Meek); 2) Type; 3) Macroglossum nubilum, Type, R & J, 1903; 4) Nov. Zool., Pl. 4, Fig. 17, 1903; 5) Rothschild Bequest, B.M. 1939-1.

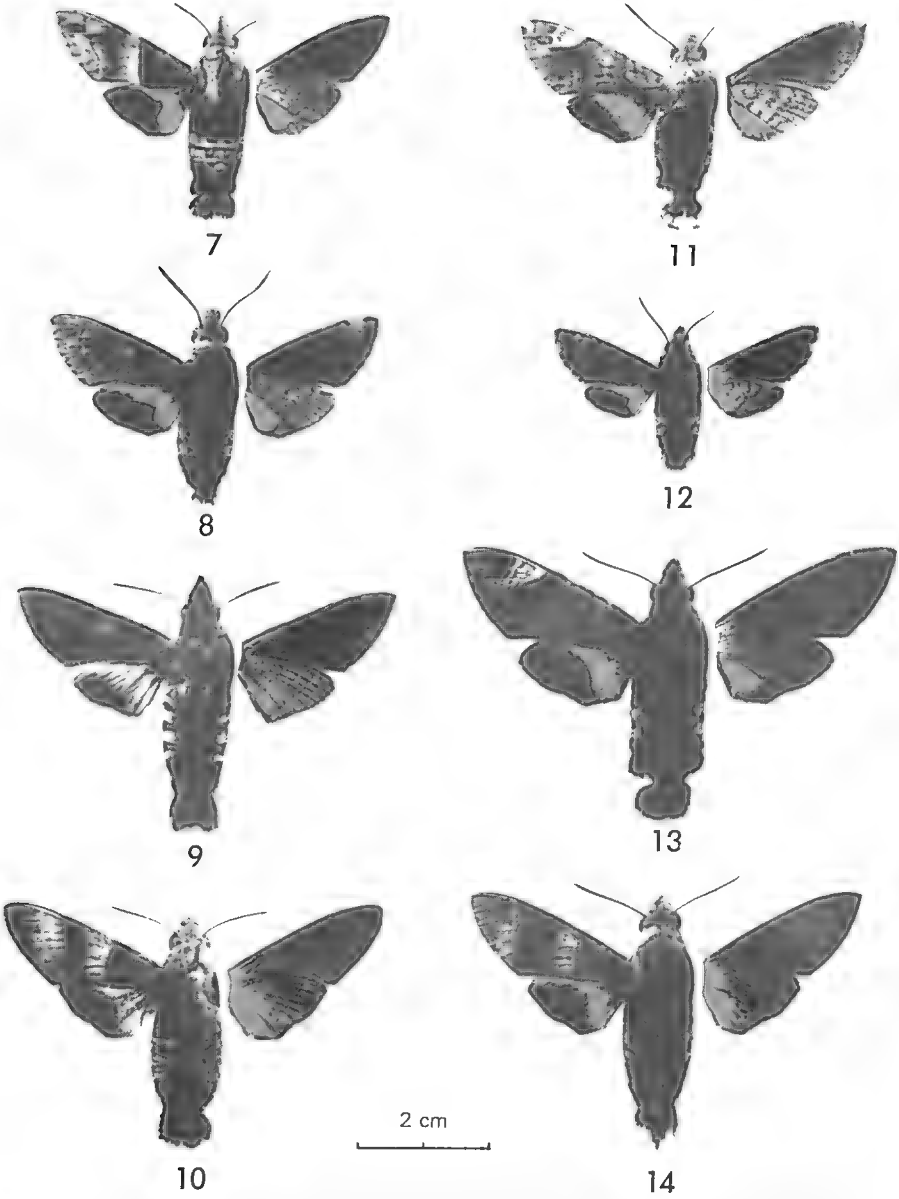
DISTRIBUTION

North-eastern Queensland from Iron Range to Cardstone (near Tully); uncommon. All recent captures have been made close to rainforest.

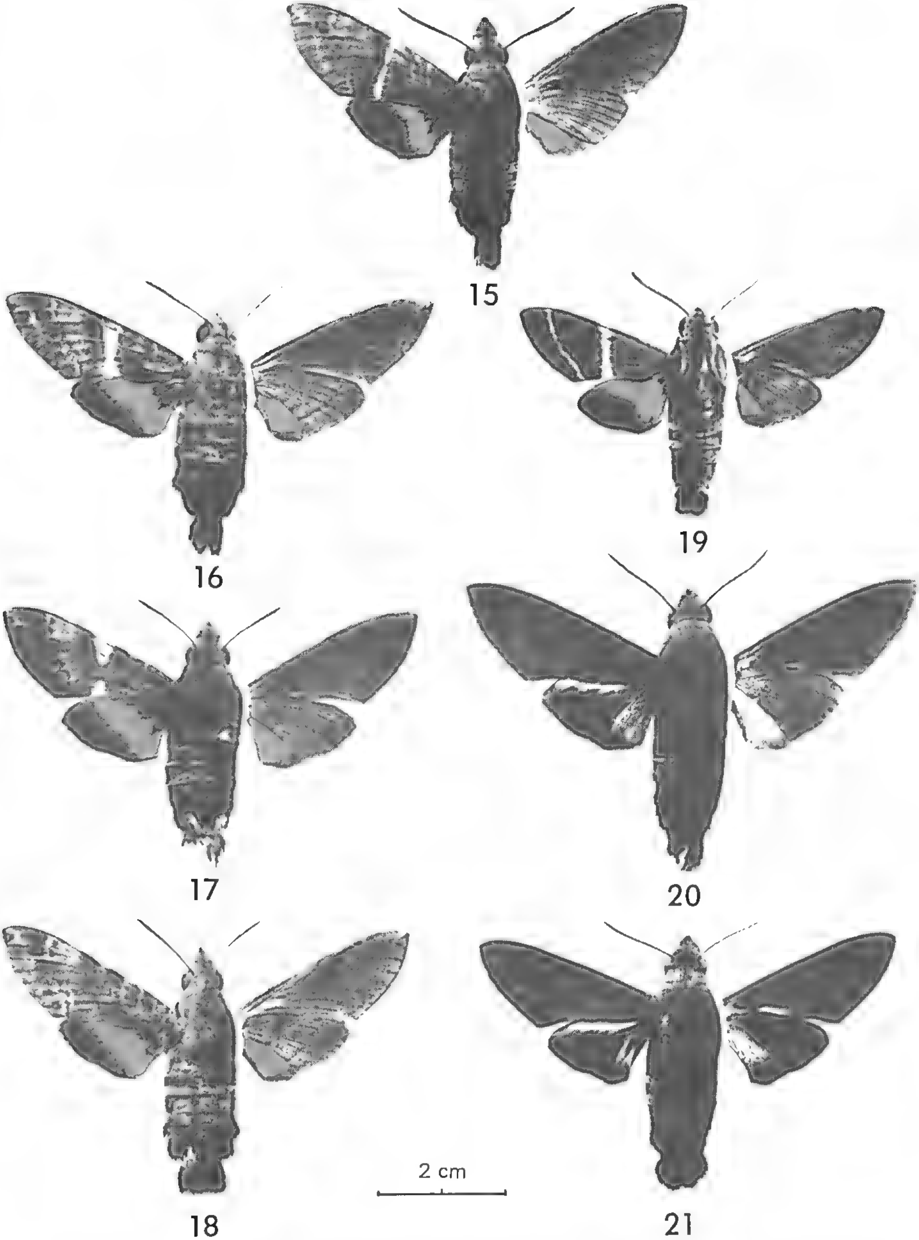
Range beyond Australia: New Guinea.

Published records (Australia only). Kuranda (Hopper 1980).

Records from material examined. QUEENSLAND: Iron Range, Dec., Jan.; Isabella Falls, 30 km N of Cooktown, Feb.; Cooktown, Apr.; Julatten, Feb., Mar., Aug.; Mossman,



Figs 7-14. *Macroglossum* species (diagnostic colouring inserted): (7) *M. heliophilum queenslandi* Clark; (8) *M. alcedo* Boisduval; (9) *M. vacillans* Walker; (10) *M. joannisi* R. & J.; (11) *M. prometheus lineatum* Lucas; (12) *M. insipidum papuanum* R. & J.; (13) *M. nubilum* R. & J.; (14) *M. corythus pylene* Felder



Figs 15-21. *Macroglossum* species (diagnostic colouring inserted): (15) *M. rectans* R. & J.; (16-18) *M. hirundo errans* Walker; (19) *M. dohertyi* Rothschild; (20) *M. tenebrosum* Lucas (21) *M. micaceum micaceum* Walker.

Apr.; Cairns district, Feb., May, June, Nov.; Kuranda, Jan., Feb., Apr.-Sep., Nov.; Lake Barrine, Jan.; 15 km SW of Gordonvale (550 m) Jan.; Etty Bay (near Innisfail), Dec., Feb.; Cardstone, Jan. (dead in spider web). (AH, AJG, ANIC, DL, EP, MSM, MV, QM, UQ, WNBQ).

There are three specimens in SAM labelled "Brisbane". Having regard to the confirmed distribution above, and the fact that the species appears to be closely associated with rainforest, these records are considered erroneous.

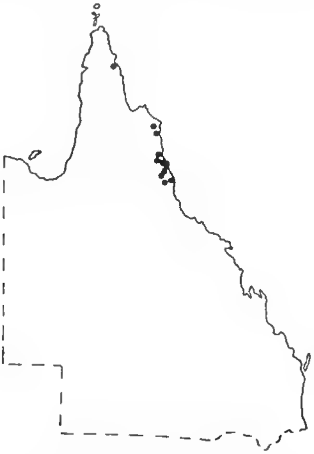


Fig. 22. Distribution of *M. nubilum* Rothschild and Jordan.

M. corythus pylene Felder
(Figs 14, 23)

Macroglossa Pylene C. Felder, 1861: 29 (Amboina, = Ambon).

TYPE (examined):– BMNH; holotype ♀, bearing five labels as follows: 1) Amboin, Doleschall, Type; 2) Type; 3) FELDER COLLn.; 4) Nov. Zool., Pl. 4, Fig. 7, 1903; 5) Rothschild Bequest, B.M. 1939-1.

Macroglossum corythus pylene Felder: Rothschild and Jordan, 1903: 661-662, pl. IV, fig. 7.

Macroglossa approximans Lucas, 1891: 834 (Mackay).

TYPE (examined):– SAM; holotype ♂, bearing four labels as follows: 1) Macroglossa approximans Luc., Mackay, Type, I.13811; 2) [repeat of label 1]; 3) 434, L, 4) S.A. Museum Specimen.

Macroglossum stenoxanthum Turner, 1925: 41-42 (Kuranda). **Syn. nov.**

TYPES (examined):– MV; syntype ♂, bearing four labels as follows: 1) Kuranda, Jan. 1912, F.P.D; 2) Macroglossum stenoxanthum Turn., TYPE; 3) G. Lyell Coll., Pres. 31.7.32; 4) National Museum of Victoria, Melbourne. ANIC; syntype ♀, bearing two labels as follows: 1) Kuranda, Jan. 1912, F.P.D.; 2) PARATYPE, Macroglossum stenoxanthum Turner 1925.

Macroglossa phlegeton Boisduval, 1875: 346 (New Guinea).

Macroglossa motacilla Boisduval, 1875: 347 (Dorey; now Manokwari, Irian Jaya).

Macroglossa cyniris Boisduval, 1875: 350 (Halmahera, = Halmahera Is., Indonesia).

Macroglossa volucris Pagenstecher, 1884 (*non* Walker, 1856): 210 (Amboina, = Ambon).

Macroglossa labrosa Swinhoe, 1892: 5 (Buru).

Macroglossa moluccensis Rothschild, 1894 (*partim*): 67 (New Guinea, Moluccas).

REMARKS

Australian specimens agree closely with New Guinea material. Although the orange-yellow band of the hind wing above is often more reduced in Australian examples, the degree of variation does not warrant subspecific status. New Guinea specimens show considerable variation in the width of the orange-yellow band and, while Australian specimens are less variable, it is not difficult to find almost identical examples from each country. The type of *M. stenoxanthum* is "typical" of Australian material and agrees well with New Guinea specimens that have the orange-yellow of the hind wing above reduced.

Contrary to the statement of Rothschild and Jordan (1903: 652) that Lucas' description of *approximans* applies in part to *corythus pylene* (wings) and *prometheus inusitata* (abdomen) the type of *approximans* is clearly the former.

DISTRIBUTION

Darwin, Northern Territory, and north-eastern Queensland from the islands of Torres Strait to Mackay; usually rare.

Range beyond Australia: this subspecies also ranges through New Guinea and neighbouring islands. Other subspecies occur in China, Japan, Taiwan, India, Sri Lanka, Malaysia, the Philippines, Indonesia, Solomon Islands, New Hebrides, New Caledonia and Loyalty Islands.

Published records (Australia only). Queensland (Kirby 1894, Rothschild and Jordan 1903, Seitz 1928-30, Wagner 1915); Kuranda, Jan. (Turner 1925); Mackay (Lucas 1891).

Records from material examined. NORTHERN TERRITORY: Darwin, Apr. (DANT). QUEENSLAND: Sue (= Warraber) Is., Torres Strait, Dec., Feb.; Booby Is., Torres Strait, Feb.; Cape York, Apr.; Cooktown; Kuranda, Nov.-May; Cairns; Meringa (near Gordonvale) Dec.; Mackay. (AM, ANIC, DL, MSM, MV, QM, SAM).

There is also a specimen in SAM labelled "Brisbane". The absence of other records south of Mackay suggests that this record is erroneous and it is here disregarded.

Fig. 23. Distribution of *M. corythus pylene* Felder.

M. rectans Rothschild and Jordan
(Figs 15, 24)

Macroglossum rectans Rothschild and Jordan, 1903: 650, pl. 4, fig. 8 (Kei Islands, = Key Islands).

TYPE (examined):– BMNH; holotype ♂, bearing five labels as follows: 1) Little Kei, 9.II.97 (H. Kühn); 2) Macroglossum rectans, Type, R. & J. 1903; 3) Nov. Zool. Pl. 4, Fig. 8, 1903; 4) Type; 5) Rothschild Bequest, B.M. 1939-1.

REMARKS

Care should be taken not to confuse this rare species with the common *M. hirundo*. It can be distinguished by the characters listed in couplet 6 of the key provided at the beginning of this paper.

DISTRIBUTION

Far northern part of Northern Territory and north-eastern Queensland from Torres Strait Islands to Ayr; rare and apparently closely associated with wet season rains. The occurence of specimens on the arid extremity of Cobourg Peninsula, and on Rimbija and Booby Islands far removed from favourable breeding sites strongly suggests that the species is migratory.

Range beyond Australia: New Guinea and Key Islands.

Published records (Australia only). Queensland (Rothschild and Jordan 1903, 1907; Seitz 1928-30).

Records from material examined. NORTHERN TERRITORY: Darwin, Jan.; Black Point, Cobourg Peninsula, Jan.; Rimbija Is., Wessel Islands, Jan.; Mainoru, ENE of Katherine, Nov.; (ANIC, MSM, MV). QUEENSLAND: Banks Is; Booby Island, Jan.; Cooktown, Dec.; Julatten, Mar.; Yorkeys Knob, Mar.; Mulgrave R., (30 m), 25 km SW of Gordonvale, Jan.; Ayr, Jan. (AH, AJG, ANIC, MSM).

Fig. 24. Distribution of *M. rectans* Rothschild and Jordan.

M. hirundo errans Walker
(Figs 16-18, 25)

Macroglossa errans Walker, 1856: 96 (Australia).

TYPE (examined):– BMNH; holotype ♂, bearing a circular label with a red border on which is printed "Type" and a circular label on which is handwritten "Australia 52-70".

In the original description Walker lists only one specimen as representing what he considered typical *errans*. A further four are listed as variants. No specimen was designated as "the type" but following Article 72(b)(i) of the *International Code of Zoological Nomenclature* variants are to be excluded from the type series thus leaving, in this case, only the single typical specimen which therefore acquires holotype status.

Macroglossum hirundo errans Walker: Rothschild and Jordan, 1903: 649-650.

Macroglossum hirundo errans, forma *interrupta* Closs, 1911 (*non* Butler 1875): 199 (Rockhampton).

TYPE:– location unknown. Dr H. J. Hannemann of the Zoologisches Museum, East Berlin, has kindly advised that although the museum acquired part of the Closs collection the type of *interrupta* is not included. This is the form of *M. hirundo* that has the transverse band of the fore wing broken.

Macroglossa belinda Pagenstecher, 1900: 18 (N. Pommern).

TYPE (not examined):– BMNH.

Rhamphoschisma Scottiarum R. Felder, *in* Felder and Rogenhofer, 1874: pl. 75, fig. 8 (no text).

TYPE (examined):– BMNH; holotype ♂, bearing six labels as follows: 1) a small circular label handwritten in four lines interpreted as–Rokampton, Mus Godeffroy; 2) Rhamphoschism Scottiarum, Type, Nov., 75.8.; 3) TYPE of scottiarum Feld.; 4) Type; 5) Rothschild Bequest, B.M. 1939-1; 6) a small blank orange square without data.

Felder does not give the type locality but one label attached to the type implies that it was taken at Rockhampton while Boisduval (1875) gives the type locality as "l'Australie". The only landing in Australia during the *Novara* voyage was at Sydney from 5 November to 7 December 1858. It is, therefore, almost certain that the specimen was not actually collected in Australia during this voyage as the species is an extreme rarity in Sydney, this locality being the southern limit of its known range. The type specimen (which is that figured by Felder) may well have been a gift from William Macleay given during the *Novara's* stay in Sydney.

Although the authorship of the moths of the *Novara* voyage is Felder and Rogenhofer, the authorship of this name is attributed to Felder alone (see Boisduval 1875: 354). Also, the year of publication of *Reise Novara Lep.* 4 has at times been quoted as 1875. D. S. Fletcher, 1979, *The generic names of moths of the world* 3: x, points out that evidence from accounts of meetings of the Royal Academy of Science in Vienna suggests that publication was most likely 1874 and not 1875.

REMARKS

The transverse pale band across the fore wing is highly variable; it is often broken centrally (holotype) form *interrupta* Closs and can be entirely absent; on some specimens this band is narrow while on others it is noticably broad. Care should be taken not to confuse this species with the rare *M. rectans* which can be readily distinguished from *M. hirundo* by the much narrower orange band on the hind wing above (refer to couplet 6 of the key provided at the beginning of this paper).

DISTRIBUTION

Northern half of Northern Territory, and eastern Queensland and New South Wales from the islands of Torres Strait to Sydney; common in Northern Territory and Queensland, less so in New South Wales, rare south of the Richmond River. Usually associated with wet season rains in the north.

Range beyond Australia: subspecies *errans* is also recorded from New Guinea and the Solomon Islands. Other subspecies occur in Fiji, Samoa, New Caledonia, Loyalty Islands, Lesser Sunda Islands, eastern Melanesia to Samoa, Tonga, the Society and Cook Islands.

Published records (Australia only). Queensland (Common 1970, Rothschild and Jordan 1903, 1907, Seitz 1928-30, Swinhoe 1892, Tillyard 1926, Wagner 1915, Walker 1856); Cape York (Swinhoe 1892); Atherton (Aurivillius 1920); Bowen (Miskin 1891, Rothschild and Jordan 1903); Mackay (Miskin 1892, Rothschild 1894); Rockhampton (Closs 1911, Miskin 1891, Rothschild and Jordan 1903); Brisbane (including Morton Bay) (Butler 1876, Miskin 1891, Rothschild and Jordan 1903, Walker 1856); Bandon Grove (near Dungog), Feb. (Dowling and Haines 1963); Norfolk Is., Jan. (Holloway 1977).

Records from material examined. NORTHERN TERRITORY: Darwin, Jan., Apr., June; near Smith Point, Cobourg Peninsula, Jan.; Rimbija Island, Wessel Islands, Jan., Feb.; Berry Springs, June; Jim Jim dist., Mar., May, Aug.; Batchelor (near Adelaide River), June; Tennant Creek, Dec. (AM, ANIC, DANT). QUEENSLAND: Banks Is., Mar., July; Cape York; Merluna Stn, SE of Weipa, Nov.; Iron Range, May; Archer R. crossing, Dec.; Pat Ck (near Archer R. crossing, N of Coen), June; 57 km SSE of Coen, Dec.; Silver Plains (E of Coen), May; near Laura, Dec., Jan., May; Hopevale Mission, N of Cooktown, Oct.; Cooktown, Dec., Jan., Apr., Oct.; Mossman, Mar.; Julatten, Jan.; Cairns, Jan.; Holloways Beach and Kamerunga (near Cairns), Jan., Feb., May-July; Kuranda, Jan., Feb., May, Dec.; Mareeba, Jan.; Atherton, Feb., Apr.; Lake Barrine, May; Forty Mile Scrub (near Mt Garnet), Jan., Nov., Dec.; Meringa (near Gordonvale), Feb., Apr., Nov.; Mt. Bartle Frere; Etty Bay (near Innisfail), Nov., Dec.; Kareeya Power Stn (near Cardstone), Dec., Jan.; Ingham, May; Townsville, Feb.; Burra Rg, Feb., Mar.; 65 km E of Hughenden, Feb.; Bowen, Dec., May; Shute Harbour, Mar.; Homebush, Dec.; Mackay,

Fig. 25. Distribution of *M. hirundo errans* Walker.

Jan., Mar.; Clermont, Jan., Mar.; Yeppoon, Dec., Jan.; Rockhampton, Dec., Jan.; Westwood, Jan.-Apr.; Expedition Range, Feb., Sep.; Corallie R., Bruce Hwy, NW of Gladstone, Jan.; Beecher. Dec.; Biggenden, Dec.; Rundle Rg., Dec.; Biloela, Jan., Mar.; Wallaville (near Gin Gin), Feb., Mar.; Goodnight Scrub, SW of Gin Gin, Dec.; Eidsvold; Maryborough, May; Montville; Gympie, Feb., Sep.; Maleny, Mar.; Maroochydore, Dec.; Bunya Mts, Jan.-Mar.; Ravensbourne, Feb.; Warra; Toowoomba, Jan.-Apr., Nov., Dec.; Somerset Dam, Jan.; Lawes, Jan.; Brisbane, Jan.-May, Sep., Oct.; Mt Glorious/Mt Nebo, Feb., Nov., Dec.; Mt Tamborine, Apr., May, Dec.; Burleigh Heads, Mar., May. NEW SOUTH WALES: Billinudgel (near Mullumbimby), Mar.; Richmond River, Mar.; Brunswick Heads, Mar.; Newcastle; Sydney, Mar. (AH, AM, ANIC, BCRI, DL, DPI, EP, LeS, MSM, MV, QM, SAM, UQ, WFG).

M. dohertyi **Rothschild**

(Figs 19, 26)

Macroglossa dohertyi Rothschild, 1894: 67, pl. 5, fig. 2, (Amboyna, = Ambon).

TYPE (examined):– BMNH; holotype ♂, bearing four labels as follows: 1) Amboyna, Feb. 1892, W. Doherty; 2) Mac. Dohertyi Rothsch. Type. Jan 1894; 3) Type; 4) Rothschild Bequest, B.M. 1939-1.

Macroglossum doddi Clark, 1922: 14-15 (Kuranda). **Syn. nov.**

TYPE (examined):– CMNH; holotype bearing five labels as follows: 1) Kuranda, Q., F. P. Dodd & Sons, Aug 1918; 2) TYPE; 3) 6290; 4) Macroglossum doddi, type. sp. nov. Clark; 5) CMNH HOLOTYPE # 735 Macroglossum doddi Clark.

REMARKS

A distinctive species but nevertheless a variable one. Of seven specimens examined no two were identical. Fresh specimens have the greater part of the fore wings above dark green.

DISTRIBUTION

North-eastern Queensland from the Torres Strait Islands to Etty Bay near Innisfail; rare.

Range beyond Australia: New Guinea and Ambon.

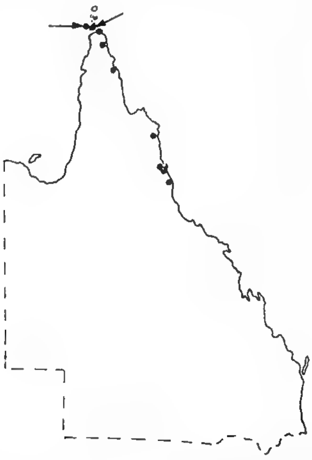


Fig. 26. Distribution of *M. dohertyi* Rothschild.

Published records (Australia only). Prince of Wales Is., Torres Strait and Cape York, June and July (Turner 1925); Kuranda (Clark 1922).

Records from material examined. QUEENSLAND: Prince of Wales Island, June; Booby Island, Apr., May; Cape York, Apr., June, July, Sep.; upper Jardine River, Cape York Pen., Oct.; Iron Range, May, Sep.; Mt Cook (near Cooktown), Dec.; Yorkys Knob (near Cairns), Apr.; Cairns, Apr.; Meringa (near Gordonvale), Feb.; Etty Bay (near Innisfail), Dec. (AJG, ANIC, DL, DPI, EP, EJH, MSM, MV, QM).

M. micaceum micaceum Walker
(Figs 21, 27)

Macroglossa micacea Walker, 1856: 96-97 (Australia and Moreton Bay).

TYPES (examined):– BMNH; syntype series of four specimens. Three specimens traced. *Lectotype here designated,* ♂, which bears a circular label on which is handwritten "Moreton Bay" and on the reverse side "56-1", a rectangular label on which is printed "21. Macroglossa micacea.", a circular red-edged label on which is printed "Type" and now also carrying a red rectangular label stating "LECTOTYPE Macroglossa micacea Walker, Moulds 1985".

Macroglossa Nox Newman, 1857 (*non* Butler, 1875): 54-55 (Moreton Bay).

TYPES (examined):– BMNH; two syntypes from Moreton Bay. The lectotype of *micacea* and one other specimen carry relevant data but neither have the pin data *nox.*

Macroglossum micacea micacea Walker: Rothschild and Jordan, 1907: 121.

DISTRIBUTION

Islands of Torres Strait through eastern Queensland to Ebor in north-eastern New South Wales; at times common.

Range beyond Australia: Papua. Another subspecies occurs in the Solomon Islands.

Published records (Australia only). Queensland (Rothschild and Jordan 1903, Seitz 1928-30, Wagner 1915); Kuranda (Hopper 1980); Mackay (Miskin 1892); Rockhampton (Miskin 1891); Moreton Bay (Butler 1876. Newman 1857, Swinhoe 1892, Walker 1856); Brisbane (Miskin 1891).

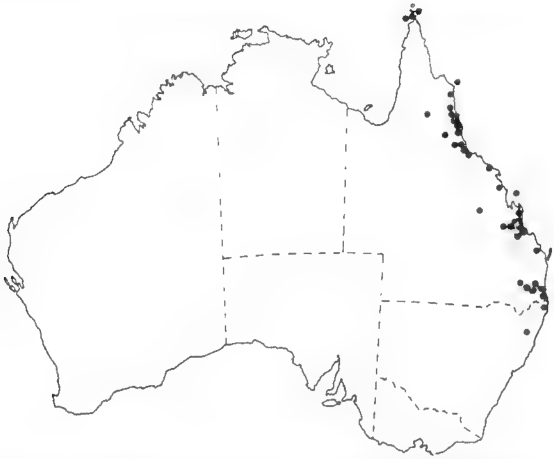


Fig. 27. Distribution of *M. micaceum micaceum* Walker.

Records from material examined. QUEENSLAND: Sue Is., Torres Strait, Feb., Dec.; Booby Is., Torres Strait, Dec., Jan.; Thursday Is., Torres Strait, Jan.; Lizard Is., NNE of Cooktown, Nov.; Cooktown, Apr., Oct., Dec.; Mt Windsor Tableland, NW of Mossman, Jan.; Julatten, Nov.; Kuranda, Jan., Mar.-June, Oct., Dec.; Cairns, Jan., May, Sep., Nov.; Mt Baldy, approx 8 km W of Atherton, Jan.; Atherton, Mar.; Lake Barrine, Jan.; Bulimba Hstd, WNW of Chillago, Feb., Mar.; Forty Mile Scrub, SSW of Mt Garnet, Mar.; Meringa (near Gordonvale), Mar., Apr.; Mt Bellenden Ker summit, Jan.; Etty Bay (near Innisfail), Nov., Dec.-Mar.; Mission Beach, Nov.; near Wallaman Falls, Mar.; Ingham, Apr.; Paluma, Jan., Feb.; Townsville, Mar., Apr., June; Bowen (Port Denison), Dec.; Mackay, Nov.; Pine Islet, Percy Is. Group, Dec.; Clermont, Mar.; Byfield, Feb.; Yeppoon, Jan., Apr.; Rockhampton, Dec.-Feb.; Westwood, Mar., Apr.; Duaringa district, Jan.; Corallie R., Bruce Hwy, NW of Gladstone, Jan.; Gladstone district, Jan.; Kroombit Tops, SW of Gladstone, Feb.; Bundaberg, Mar.; Hervey Bay (near Maryborough), Jan.; Dalby; Somerset Dam, Dec.; Mt Glorious/Mt Nebo, Mar., Apr., Oct., Nov.; Brisbane, Jan.-May, Nov.; Lawes, Jan.; Toowoomba, Jan., Feb., May, Dec.; Canungra, Feb.; Southport, Feb. NEW SOUTH WALES: Billinudgel (near Mullumbimby), Mar.; Ebor, Jan., Nov. (AH, AM, ANIC, DL, DPI, EJH, EP, JO, MC, MSM, MV, QM, RM, UQ, SAM).

M. tenebrosum Lucas

(Figs 20, 28)

Macroglossa tenebrosa Lucas, 1891: 834 (Rockhampton).

TYPE (examined):– SAM; ? holotype, ♀, bearing one label as follows: "Macroglossa tenebrosa Lucas, ?Type, agrees but expanse different. unique in L. coll.". The difference in the measurement of the wing expanse most likely has arisen from the specimen partly relaxing so that the wings now spread more widely than in the original setting. The fore wings appear to have pulled back as they now have the costa more or less at right angles to the body.

Macroglossum tenebrosum Lucas: Tillyard, 1926: 448

Macroglossa nox Butler, 1875 (*non* Newman, 1857): 5, pl. 1, fig. 6 (Rockingham Bay).

TYPE (examined):– BMNH; holotype ♂, the same specimen that is the type of *M. splendens* Butler, *q.v.* [refer Butler (1892)]. Syn. nov.

Macroglossa vox Butler, 1892: 20. [An incorrect spelling of *nox*.]

Macroglossa splendens Butler, 1892: 20. **Syn. nov.**

TYPE (examined):– BMNH; holotype ♂, bearing four labels as follows: 1) Aust.; 2) R. Bay; 3) splendens Butl. type; 4) Type. This specimen is also the type of *M. nox* Butler.

Macroglossum splendens Butler: Rothschild and Jordan, 1903: 669-670, pls LVI, fig. 53 and LXIV, fig. 22.

Macroglossa micacea Walker, 1856 (*partim*): 96-97. Syn. nov.

The female of *M. nox* was described as that of *M. micaceum.*

REMARKS

The specimen figured by D'Abrera (1974) under this name is not this species. It appears to be a slightly discoloured specimen of *M. joannisi.*

DISTRIBUTION

North-eastern Queensland from the islands of Torres Strait to Yeppoon (near Rockhampton); uncommon.

Range beyond Australia. Eastern Indonesia, through New Guinea to the Solomon Islands.

Published records (Australia only). Queensland (Kirby 1892, Rothschild and Jordan 1903, 1907, Seitz 1928-30, Wagner 1915); Rockingham Bay (Butler 1875, 1876, 1892); Cardwell (Miskin 1891); Mackay (Miskin 1891); Rockhampton (Lucas 1891).

Records from material examined. QUEENSLAND: Sue Is., Torres St., Mar.; Booby Is., Torres St., Dec.; Iron Range, Apr.; Cooktown, Apr.; Palmer R.; Jan.; Julatten, Apr.; Cairns, Mar.; Kuranda, Jan.-May, July-Sep., Dec.; Lake Barrine, Apr.; Malanda, May; Gordonvale; Innisfail; Etty Bay (near Innisfail), Feb.; Dunk Island, May; Mission Beach, Jan.; Rockingham Bay (near Tully and Cardwell); Mackay; Yeppoon, Mar. (AJG, AM, ANIC, EJH, MSM, MV, QM, SAM, UQ, WFG, WNBQ).

In SAM there are specimens labelled Warra and Brisbane. These localities are doubtful and require confirmation; they are much further south than I would expect the species (which I have found only in association with rain forest) to occur.

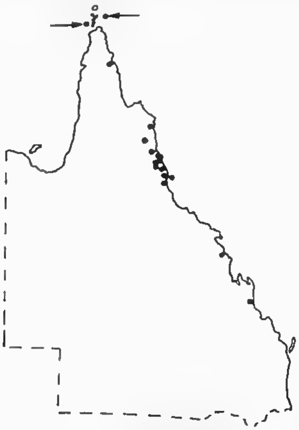


Fig. 28. Distribution of *M. tenebrosum* Lucas.

Discussion

It is interesting to note that *M. joannisi* is the only endemic *Macroglossum* species occurring in Australia. *M. stenoxanthum* had previously been considered an Australian endemic but it is now clear that it is a synonym of *M. corythus pylene.* The majority of *Macroglossum* species found in Australia range north-west through Indonesia, some extending as far afield as India and China. Only one species, *M. hirundo*, ranges eastwards and, although this species is widespread, its distribution is confined to Melanesia and Polynesia.

Within Australia, north-eastern Queensland is undoubtedly the region richest in *Macroglossum* species. All 13 species found in Australia occur in this region and with but one possible exception, *M. vacillans,* numbers of specimens in collections indicate that the highest population densities of these species also occur in this region. Seven species, *M. vacillans, M. hirundo, M. rectans, M. prometheus, M. corythus, M. joannisi* and *M. micaceum,* range beyond north-eastern Queensland. Of these all but *M. micaceum* also occur in the northern part of the Northern Territory, while *M. vacillans* is found further west, near Derby in Western Australia. Only two species, *M. hirundo* and *M. micaceum,* range south of the tropics, both occurring along the eastern coasts of Queensland and New South Wales, the former as far south as Sydney and the latter as far as Ebor.

Much remains to be learnt concerning the influences affecting the geographical and seasonal distributions of Australian *Macroglossum* species.

There is little doubt, however, that the presence of rainforest and the tropical wet season play significant roles. All species have been taken in rainforest in north-eastern Queensland and population numbers are usually highest during or immediately after the wet season (approximately January to April). It is most likely that the majority of *Macroglossum* food plants are rainforest species. To date only *M. hirundo* and *M. vacillans* are known regularly to inhabit non-rainforest regions. The larvae of *M. hirundo* feed on at least one non-rainforest plant (Moulds 1984) while the wide distribution of *M. vacillans* in semi arid areas of the Northern Territory and Western Australia suggests that this species may also have at least one non-rainforest food plant.

Acknowledgements

Those individuals and institutions listed with abbreviations at the beginning of this paper allowed examination of specimens and types in their care; to each I am especially grateful. In addition A. & M. Walford-Huggins, G. Sankowsky, A. J. Graham, A. Hiller, W. F. Gibb, the late J. W. C. Le Souëf, R. Storey, G. Daniels, D. Lane, J. Olive and E. Porteus kindly gave me many useful specimens. I wish to thank also Mr A. H. Hayes, Mrs A. Z. Smith and Dr P. E. L. Viette for providing colour slides of types held in BMNH, HOPE and Museum National d'Histoire Naturella, and Dr D. K. McAlpine for examining BMNH types for me during a visit to that institution. To Drs I. F. B. Common and A. Neboiss I am indebted for allowing dissection of specimens in ANIC and MV respectively. I am also most grateful to Dr J. P. Duffels for considerable assistance in locating literature and Mr E. D. Edwards and Dr G. B. Monteith for help in a variety of ways. For helpful criticism of the manuscript I wish to thank Dr I. F. B. Common, Mr A. H. Hayes, Mr W. Hogenes, Dr D. K. McAlpine and Dr C. N. Smithers.

References

Aurivillius, P. O. C., 1920. Results of Dr E. Mjoberg's Swedish scientific expeditions to Australia 1910-1913. 21. Macrolepidoptera. *Ark. Zool.* 13(1-2) (2): 1-44.

Bell, T. R. D. and Scott, F. B., 1937. Moths. Sphingidae. In: *The fauna of British India including Ceylon and Burma.* Vol. 5. Taylor and Francis, London. 537 pp., 15 pls. [Facsimilie reprint, 1976, Today and Tomorrow's, New Delhi.]

Boisduval, J. B. A. D. de, 1832. *Voyage de decouvertes de l'Astrolabe execute par ordre du Roi, pendant les annees 1826-1827-1828-1829, sous le commandement de M. J. Dumont d'Urville. Faune Entomologique de l'Ocean Pacifique, avec l'illustration des insects mouveaux recueillis pendant le voyage.* Premiere Partie. Lepidopteres. 267 pp., atlas. J. Tastu, Paris.

Boisduval, J. B. A. D. de, 1875 [1874]. *Histoire naturelle des Insects. Species General des Lepidopteres.* Heteroceres. I. Sphingides, Sesiides, Castnides. 568 pp., 11 pls. Paris. [Forms part of Roret's "Suites a Buffon".]

Butler, A. G., 1875. Descriptions of thirty-three new or little-known species of Sphingidae in the collection of the British Museum. *Proc. zool. Soc. Lond.* 1875: 3-16, pls I & II.

Butler, A. G., 1876. Revision of the heterocerous Lepidoptera of the family Sphingidae. *Trans. zool. Soc. Lond.* 9: 511-644, pls XC-XCIV.

Butler, A. G., 1881. On a second collection of Lepidoptera made in Formosa by H. E. Hobson, Esq. *Proc. zool. Soc. Lond.* 1880: 666-691.

Butler, A. G., 1892. *Macroglossa vox,* Newman. *In*: Entomological notes, captures, &c. *Entomologist* 25(no. 344): 20. [The specific name "*vox*" in the title is a misspelling of the name "*nox*".]

Clark, B. P., 1922. Twenty-five new Sphingidae. *Proc. New England zool. Club* 8: 1-23.

Clark, B. P., 1927. Descriptions of twelve new Sphingidae and remarks upon two other species. *Proc. New England zool. Club* 11: 99-109.

Closs, A. G., 1911. Zwei neue Sphingidenformen in meiner Sammlung. *Int. Ent. Z. Guben* 5: 199.

Common, I. F. B., 1963. *Australian moths.* Jacaranda Press, Brisbane. 129 pp. [Revised edition, 1966.]

Common, I. F. B., 1970. Lepidoptera. Chapter 36 in *The insects of Australia.* Melbourne University Press, Melbourne, Pp. 765-866, pl. 8.

D'Abrera, B., 1974. *Moths of Australia.* 85 pp. Lansdowne, Melbourne.

Dowling, M. J. and Haines, L. C., 1963. Notes on the hawk-moths and butterflies of Bandon Grove, N.S.W. *Aust. Zool.* 13(1): 1-8.

Dupont, F. and Roepke, W., 1941. Heterocera Javanica. Fam. Sphingidae hawk moths. *Nederl. Akad. v. Wet., Verk.* Tweede Sectie, 40(1): 1-104, pls 1-23.

Felder, C., 1861. Lepidopterorum Amboinensium a Dre. L. Doleschall annis 1856-58 collectorum species collustratae. II. Heterocera. *Sitzungsb. der Berl. Akad. Wissen. Wien* 43: 26-44

Felder, R. and Rogenhofer, A. F., 1874. *Reise der Österreichischen Fregatte "Novara" um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. van Wüllerstort-Urbair.* Zoologischer Theil, Band 2, Abtheilung 2, Heft 4. Lepidoptera Heterocera. Pp. 537-549, pls LXXV-CXX.

Fletcher, D. S. and Nye, I. W. B., 1982. Bombycoides, Castnioidea. Cossoidea, Mimallonoidea, Sesoiodea, Sphingoidea, Zygaenoidea. *In* Nye, I. W. B. (ed.), *The generic names of moths of the world.* British Museum (Natural History), London. Vol. 4. Pp. xiv, 192.

Holloway, J. D., 1977. *The Lepidoptera of Norfolk Island: their biogeography and ecology.* Junk, The Hague. 291 pp., illustr.

Hopper, S. D., 1980. Pollination of the rain-forest tree *Syzgium tierneyanum* (Myrtaceae) at Kuranda, northern Queensland. *Aust. J. Bot.* 28: 223-237.

Inoue, Hiroshi, 1973. An annotated and illustrated catalogue of the Sphingidae of Taiwan (Lepidoptera). *Bull. Fac. domestic Sci., Otsuma Woman's Univ.* 9: 103-139, pls 1-12.

Jordan, K., 1911. Family: Sphingidae. In: Seitz, A., *The Macrolepidoptera of the world.* Vol. 2. Bombyces and sphinges of the Palalarctic region. Pp. 229-256. [Continued 1912, pp. 257-260.]

Kirby, W. F., 1892. *A synonymic catalogue of Lepidoptera Heterocera. (Moths.).* Vol. I. Sphinges and bombyces. 951 pp.

Kirby, W. F., 1894. Supplementary list of Sphingidae. *Novit. zool.* 1: 99-103.

Lucas, T. P., 1891. *Butterflies and moths. Descriptions of two new butterflies and nine new Sphingidae or hawk moths found in Queensland.* Privately published by the author, Brisbane. 4 pp. [In the same year republished in two parts in *The Queenslander* (newspaper) May 2nd and 9th, Vol. 39, pp. 834 & 894. I know of only one copy of the original and that is in the BMNH (separates collection).

Mell, R, 1922. *Beitrage zur Fauna Sinica (II). Biologie u. Systematik der sudchinesischen Sphingiden.* 331 pp., atlas. R. Friedlander & Son, Berlin.

Miskin, W. H, 1891. A revision of the Australian Sphingidae. *Proc. R. Soc. Qd* 8(1): 1-28.

Miskin, W. H, 1892. Further note on Australian Sphingidae. *Proc. R. Soc. Qd* 8(3): 60-64.

Moulds, M. S. 1984. Larval food plants of hawk moths (Lepidoptera: Sphingidae) affecting garden ornamentals in Australia. *Gen. appl. Ent.* 16: 57-64.

Newman, E., 1857-58. Characters of a few apparently undescribed insects collected by James Gibbon, Esq., at Moreton Bay. *Trans. ent. Soc. Lond.* (2)4: 51-57. [Pp. 51-56 appeared in 1857 while p. 57 was not published until 1858. See Wheeler, *Trans. ent. Soc. Lond.* 1911(4): 755.]

Pagenstecher, A., 1884. Beitrage zur Lepidopteren-Fauna von Amboina. *Jahrb. Nass. Ver. Nat.* 37: 149-326, 2 pls.

Pagenstecher, A., 1900. Die Lepidopterenfauna des Bismarck-Archipels mit Berucksichtigung der thiergeographischen und biologischen Verhaltnisse systematisch dargestellt. II Teil: Die Nachfalter. *Zoologica, Stutt.* 12(29): 268 pp, 2 pls.

Rothschild, W., 1894. Notes on Sphingidae, with descriptions of new species. *Novit. zool.* 1(1): 65-98, pls 5-7.

Rothschild, W. and Jordan, K., 1903. A revision of the lepidopterous family Sphingidae. *Novit. zool.* 9, Supplement. 972 pp., 67 pls.

Rothschild, W. and Jordan, K., 1907. Lepidoptera Heterocera Fam. Sphingidae. *Genera Insectorum* Vol. 9, Fasc. 57: 1-157, pls 1-8.

Seitz, A., 1928-30. Family: Sphingidae. In: Seitz, A., *The Macrolepidoptera of the world.* Vol. 10. Bombyces and sphinges of the Indo-Australian region. Pp. 523-576, pls 60-68. [The dates of pub. given are for the original German edition; see Griffin, F. J., 1936, *Trans. R. ent. Soc. Lond.* 85(10): 243-280.]

Singh, B., Bhasin, G. D., Roonwal, M. L. and Mathur, R. N., 1954-1960. A list of insect pests of forest plants in India and the adjacent countries. *Forest Bull., Dehra Dun* 171: 10 parts.

Swinhoe, C., 1892. *Catalogue of Eastern and Australian Lepidoptera Heterocera in the collection of the Oxford University Museum.* Part 1, Sphinges and Bombyces. 324 pp. Clearendon Press, Oxford.

Tillyard, R. J., 1926. *The insects of Australia and New Zealand.* Angus and Robertson, Sydney. 560 pp., Illustr.

Turner, A. J., 1925. New Australian Lepidoptera. *Trans. Proc. R. Soc. S. Aust.* 49: 37-60.

Wagner, H., 1915. Sphingidae. Subfam. Philampelinae. *Lepidopterorum Catalogus.* Vol. 8 or Part 21. Pp. 1-304.

Walker, F., 1856. *List of the specimens of lepidopterous insects in the collection of the British Museum.* Part 8. British Museum, London.

Walker, F., 1864, *List of the specimens of lepidopterous insects in the collection of the British Museum.* Part 31, Supplement. British Museum, London.

Index to species, subspecies and forms

(Valid names in bold type)

NEW BUTTERFLY RECORDS FROM MOUNT KAPUTAR, N.S.W. INCLUDING A NEW WESTERN RECORD FOR *HYPOCYSTA EUPHEMIA* WESTWOOD (LEPIDOPTERA: NYMPHALIDAE)

By Andrew Atkins
45 Caldwell Avenue, Dudley, N.S.W., 2290

A male and female of the satyrid butterfly, *Hypocysta euphemia* Westwood, were collected by me on the 6 October 1984, at Mount Kaputar, New South Wales (height approximately 400 m). This species has been recorded from southern Queensland to far eastern Victoria, mainly in isolated localities along the eastern slopes of the Great Dividing Range (c.f. Common and Waterhouse, 1981). The Mount Kaputar locality represents a significant western extension to the known range of *H. euphemia.*

On the same day I observed or collected the following butterfly species which are additional to those listed by Daniels (1979) for Mount Kaputar: *Netrocoryne repanda repanda* C. and R. Felder (larva only); *Toxidia peron* (Latreille) and *Lampides boeticus* (Linnaeus). This brings the number of species now known from Mount Kaputar to 41.

References

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Angus and Robertson, Sydney.

Daniels, G., 1979. The Butterflies of Mount Kaputar National Park, New South Wales. *Aust. ent. Mag.* 6(3): 57-59.

A NEW SOUTHERN RECORD FOR THE YELLOW PALMDART, *CEPHRENES TRICHOPEPLA* (LOWER) (LEPIDOPTERA: HESPERIIDAE)

By Edward Petrie
P.O. Box 719, Lane Cove, N.S.W. 2066

Cephrenes trichopepla (Lower) is recorded as occurring from northern Western Australia across the Northern Territory, the Torres Strait Islands, Cape York south to Brisbane and from the Alice Springs area (Common and Waterhouse, 1981).

From the 12th to the 14th March, 1984 I collected six males and a female of *C. trichopepla* at Watego's Beach, 2 km east of Byron Bay township, New South Wales. All specimens were taken flying in a garden in which were growing *Livistona australis* (cabbage tree palm) and other ornamental palms but no larvae could be located. This locality is approximately 150 km south of the species previously known southern limit. The range of *C. trichopepla* may well be extending due to the widespread planting of ornamental palms.

Acknowledgement

I thank Max Moulds for confirming the identity of the skipper.

Reference

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* 2nd Edition. Angus and Robertson, Sydney. 682 pp.

BOOK REVIEWS

Insect communication 12th Symposium of the Royal Entomological Society of London. Edited by Trevor Lewis. 8vo. 414 pages, illustr. Published December 1984 by Academic Press, 24-28 Oval Rd, London NW1 7DX. Price Stg. £35.00.

As the Preface to this work states "This symposium volume draws together views on diverse aspects of insect communication, thereby serving as a definitive statement of the latest advances in the subject and providing ideas and encouragement for further study". In fact, its significance is greater than this.

Sixteen papers are included by leading world researchers. To give an idea of the subjects included I list a selection of the more fundamental: The world as the insect sees it; Insect hearing: acoustics and transduction; Chemistry of insect communication; Sexual selection, competitive communication and species-specific signals in insects; The exploitation in insect communication by man–fact or fantasy.

For almost everyone interested in insect communication this book offers interesting and informative reading. All of the contributions are clearly written and easy to follow despite the complex nature of some of the subjects discussed. The primary literature references included are alone an important aspect of this text. It is a book well illustrated, well printed with a quality binding. A 12 page index complements the listings under Contents.

I have no hesitation in recommending this volume to all seriously interested in insect communication–in fact, for most I consider consultation of it essential. All universities and other research libraries should have it on their shelves.

C. J. HOLMES

The biology of butterflies. Symposium of the Royal Entomological Society of London. No. 11. Edited by R. I. Vane-Wright and P. R. Ackery. 4to. xxiv, 429 pages, illustr. Published November 1984 by Academic Press Inc., 24-28 Oval Rd, London NW1 7DX. Price Stg. £39.50. ISBN 0 12 713750 5.

This impressive volume contains 33 original contributions by leading butterfly researchers from around the world. The papers are grouped into eight sections: (1) Systematics, (2) Populations and communities, (3) The food of butterflies, (4) Predation, parasitization and defence, (5) Genetic variation and speciation, (6) Sex and communication, (7) Migration and seasonal variation, (8) Conservation.

I have found all papers easy to comprehend; they have been written for a wide readership, not the narrow specialist. The papers, although orientated around specific research studies, have a broad-based application and consequently I would be surprised if any serious lepidopterist, amateur or professional, did not find several papers of particular interest and value. There is a theme throughout the book discussing basic principles–I list a few chapter headings taken at random as examples: Spatial distribution of eggs. Why are warning colours bright? Hereditability of spot pattern characters. Male pheromones–aphrodisiacs? Why should larvae bask? Another significant contribution from this volume is the extensive review of primary literature for all subjects covered.

The book is well illustrated (including 4 colour plates), beautifully printed, bound to withstand considerable use, comprehensive systemic and subject indices are included and the price is certainly reasonable for a text of this type.

The Royal Entomological Society of London and Academic Press are to be congratulated on the production of this volume. I understand, however, that it is already out of print but it may be reprinted–if you missed out on the first printing make sure you order early for the next.

M. S. MOULDS

AN ACCUMULATIVE BIBLIOGRAPHY OF AUSTRALIAN ENTOMOLOGY

Compiled by M. S. and B. J. Moulds

ALLSOPP, P. G., COWIE, B. A. and FRANZMANN, B. A.

1983. Development of immature stages of the lucerne leafroller *Merophyas divulsana* (Walker) (Lepidoptera: Tortricidae) under constant temperatures and on several larval diets. *J. Aust. ent. Soc.* 22(4): 287-291, 4 tables.

ANDERSON, Alan N.

1983. An introduction to ants. *Victorian Nat.* 100(5): 188-195, text-figs 1-4.

1983. A brief survey of ants in Glenaladale National Park, with particular reference to seed-harvesting. *Victorian Nat.* 100(6): 233-237, 1 table, text-figs 1-3.

ATKINSON, W. D.

1983. Gregarious oviposition in *Drosophila melanogaster* is explained by surface texture. *Aust. J. Zool.* 31(6): 925-929, 1 table, 1 text-fig.

BAILEY Winston J.

1983. Sound production in *Micronecta batilla* Hale (Hemiptera: Corixidae)–an alternative structure. *J. Aust. ent. Soc.* 22(1): 35-38, text-figs 1-9.

BARKER, S.

1983. New synonyms and new species of *Stigmodera* (Castiarina) (Coleoptera: Buprestidae). *Trans. R. Soc. S. Aust.* 107(3 & 4): 139-169, text-figs 1-7.

BICKEL, Daniel J.

1983. Two new Australian *Teuchophorus* Loew (Diptera: Dolichopodidae). *J. Aust. ent. Soc.* 22(1): 39-45, text-figs 1-8.

BOCK, Ian R.

1984. The chromosomes of six species of the *Drosophila lativittata* complex. *Aust. J. Zool.* 32(1): 43-55, text-figs 1-19.
Diptera

1984. Drosophilidae (Insecta: Diptera) in the Cooktown area of north Queensland. *Aust. J. Zool.* 32(1): 109-129, text-figs 1-4.

BOLAND, N. P. and ROOM, P. M.

1983. Estimating population density of a *Cyrtobagous* sp. (Coleoptera: Curculionidae) on the floating weed salvinia using berlese funnels. *J. Aust. ent. Soc.* 22(4): 353-354, 2 tables.

BOWEN, B. J., CODD, C. G. and GWYNNE, D. T.

1984. The katydid spermatophore (Orthoptera: Tettigoniidae): male nutritional investment and its fate in the mated female. *Aust. J. Zool.* 32(1): 23-31,3 tables, 1 text-fig.

BROWN, G. R.

1983. *Pentazeleboria*, a new genus of Australian Thynnini (Hymenoptera: Tiphiidae). *J. Aust. ent. Soc.* 22(1): 61-64, text-figs 1-9.

BRUN, L. O., CHAZEAU, J. and EDGE, V. E.

1983. Toxicity of four insecticides to *Phytoseiulus macropilis* (Banks) and *P. persimilis* Athias-Henriot (Acarina: Phytoseiidae). *J. Aust. ent. Soc.* 22(4): 303-305, 2 tables, 1 text-fig.

CAMPBELL, M. M.

1983. Effect of several additives to cattle dung on yield and size of pupae of the bush fly *Musca vetustissima* Walker (Diptera: Muscidae) in cultures. *J. Aust. ent. Soc.* 22(2): 125-127, 2 tables.

MILLER, L. A., ROSE, H. A. and McDONALD, F. J. D.

1979. A sweep net survey of soybean insects, north west slopes and plains region, New South Wales. *Gen. appl. Ent.* 11: 9-12, 1 table.

SPAIN, A. V., OKELLO-OLOYA, T. and JOHN, R. D.

1983. Orientation of the termitaria of two species of *Amitermes* (Isoptera: Termitinae) from northern Queensland. *Aust. J. Zool.* 31(2): 167-177, 1 table, text-figs 1 & 2.

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COVER

Illustrated by Marnie Holmes

Pharochilus dilatus Dalm. (length 28-36 mm) is a common species in forested areas of eastern Australia. Like other Passalidae the larvae and adults live together in groups feeding on rotting logs. Both larvae and adults can stridulate; the larvae by rubbing their hind legs against a file and the adults by scraping their abdomen against their underwings.

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PARASITOID RECORDS FOR *EUPLOEA CORE CORINNA* (W. S. MACLEAY) (LEPIDOPTERA: NYMPHALIDAE) IN SOUTH-EASTERN QUEENSLAND

By Habib Ur Rahman and Myron P. Zalucki
Department of Entomology, University of Queensland, St Lucia, Brisbane, Qld 4067

Abstract

Larvae of *Euploea core corinna* were sampled from *Nerium oleander* and *Parsonsia straminea*; both are common food plants in the Brisbane region. A higher percentage of larvae collected from oleander were parasitied (61%) compared to *P. straminea* (7%). Three species of parasites were reared out: two tachinids, *Paradrino laevicula* Mesnil and *Winthemia neowinthemioides* (Townsend), and a chalcid, *Brachymeria lasus* (Walker). The latter was recorded from *E. core corinna* for the first time.

Introduction

Many factors influence the population dynamics of butterflies (Ehrlich 1984) although the role of parasitoids in terms of regulation remains controversial (Dempster 1984). As part of our studies of the population biology of the common crow butterfly, *Euploea core corinna* (W. S. Macleay) (Rahman *et al.* 1985; Scheerymeyer & Zalucki 1985; Daglish *et al.* 1985) we investigated the effect of two larval food plants on levels of parasitism in this species. In the Brisbane region the introduced *Nerium oleander* and the native vine, *Parsonsia straminea*, (both Apocynaceae), are the major food plants of *E. core.* Here we report on the overall levels of parasitism recorded on these plants and the parasitoids reared out.

Materials and Methods

Euploea larvae were collected from 150 oleander plants growing in and around the University of Queensland campus during January 1983 and 21 *P. straminea* plants growing at Griffith University (GU) during January and March 1983. The larvae were individually reared in plastic cups (600 ml capacity) in a constant temperature room (25 ± 2°C, 70% RH) and supplied daily with fresh leaves of the host on which they were collected. The leaves were rinsed thoroughly in a weak (2%) sodium hypochlorite solution, followed by a weak detergent wash and several rinses in water to prevent introducing parasitoid eggs and/or diseases. All parasitoid adults reared from larvae and pupae were identified to species level by Miss M. Schneider (University of Queensland) and Mr B. K. Cantrell (Queensland DPI). Voucher specimens were lodged in the Entomology Department Museum (University of Queensland). Any larvae that died for no apparent reason were dissected and checked for parasitoid larvae.

Results and Discussion

A total of 107 larvae were collected from oleander and 29 from *P. straminea* and of these 61% and 7% respectively were parasitised. Although the sample size on *P. straminea* was small the differences in levels of parasitism were significant ($\chi^2 = 25.269$, $P < 0.001$, Table 1). The percentage parasitised increased with larval instar (Table 2). A small percentage (6%) of first instars on oleander were parasitized. The percent parasitised jumped to 60-70% in the second and third instars and remained high (*ca* 90%) in the fourth and fifth instars on oleander (Table 2). Only 2 larvae (both fifth instars) on *P. straminea* were parasitised (Table 2). Comparisons of overall parasitism levels (above) may be misleading due to: (1) the different age distributions of larvae on the two plant species (Table 2); and (2) the pattern of parasitism among instars. Comparing the 2 hosts for percent parasitism of of fifth instars, the level on oleander is higher ($\chi^2 = 4.711$, $P < 0.05$). The differences in levels of parasitism are due either to host plant effects on searching parasitoids *per se* (that is, parasitoids avoid *P. straminea* or find oleander 'attractive' for searching), or to habitat effects on parasitoids (that

TABLE 1

Number of *Euploea* larvae parasitised, eclosed successfully to adult and died from unknown causes collected from *Nerium oleander* and *Parsonsia straminea.*

Larval condition	*Nerium oleander*		*Parsonsia straminea*	
	No.	%	No.	%
Parasitised	65	61	2	7
Eclosed	21	20	16	55
Died (cause unknown)	21	20	11	38
Total	107		29	

TABLE 2

Breakdown of parasitism rates in *Euploea* larvae by instar collected from *Nerium oleander* and *Parsonsia straminea*

Larval instar at collection	No. collected	% parasitised	No. collected	% parasitised
I	17	6	14	0
II	32	60	7	0
III	24	70	2	0
IV	15	87	1	0
V	19	89	5	40
Total	107		29	

is, parasitoids are at a very low density at the GU site). The collections from *P. straminea* were made at Griffith University, which is set in a patch of sclerophyll forest. The oleander collections were made in suburban gardens. Experiments to test these hypotheses have been done and will be reported elsewhere.

The predominant parasitoid recorded in this study was *Paradrino laevicula* Mesnil (Diptera: Tachinidae). This parasitoid was recorded from larvae and papae collected as larvae from both oleander and *P. straminea.* Out of a total of 136 larvae, 67 were parasitised by tachinids (as judged by the presence of maggots and/or emergence of adult flies). Tachinids emerged from 38 larvae and pupae and *P. laevicula* emerged from 37 of these. Parasitised larvae contained on average 2.4 tachinids (range 1-7). Out of 93 tachinid adults emerging from Euploea, 88 were *P. laevicula* (37 ♂♂ and 49 ♀♀). The remaining 5 were *Winthemia neowinthemioides* (Townsend). These were reared solely from *Euploea* collected from oleander. In one instance a *P. laevicula* and a *W. neowinthemioides* emerged from one *Euploea* pupa. Crosskey (1973) also records both these tachinids from *Euploea core.* One *E. core* pupa collected from an oleander plant produced a specimen of *Brachymeria lasus* (Walker) (Hymenoptera: Chalcididae). This is a polyphagous parasitoid having been recorded from over 100 hosts (Habu 1960), but not previously from *E. core.* It probably attacks the prepupal stage of its hosts and, as this and the pupal stage are often difficult to sample, the incidence of this species is probably greatly underestimated.

Acknowledgements

We would like to thank Dr E. M. Exley for providing the facilities for this study, Dr V. E. Harris for reading an earlier version of this paper and Mrs B. Dennis for typing the manuscript. One of us (HUR) was supported by a grant from the Australian Development Assistance Bureau.

References

Crosskey, R. W., 1973. A conspectus of the Tachinidae (Diptera) of Australia, including keys to the supra specific taxa and taxonomic and host catalogues. *Bull. Br. Mus. nat. Hist.* (Ent.) Suppl. 21.

Daglish, G., Zalucki, M. P., Gynther, I., Rahman, H. ur, Scheermeyer, E. and Arura, M., 1985. Dynamics of oviposition in *Euploea core corinna* (Insecta: Lepidoptera) on its host plants. *Aust. J. Zool.* (in press).

Dempster, J. P., 1984. The natural enemies of butterflies, in *The biology of butterflies* (R. I. Vane-Wright and P. R. Ackery, eds) Symp. Roy. Ent. Soc. Lond. 11. Pp. 97-104. Academic Press, London and Orlando.

Ehrlich, P. R., 1984. The structure and dynamics of butterfly populations, in *The biology of butterflies* (R. I. Vane-Wright and P. R. Ackery, eds). Symp. Roy. Ent. Soc. Lond. 11. Pp. 25-40. Academic Press, London and Orlando.

Habu, A., 1960. A revision of the Chalcididae (Hymenoptera) of Japan. *Bull. Nat. Inst. agric. Sci.* (C)11: 131-363.

Scheermeyer, E. and Zalucki, M. P., 1985. Food plant records of *Euploea core corinna* (W. S. Macleay) with some notes on larval coloration. *Aust. ent. Mag.* 11: 87-90.

Rahman, H. ur, Zalucki, M. P. and Scheermeyer, E., 1985. The effect of host plant on the development and survival of the immature stages of *Euploea core corinna* (Lepidoptera: Nymphalidae). *Aust. J. ent. Soc.* 24: 95-98.

THE LIFE HISTORY OF *SABERA CAESINA ALBIFASCIA* (MISKIN) (LEPIDOPTERA: HESPERIIDAE: HESPERIINAE)

By G. A. Wood
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Abstract

The previously unrecorded life history of the black and white swift, *Sabera caesina albifascia*, is described and the food plant reported for the first time.

Introduction

While examining the foliage of the palm, *Calamus caryotoides*, at Iron Range several hesperiid larvae were found. These were reared to adults and found to be the black and white swift, *Sabera caesina albifascia* (Miskin). This butterfly occurs on Moa and Prince of Wales Islands and from Cape York to Ingham (Common and Waterhouse, 1981).

Life history

Egg. Hemispherical, approximately 1 mm at base; red; smooth, but with very fine vertical ribs.

First instar. Length 3.5 mm. Head smooth; black and shining, with shallow longitudinal groove. Prothoracic plate black. Body pale yellow, last segment bearing conspicuous hairs.

Third instar. Length 11.0 mm. Head black; body translucent green.

Fourth instar. Head with lower two thirds and longitudinal groove black, upper third pale brown. Body translucent green.

Fifth instar (Fig. 1). Length 27 mm. Head black with two pale brown lateral areas. Body translucent green, dorsal midline black.

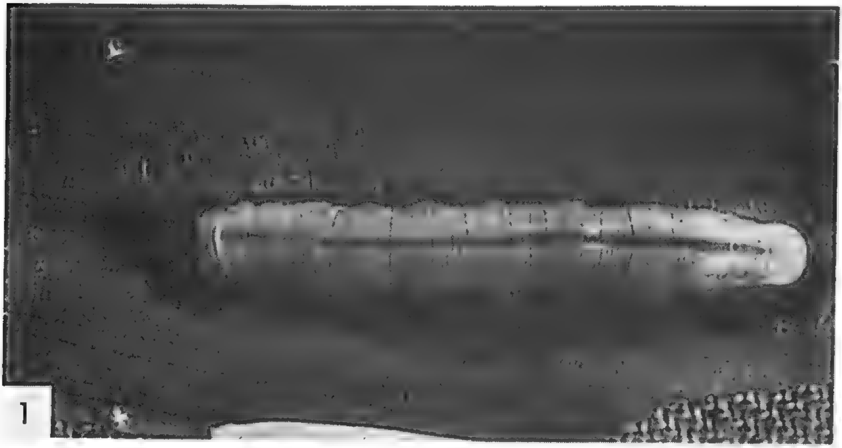
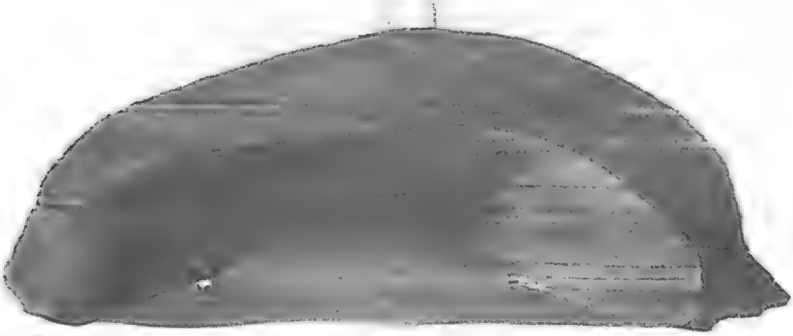


Fig. 1. *Sabera caesina albifascia* (Miskin) fifth instar larva, dorsal view.



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Figs 2, 3. *Sabera caesina albifascia* (Miskin): (2) pupal shelter constructed from leaf section; (3) pupa, dorsal view.

Pupa (Fig. 3). Length 17 mm. Brown, covered with white, waxy powder; attached by cremaster.

Larval food plant. Calamus caryotoides Mart.

Notes. Ova are deposited singly on the upperside of leaves of the food plant. Larvae construct shelters using a section of the leaf margin which they isolate at either end and bend underneath. Bending is achieved by construction of a silken hinge and tensioned silken threads. Further shelters are constructed as the larva grows, the final one becoming the puparium (Fig. 2), which is detached from the food plant and falls to the ground. Larvae feed at night.

The duration of the life cycle commencing late May was approximately nine weeks (larval stage five weeks, pupal stage three weeks).

Reference

Common, I. F. B. and Waterhouse, D. F., 1981. *Butterflies of Australia.* Second edition. Angus and Robertson, Sydney. 682 pp.

EUCALYPTUS MACULATA HOOK (MYRTACEAE), A NEW HOST RECORDED FOR *CALYMMADERUS INCISUS* LEA (COLEOPTERA: ANOBIIDAE)

By M. J. Hockey
Department of Forestry, Biology Section, 80 Meiers Rd, Indooroopilly, Q 4068

Calymmaderus incisus Lea (Coleoptera: Anobiidae), the native Queensland pine beetle is a common destructive borer in houses and furniture in south-eastern Queensland. The beetle has habits similar to the exotic furniture beetle *Anobium punctatum* De geer (Brimblecombe 1956).

Calymmaderus larvae were previously thought to utilise a restricted range of softwood timbers as host. Recorded hosts are hoop pine (*Araucaria cunninghamii* Aiton ex D. Don), bunya pine (*Araucaria bidwillii* Hook) and New Zealand white pine [*Dacrycarpus dacrydioides* (A. Rich) de Laubenfels] (Brimblecombe 1956). Attack is most often recorded from hoop pine, that of other timbers being rare.

In July 1982, I inspected a house in Bardon, Brisbane, built pre-1940 and constructed of hoop pine subsequently infested with *Calymmaderus.* The sapwood of one house stump, later identified as *Eucalyptus maculata* Hook, was found to be heavily infested with live *Calymmaderus* larvae. There were numerous emergence holes in the stump indicating that some insects had already completed their life cycle. Others emerged in January 1983 and January 1984 following removal of the stump to a breeding cage.

Since hardwood timbers, such as *E. maculata*, differ significantly both structurally and chemically from softwoods (Doimo 1984), this is evidence that the host requirements of *Calymmaderus* are broader than previously thought. Rather than being timber related, successful oviposition and larval survival may depend on environmental factors such as surface roughness and moisture content. Both factors are known to be important for *Anobium* (Hickin 1975). Like *Anobium, Calymmaderus* probably preferentially attacks softwood timbers. Of the newly introduced softwoods, some may be at risk. For example, although there is no recorded field attack of any of the *Pinus* spp grown in Australia, *Calymmaderus* has attacked an unidentified *Pinus* timber built into imported furniture (Queensland Department of Forestry records). Hence the large volumes of *Pinus* spp marketed for use in Queensland housing may be susceptible to attack by *Calymmaderus.* This view is supported by small scale laboratory trials which indicate that transplanted second and third instar larvae can successfully complete their development in the timber of *Pinus elliottii* Engelm. var. *elliottii* L. & D. and *Pinus caribaea* Morelet var. *hondurensis* Barr. & Golf., both important commercial species in Queensland.

References

Brimblecombe, A. R., 1956. Destructive wood borers and their damage. *Qd Dep. Agric. Stock Pamphlet* 165. 43 p.

Doimo, L., 1984. What is wood? A review of the major chemical components. *Qd Dep. Forestry Tech. Pap.* 38.

Hickin, N. E., 1975. *The insect factor in wood decay.* 3rd edition. Hutchinson, London.

BIOLOGICAL NOTES ON THE POLLEN WASP *PARAGIA (CYGNAEA) VESPIFORMIS* (HYMENOPTERA: VESPIDAE: MASARINAE) WITH DESCRIPTION OF A NEST

By Terry F. Houston
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Abstract

Paragia vespiformis, an endemic of south-western Australia, produces one generation of adults annually between July and October and forages at flowers of three plant families. An incomplete nest, the first described for the species, was found in sandy ground and consisted of a cell cluster at the end of a deep turretless burrow. Larval provisions were firm loaves of pollen supported on papillae.

Introduction

Members of the wasp subfamily Masarinae (*sensu* Carpenter 1982) are notable in that they provision their brood cells with pollen and nectar rather than with paralysed insect or spider prey as is usual amongst wasps. The habits of Australian masarines were virtually unknown until recently when studies were made of two species in the nominate subgenus of *Paragia* Shuckard (Houston 1984, Naumann and Cardale in press). The present paper results from the chance discovery of a single nest of *P. (Cygnaea) vespiformis* Smith in Western Australia. The nest is the first reported for the species and differs significantly from those described for *Paragia s. str.*

Paragia vespiformis is a moderately large wasp (body length 17-20 mm) and is one of the most frequently collected masarines in the South-West. As evidenced by specimens in the collections of the Western Australian Department of Agriculture and the Western Australian Museum (WAM), its geographic range extends from Shark Bay in the north to Cunderdin and Johnstone Lakes in the south with an outlying population near Sandstone.

Observations

Adult activity

From a review of specimen data in the abovementioned collections, it appears that adults fly from July until October. The earliest records are from northern localities and the latest from southern ones. The flight period at any one locality may possibly not exceed a month so that there is probably only one generation per year.

Males are recorded only for July (when no females are recorded) and August; but these records are for northern localities. Fifteen males in WAM from Balline Station were collected while alighting on the surface of a roadside pool of water (A. M. Douglas pers. comm.).

Records of forage plants are few but include Mimosaceae (*Acacia blakelyi* Maiden), Myrtaceae (*Eucalyptus oldfieldii* F. Muell., *Melaleuca nematophylla* F. Muell., *M. scabra* R. Br., *M. uncinata* R. Br. and *Scholtzia drummondii* Benth.) and Proteaceae (*Grevillea teretifolia* Meissn.).

Description of nest and nesting area

The nest was found 13 km south of Wannoo, about 209 km north of Geraldton, Western Australia, on 27 August 1984. It was in level sandy ground between dunes. The vegetation of the flat was regenerating from fire damage and consisted almost wholly of waist-high *Acacia* and *Grevillea* shrubs providing about 30% ground cover. The ground surface was largely bare except for some leaf litter beneath the shrubs.

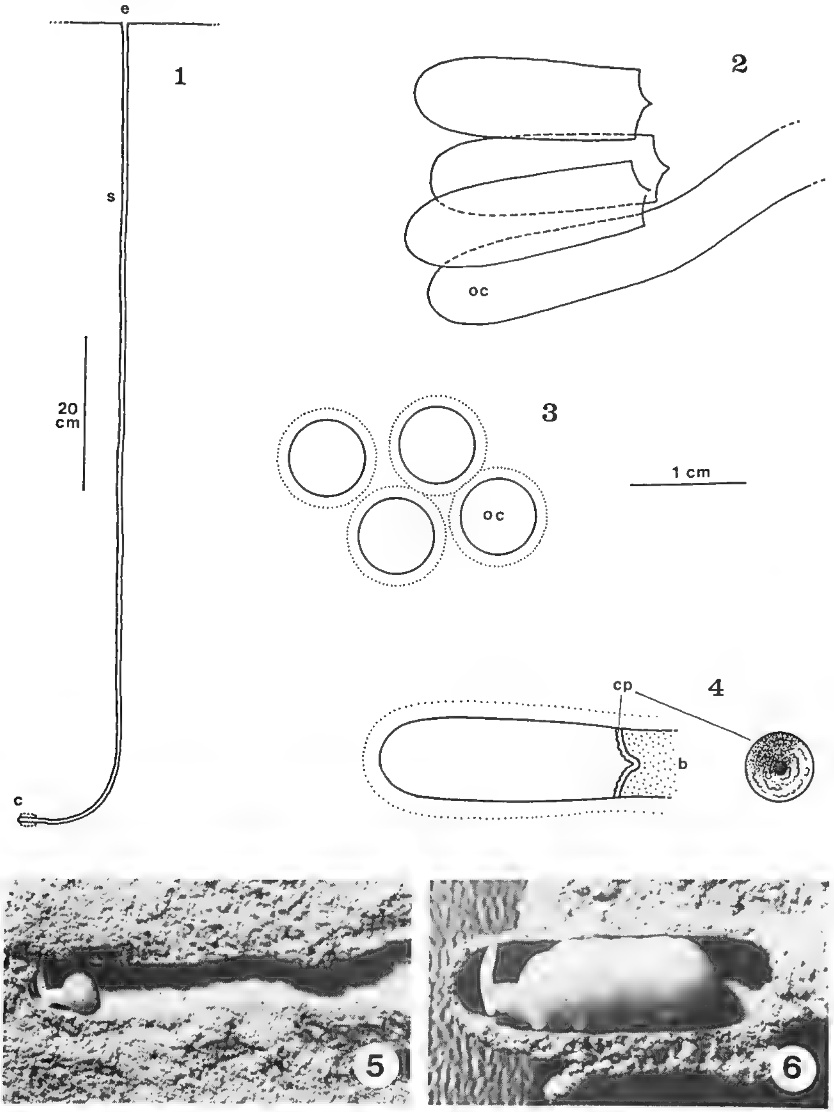
The nest entrance, a simple hole with neither turret nor tumulus, was situated in bare sand beneath a *Grevillea* bush and was revealed when the female wasp arrived and entered it (she was captured as she re-emerged and is preserved in the WAM). A search of the surrounding area failed to locate any other nests of the species but numerous active burrows of the bee *Ctenocolletes nicholsoni* Cockerell occurred throughout the flat.

Excavation revealed the soil to be uniform red sand to a depth of 3 m. Although soft and loose at the surface, it became increasingly more compacted with depth.

Below the nest entrance, a simple, cylindrical, unlined shaft, 6-7 mm in diameter, descended vertically to a depth of about 90 cm then curved to end in an open horizontal cell at a depth of 104 cm (Fig. 1) in moderately compact sand. Adjacent to and more or less parallel with the open cell were three closed cells (Figs 2, 3). All cells had cemented earthen walls about 1.0-1.5 mm thick and were removed as a cluster intact.

Each cell was rather cylindrical but had a rounded basal end and tapered slightly towards the mouth. Internal dimensions of closed cells (in mm) were: maximum diameter 6.5-7.0, diameter at mouth 5.6-6.0, length 20-21. The closure of each completed cell consisted of a septum of cemented earth about 0.5 mm thick showing a faint spiral pattern and a deep central depression internally (Fig. 4). Access burrows (except that of the open cell) were packed with sand and their connection with the shaft was obscured. The inner surfaces of cells were finished in fine soil, very smooth and matt. In the open cell, the smooth surface graded into the natural sand surface of the access burrow 20-30 mm from the cell base. Droplets of water placed on the inner surfaces of cells remained unabsorbed in the middle region but were quickly absorbed in the cell base and at the mouth.

The open cell contained a small moulded pollen mass at its inner end. The mass stood on a pair of small papillae and extended a much larger projection towards the base of the cell. Attached to this projection was a slender vertical egg (Fig. 5). The 3 closed cells were alike in that each contained an elongate pollen loaf of characteristic form with an egg attached vertically at its inner end (Fig. 6). Each loaf was comprised of 5 or 6 segments and stood on as many pairs of ventral papillae. Presumably each segment represented a separate regurgitation by the female wasp. The innermost segment resembled the small pollen mass of the open cell. Complete loaves were 14-15 mm long, uniformly moist and firm enough to be handled



Figs 1-6. *Paragia vespiformis* nest detail: (1) nest in profile [c, cell cluster; e, entrance; s, shaft]; (2) cell cluster in top view with only chambers outlined [oc, open cell at end of shaft]; (3) schematic cross-section of cell cluster [dotted lines delimit cemented earth walls]; (4) longitudinal section of completed cell and inner view of cap [b, earth barricade; cp, cell cap]; (5) open cell with egg on incomplete provision; (6) closed cell with egg on complete provision. Figs 2-4 to same scale.

without deforming. The provisions of all four cells proved to be composed of *Acacia* pollen (myrtaceous pollen was present but as it constituted less than 1% of the sample it was probably an incidental contaminant). The eggs were about 5.4 mm long and 1.1 mm in maximum diameter.

Discussion

While the above observations are few and far from complete, they serve to reinforce the emerging picture of *Paragia s. lato* as a group of solitary, pollen-collecting, ground-nesting wasps essentially little different in habits from other Masarinae; yet they also reveal some differences between *P. vespiformis* and those of its congeners whose habits are known. We now have some insights into the nesting biology of two of the subgenera of *Paragia* but await details of the third (*Paragiella* Richards). Thus only a limited comparison may be drawn at present.

P. vespiformis differs from species of *Paragia s. str.* in its earlier flight season, wider range of forage plants and choice of sandy soil as a nest substrate (only one nest was examined but it may be noted that sandy soils characterize all collection localities). Species of *Paragia s. str.* display a summer and/or autumn flight season, a preference for *Eucalyptus* flowers as a food source and clay soils as a nest substrate.

The nest of *P. vespiformis* was notable for the following features (corresponding character states for *Paragia s. str.* are given in parentheses): shaft 104 cm deep (not exceeding 40 cm), turned horizontally at lower end (vertical throughout) and without an entrance turret (turrets present, except in *P. decipiens* Shuckard); cells terminal with respect to shaft and clustered side by side (lateral to and radiating from shaft), their inner surfaces matt (glossy in *tricolor* Smith); cell caps very thin with pronounced central depression (thick and flat in *P. tricolor*); provision very firm and resting on rows of papillae (soft and making broad contact with cell floor in *P. tricolor*); egg attached vertically to inner end of provision (loose and horizontal in *P. tricolor*).

Acknowledgements

I am most grateful to Brian Hanich who found the nest described here and assisted with its excavation and to Ian Naumann and Josephine Cardale for access to their unpublished manuscript.

References

Carpenter, J. M., 1982. The phylogenetic relationships and natural classification of the Vespoidea (Hymenoptera). *Syst. Ent.* 7: 11-38.

Houston, T. F., 1984. Bionomics of a pollen-collecting wasp, *Paragia tricolor* (Hymenoptera: Vespidae: Masarinae), in Western Australia. *Rec. West. Aust. Mus.* 11(2): 141-151.

Naumann, I. D. and Cardale, J. C. (in press). Notes on the behaviour and nest of an Australian masarid wasp *Paragia (Paragia) decipiens decipiens* Shuckard (Hymenoptera: Vespoidea: Masaridae). *Aust. ent. Mag.*

Aust. ent. Mag. 12(6), February, 1986

A REVISION OF THE GENUS *CYATHIGER* (COLEOPTERA: PSELAPHIDAE)*

By Donald S. Chandler

Department of Entomology, University of New Hampshire, Durham, NH 03824, U.S.A.

Abstract

The relationships within the Cyathigerini are briefly examined with *Cyathiger* King being considered as very close to the African *Cyathigerodes* Jeannel and the Oriental *Paracyathiger* Jeannel. The two known Australian species of *Cyathiger, punctatus* King and *simulator* Lea, are redescribed, and two new species are described, *leai* and *kingi* from Queensland.

Introduction

The Cyathigerini comprise one of the most distinctive tribes of the Pselaphidae, being recognized at that level comparatively early by Raffray (1890) even though it consisted only of *Cyathiger punctatus* King. The tribe currently consists of five genera: *Cyathiger* King with two Australian species, *Cyathigerodes* Jeannel with 28 African species, *Paracyathiger* Jeannel with about 26 oriental species, *Denicyathiger* Jeannel with one species from New Guinea, and *Manuleiger* Jeannel from Sri Lanka. The Cyathigerini are readily distinguished from all other Pselaphidae by the following combination of characters: body coarsely and closely punctate; two visible tergites and sternites, the first occupying almost the entire length of the abdomen; seven to ten antennomeres with the last forming a quite large club; femora grooved to receive the tibiae, metathorax deeply impressed to receive head, and first abdominal sternite deeply impressed to receive the large last antennomeres. Members of the tribe apparently curl into a compact ball when disturbed.

Cyathiger was created by King (1865) for a new species, *punctatus,* from New South Wales. Over the next eighty years more than twenty species were placed in this genus from Southeast Asia and New Guinea, and a second Australian species, *simulator* Lea, was added in 1910. With the discovery of a second new species of the tribe from Africa, Jeannel (1951) created three new genera for the African and Oriental faunas, restricting *Cyathiger* to the type species *punctatus* (he was apparently unaware of the description of *simulator* Lea). *Manuleiger remyi* Jeannel was later described from Sri Lanka (Jeannel 1961).

Jeannel's (1951) division of *Cyathiger* into four genera was essentially based on three criteria: number of antennomeres; relative proportions in size of the penis, parameres and phallobase of the male aedeagus; and width of the frontal lobe of the head. As Leleup (1974) has already pointed out, Jeannel erred in separating the African *Cyathigerodes* from the Australian *Cyathiger* by stating that the females of *Cyathigerodes* possess only six antennomeres. Leleup established that the sexes of both genera possess seven antennomeres. The genitalic proportions which were used to separate *Cyathiger* and *Cyathigerodes* from the Oriental *Paracyathiger* (which also have seven antennomeres in both sexes), are now invalidated by the range of genitalic variation now known for *Cyathigerodes* (Leleup 1974) and for *Cyathiger* in this paper.

*Scientific Contribution No.1263 from New Hampshire Agricultural Experiment Station.

Jeannel's third criterion of the width of the frontal lobe has not been clear to me when used to discriminate *Cyathiger* from the few specimens of *Denicyathiger* and *Paracyathiger* which have been available. As it appears to me, only *Denicyathiger* and *Manuleiger* are distinctly separable from the Australian *Cyathiger* by their possessing ten and nine antennomeres respectively. On the known criteria for separation, *Cyathiger, Cyathigerodes*, and *Paracyathiger* are very close and perhaps should be synonymized. However, as I have on hand only the Australian species, and my knowledge of the other genera is based only on literature and a few unidentified *Paracyathiger* and *Denicyathiger* from New Guinea, I will restrict this paper to a revision of the *Cyathiger* of Australia.

The holotypes and most of the paratypes of *C. leai* are to be placed in The Australian National Insect Collection (ANIC), Canberra.

Cyathiger King

Cyathiger King 1865: 174. Raffray 1890: 134; 1904: 304; 1908: 301. Jeannel 1951: 109. Type species *Cyathiger punctatus* King 1865: 174, fixed by monotypy.

Key to males

It would be wise to check the genitalia of males from any population discovered to confirm identifications and to reveal the presence of any new species.

1. Impression of antennal club conspicuously pebbled, glabrous; New South Wales . . . . *punctatus* King
— Impression of antennal club smooth or minutely roughened, surface dull or shining 2

2. Impression of antennal club with dull surface, minutely roughened; Queensland . . . . *leae* n. sp.
— Impression of antennal club glabrous, shining 3

3. Antennal club with ventral angle distinct (Fig. 3); Queensland . . . . *kingi* n. sp.
— Antennal club with ventral margin smoothly rounded (Fig. 4); New South Wales . . . . *simulator* Lea

Cyathiger punctatus King

(Fig. 1)

Cyathiger punctatus King 1865: 174. Raffray 1904: 308; 1908: 302. Lea 1912: 49. Jeannel 1951: 110. Type localities: Blue Mountains, and Petersham, New South Wales. Type series dispersed, the known syntypes are in ANIC, South Australian Museum, Australian Museum, and Museum National d'Histoire Naturelle, Paris.

Cyathiger reitteri Schaufuss 1886: 242. Type localities: Blue Mountains, and Petersham, New South Wales. Type female. Synonymized by Raffray 1904: 308.

Length 1.20-1.23 mm. Male antennal club with setae on outer surface longer than short decumbent setae on body, inner surface deeply concave, surface pebbled, setae not apparent in impression at 100x except on extreme lateral margins, club with short but distinct angulation on ventral margin, evenly rounded on dorsal margin. Lateral carinae of first sternite with length of interruptions about half length of each tooth, teeth sloping to increase in height posteriorly. Mesofemora with single ventral tooth. Male genitalia with phallobase and parameres short, both together about as long as penis.

Female similar to male, antennal club with dorsal margin strongly angulate.

Specimens examined:– AUSTRALIA: NEW SOUTH WALES: 2 ♀♀, Petersham, Topotype S. Misko det. 1976 (ANIC); 1 ♀, same locality (South Australian Museum); 1 ♂, "Australia" (Cornell University).

Comments

King's specimens have been dispersed to several museums, with only females remaining in the collections of The Australian Museum, the South Australian Museum, and ANIC. Additional specimens are known to be in the Paris Museum, Cornell University, and the Schaufuss collection. The only males known are in the Paris Museum (Jeannel 1951: 110, figured the male genitalia and antennal club), and Cornell University (Ithaca, New York). Jeannel's figure of the male antennal club is somewhat misleading as the club was apparently rotated dorsally when the illustration was made. As a result, the weak ventral angle was considerably prolonged, and the general proportions were distorted in the figure.

Punctatus is distinct by the impression of the male antennal club being pebbled, and the comparatively large gaps between the teeth of the sternal carinae. It is most similar to *leai* by the modified surface of the club impression, and the single medial tooth on the posterior margin of the mesofemora. The females of these two species are only separable by the more distinct ventral angulation of the antennal club in *punctatus.*

King reported that this species is found under burned logs half buried in the ground.

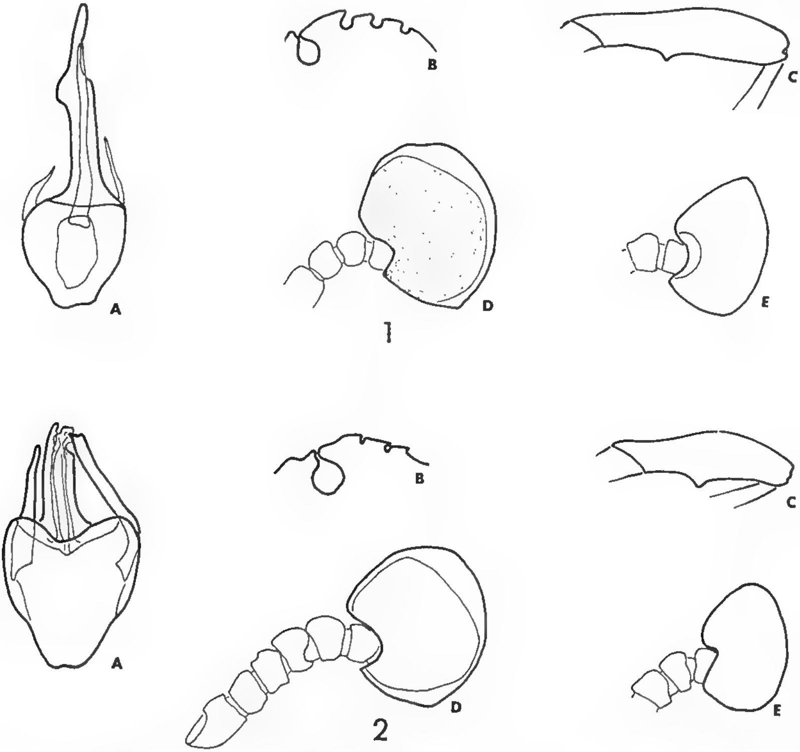
Cyathiger leai n. sp.

(Fig. 2)

Length 1.15-1.23 mm. Male antennal club with outer surface densely clothed with hairs, inner surface deeply concave, minutely roughened, setae as dense as on outer surface but shorter, readily seen at 60X, dorsal angulation of club weakly defined, ventral angulation as distinct as that of dorsal. Teeth on lateral carinae of first abdominal sternum short, elongate, with short posterior prolongation at apices. Mesofemora with single ventral tooth. Male genitalia with phallobase moderately large, slightly longer than parameres or penis, which are of equal lengths.

Female similar to male, with antennal club ellipsoidal, smoothly prolonged on dorsal margin.

Specimens examined:– AUSTRALIA: QUEENSLAND: Holotype ♂, nr Cape Tribulation, 16.06S, 145.27E, 50 m, 21.vi.1971, Taylor & Feehan, rainforest, ANIC 322. *Paratypes*: 1 ♂, Mt. Lewis, 16.33S, 145.13E, 1010 m, 20.vi.1971, Taylor & Feehan, rainforest, berleseate ANIC 320; 1 ♀, same data except, ANIC berleseate 319; 1 ♀, same locality, c. 970 m, 29.vi.1973, R. W. Taylor; 1 ♀, nr Cape Tribulation, 50 m, 20.vi.1971, berleseate.



Figs 1-2. (1) *Cyathiger punctatus* King; (2) *C. leai* n. sp. A—dorsal view male genitalia, B—left lateral view sternal carinae, C—posterior view right mesofemur, D—mesal view left antennal club of male, E—mesal view left antennal club of female.

ANIC 326; 1 ♂, 3 ♀♀, Thornton Range, 16.15S, 145.26E, 23.vi.1971, Taylor & Feehan, rainforest, ANIC berleseate 324; 1 ♂, 1 ♀, same data except, 100 m; 4 ♀♀, Alexandra Bay, 16.12S, 145.26E, 50 m, 24.vi.1971, Taylor & Feehan, rainforest, berleseate ANIC 331.

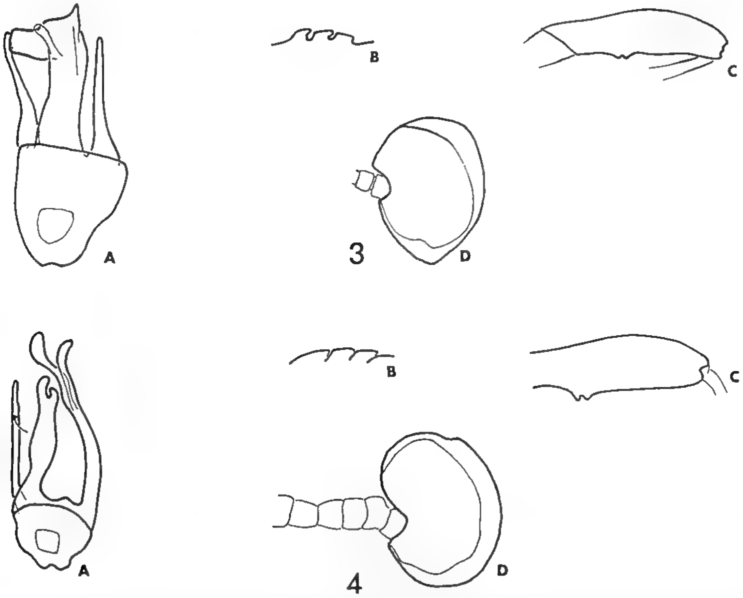
Comments

Leai is most similar to *punctatus* as mentioned in the discussion of that species. It is separable by the minutely roughened inner surface of the male antennal club impression, and the teeth of the sternal carinae being barely separated.

Cyathiger kingi n. sp.

(Fig. 3)

Length 1.23 mm. Male antennal club densely clothed with setae, setae slightly longer than short appressed setae on body, ventral angulation distinct, dorsal angulation feebly indicated, inner surface deeply excavated, appearing



Figs 3-4. (3) *C. kingi* n. sp., (4) *C. simulator* Lea. A—dorsal view male genitalia, B—left lateral view sternal carinae, C—posterior view right mesofemur, D—mesal view left antennal club of male.

glabrous, faintly punctulate, setae not apparent in impression at 100X. Teeth of lateral carinae of sternum short, rectangular, with posterior angulation at apex of each tooth. Mesofemora with two close-set teeth on posterior margin of tibial groove. Male genitalia with phallobase moderately long, penis and parameres about same length, slightly longer than phallobase.

Female unknown.

Specimens examined:— AUSTRALIA: QUEENSLAND: Holotype ♂, Dingo Creek, 1 km E Traveston, c. 80 m, 18.iii.1973, 26.18S, 152.48E, R. J. Kahout, poor rainforest, berleseate ANIC 456.

Comments

This species shares with *simulator* the deep, glabrous excavation of the antennal club, and possesses two teeth on the ventral margin of the mesofemur. The teeth of the abdominal carinae possess a posterior angulation in *kingi*, while in *simulator* the teeth are sharply incised at an oblique angle anteriorly. The antennal club of the male has a distinct ventral angulation, while in *simulator* the margin lacks any distinct angles.

Cyathiger simulator Lea

(Fig. 4)

Cyathiger simulator Lea 1912: 49. Type locality: Otford, New South Wales. Holotype male in South Australian Museum, Adelaide.

Length 1.80 mm. Male antennal club with setae of outer surface as long as those on body, club oval, lacking any angulation of outer margins, inner surface minutely punctulate in impression, appearing glabrous. Teeth on lateral carinae of first sternite short, barely separated, sharply incised at an oblique angle anteriorly, smoothly confluent and receding in height posteriorly. Right mesofemur with two teeth on posterior margin of tibial groove, left mesofemur with one tooth, anterior margin of groove with five separate smaller teeth in basal half. Male genitalia strongly asymmetrical, penis offset toward small thin right paramere, left paramere apically branched, phallobase short.

Female unknown.

Specimens examined:– AUSTRALIA: NEW SOUTH WALES: Holotype ♂, Otford (South Australian Museum). The type is associated with two ants (one winged) and bears the label "Inquiline".

Comments

This species is recorded from the nest of the ant, *Stenamma longiceps*, in Lea's original description of the species.

It is very similar to *kingi* in the antennal club being almost circular in outline, and the glabrous impression of the club. *Simulator* lacks any ventral angle of the club, and the male genitalia is markedly asymmetrical.

Acknowledgements

I would like to thank Dr J. F. Lawrence, CSIRO, for the loan of most of the material included in this revision. Dr E. Matthews, South Australian Museum, Adelaide, aided through the loan of the holotype of *simulator*, and a syntype of *punctatus*. Dr D. K. McAlpine, The Australian Museum, Sydney, graciously established the sex of the syntype in his care by furnishing an illustration of the antennal club; and Dr J. K. Liebherr, Cornell University, Ithaca, New York, arranged the loan of a male specimen of *punctatus*. Dr C. Besechet, Museum d'Histoire Naturelle, Geneva, deserves my appreciation for photocopying portions of several articles by Jeannel which were unavailable. Drs J. F. Burger and R. M. Reeves, University of New Hampshire, checked the manuscript.

References

Jeannel, R., 1951. Pselaphides de l'Angola (Coleopteres) recueillis par M. A. de Barros Machado. Companhia de Diamantes de Angola (Diamang). *Servicos Culturais, Publicacoes Culturais* No. 9, 125 pp.

Jeannel, R., 1961. Sur les Pselaphides de Ceylan. *Bull. Br. Mus. nat. Hist. (Ent.)* 10(10): 423-456.

King, R. L., 1865. On the Pselaphidae of Australia. *Trans. ent. Soc. N.S.W.* 1: 167-175, pl. 14.

Lea, A. M., 1912. Australian and Tasmanian Coleoptera inhabiting or resorting to the nests of ants, bees and termites. Supplement. *Proc. R. Soc. Vict.* 25: 31-78, pl. 2.

Leleup, N., 1974. Contributions a l'etude des Coleopteres Pselaphides de l'Afrique. 15. Revision et position systematique du genre *Cyathigerodes* Jeannel (Bythininae Cyathigerini). *Revue Zoologie Africaine* 88: 625-673.

Raffray, A., 1890. Etude sur les Pselaphides. V. Tableaux synoptiques. Notes et synonymie. *Revue d'Entomologie* 9: 81-172.

Raffray, A., 1904. Genera et catalogue des Pselaphides. *Annls Soc. ent. Fr.* 73: 1-146. pls 1-3.

Raffray, A., 1908. Coleoptera, Fam. Pselaphidae. *Genera Insect.* fasc. 64, 487 pp., pls 1-9.

ABSENCE OF REPAGULA IN AUSTRALIAN ASCALAPHIDAE (NEUROPTERA)

By T. R. New
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Abstract

Repagula have not been found in ascalaphid egg batches collected in Australia. Gregarious behaviour of first instar larvae may be related to predation rather than to defence.

Repagula, aborted eggs deposited near normal eggs and perhaps helping to protect them from predation by functioning as alternative food, are now well-known in Ascalaphidae from the New World (Henry 1972, for summary), but the few observations made on Old World species imply that they are absent. The only data available for the Australian fauna are the somewhat casual observations reported by Froggatt (1906) and Tillyard (1926), which were made in the context of a largely unknown fauna. It is now clear (New 1984) that the Australian Ascalaphidae comprise a group of closely related genera in the Suhpalacsini (Ascalaphinae), and the above inferences can be considered more confidently. Some additional information is also given.

About 20 egg masses of ascalaphids from various parts of southern Australia and the southern savannah regions of Papua New Guinea have been examined at intervals over the last few years. All were field-collected and their identities therefore not confirmed. All batches consisted of 30-76 eggs (Tillyard, 1926, noted 50-100 laid by one female), and eggs were laid on twigs or grasses, attached by their lower and central regions. There is some variety in oviposition pattern, as some batches comprised distinct longitudinal rows or eggs and others of eggs completely encircling the substrate. No batch bore any repagula, and all eggs of most hatched. From features of laboratory-hatched larvae, at least 4 species are present in the overall sample.

Because of the close relationship between the taxa possibly represented it is now virtually certain that repagula are not produced by Australian ascalaphids. A few females (*Suhpalacsa* Lefebvre (2), *Suphalomitus* van der Weele, *Pilacmonotus* New) have been dissected and none has the anterior differentiated ovarioles found in species which produce repagula (see New 1971).

Larvae are gregarious, and gather at the uppermost end of the egg-batch immediately after hatching. They typically face downwards with mandibles apart in the 'group defense' posture noted by Henry (1972), and remained there for 16 days in a Papua New Guinea species observed in early 1984. The larvae did not feed during this period, although a range of small insects was provided, and the role of this behaviour for such a long period after all the eggs have hatched is unclear. The usual suggestion of 'defence' is not altogether convincing, and Tillyard's (1926) comment (repeated by McKeown 1942) that larvae may jointly attack 'unwary insects' merits further investigation. Such communal predation is highly unusual in the Neuroptera.

References

Froggatt, W. W., 1906. *Australian Insects.* Sydney.

Henry, C. S., 1972. Eggs and rapagula (sic) of *Ululodes* and *Ascaloptynx* (Neuroptera: Ascalaphidae): a comparative study. *Psyche* 79: 1-22.

McKeown, K. C., 1942. *Australian Insects: An Introductory Handbook.* Royal Zoological Society of New South Wales, Sydney. 304 pp.

New, T. R., 1971. Ovariolar dimorphism and repagula formation in some South American ascalaphids (Neuroptera). *J. Ent.* (A) 46: 73-77.

New, T. R., 1984. Revision of the Australian Ascalaphidae (Insecta: Neuroptera). *Aust. J. Zool., Supplementary Series* No. 100, 86 pp.

Tillyard, R. J., 1926. *The Insects of Australia and New Zealand.* Angus and Robertson, Sydney. 560 pp.

BOOK REVIEW

A guide to common moths of the Adelaide region by P. B. McQuillan and J. A. Forrest. 52 pages including 15 pages of plates. South Australian Museum, Adelaide. Published November 1985.

It is always pleasing to see a well-written identification guide on Australian moths. This small but valuable book is one to be recommended to all interested in moths, especially to moth collectors and field naturalists. 114 species are illustrated (64 in colour) and a corresponding text for each species summarises its range, flight period, life history, food plants and other points of particular interest for that species. In addition there is a brief Introduction which discusses subjects such as life history, strategies for survival, seasonality and collecting. The entire text is supplemented by references to further reading for those who wish to delve deeper into the subject; 40 key references are listed in the Bibliography. There is also a Glossary, a list of larval foods and an Index.

I could find no errors for the species with which I am familar and only 1 minor typographical error in the index. Priced at a very reasonable $8.50 this useful reference should be on your book shelf if you are interested either directly or indirectly in Australian moths.

MAX MOULDS

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AHMAD Imtiaz and KHAN Naseer Ahmad

1983. A revision of the genus *Stenozygum* Fieber (Pentatomidae: Strachini) from the Oriental and Australian regions, with reference to zoogeography and phylogeny. *Aust. J. Zool.* 31(4): 581-605, text-figs 1-97.

ASTON, D. E.

1983. Two more food plants for *Polyura pyrrhus sempronius* (F.) (Lepidoptera: Nymphalidae). *Aust. ent. Mag.* 10(1): 12.

EVANS, Howard E., EVANS, Mary Alice and HOOK Allan

1981. Observations on the prey and nests of some Australian spider wasps (Hymenoptera, Pompilidae). *Aust. ent. Mag.* 8(1): 9-12.

EVANS, Howard E. and HOOK, Allan W.

1984. Nesting behaviour of a *Lyroda* predator (Hymenoptera: Sphecidae) on *Tridactylus* (Orthoptera: Tridactylidae). *Aust. ent. Mag.* 11(1): 16-18.

HUTCHISON, Michael

1983. Occurrence of *Cephrenes augiades sperthias* (orange palmdart butterfly) in Perth. *West. Aust. Nat.* 15(6): 125-126, text-figs 1 & 2.

MAHON, R. J.

1983. Identification of the three sibling species of *Anopheles farauti* Laveran by the banding pattern of their polytene chromosomes. *J. Aust. ent. Soc.* 22(1): 31-34, text-figs 1-2.

MALIPATIL, M. B.

1983. Revision of world Cleradini (Heteroptera: Lygaeidae), with a cladistic analysis of relationships within the tribe. *Aust. J. Zool.* 31(2): 205-225, 3 tables, text-figs 1-33.

1983. A new genus of Holoptilinae from Australia (Hemiptera: Reduviidae). *J. Aust. ent. Soc.* 22(4): 273-276, text-figs 1-16.

MALIPATIL, M. B. and MONTEITH, G. B.

1983. One new genus and four new species of terrestrial Mesoveliidae (Hemiptera: Gerromorpha) from Australia and New Caledonia. *Aust. J. Zool.* 31(6): 943-955, 2 tables, text-figs 1-25.

MANSELL, M. W.

1983. A revision of the Australian Crocinae (Neuroptera: Nemopteridae). *Aust. J. Zool.* 31(4): 607-627, 3 tables, text-figs 1-63.

MAZANEC, Z.

1983. The immature stages and life history of the jarrah leafminer, *Perthida glyphopa* Common (Lepidoptera: Incurvariidae). *J. Aust. ent. Soc.* 22(2): 101-108, 2 tables, text-figs 1-20.

1984. Studies on the sex ratio in the jarrah leafminer *Perthida glyphopa* (Lepidoptera: Incurvariidae). *J. Aust. ent. Soc.* 23(1): 69-74, 4 tables, 1 text-fig.

MILLER, L. R.

1984. *Invasitermes*, a new genus of soldierless termites from northern Australia (Isoptera: Termitidae). *J. Aust. ent. Soc.* 23(1): 33-37, text-figs 1-6.

MILNER, R. J. and LUTTON, G. G.

1983. Effect on temperature on *Zoophthora radicans* (Brefeld) Batko: an introduced microbial control agent of the spotted alfalfa aphid, *Therioaphis trifolii* (Monell) *f. maculata. J. Aust. ent. Soc.* 22(2): 167-173, 1 table, 4 text-figs.

PURSER, John

1984. A new northern record for the common silver xenica, *Oreixenica lathoniella* (Westwood) (Lepidoptera: Nymphalidae). *Aust. ent. Mag.* 10(6): 92.

SAMSON, P. R. and O'BRIEN, C. F.

1981. Predation on *Ogyris genoveva* (Lepidoptera: Lycaenidae) by meat ants. *Aust. ent. Mag.* 8(2, 3): 21.

SANDS, D. P. A., MILLER, C. G., KERR, J, F. R. and ATKINS, A. F.

1984. The specific status of *Trapezites praxedes* (Plotz) (Lepidoptera: Hesperiidae): previously considered to be a subspecies of *T. maheta* (Hewitson). *Aust. ent. Mag.* 11(2): 27-33, 1 table, text-figs 1-31.

SHEA, G. M.

1983. The type host of *Aponomma hydrosauri* (Denny) (Acari: Ixodidae). *Aust. ent. Mag.* 10(2, 3): 28.

SIBATANI, A.

1984. A remarkable polymorphism of mature larvae of *Zizina labradus* (Godart), common grass blue butterfly (Lepidoptera: Lycaenidae) from the Sydney area. *Aust. ent. Mag.* 11(2): 21-26, 1 table, 1 text-fig.

SMITHERS, C. N.

1980. A redescription of *Ectopsocus richardsi* (Pearman) (Psocoptera: Ectopsocidae) based on Australian material. *Gen. appl. Ent.* 12: 13-15, text-figs 1-5.

1982. *Aphyopsocus* gen. nov., a remarkable new genus of Caediliidae (Psocoptera) from south-eastern New South Wales. *Aust. ent. Mag.* 9(1): 13-18, text-figs 1-13.

1983. A reappraisal of *Clematostigma* Enderlein with notes on related genera (Psocoptera: Psocidae). *Aust. ent. Mag.* 9(5): 71-79, text-figs 1-8.

1983. Migration records in Australia. 3. Danainae and Acraeinae (Lepidoptera: Nymphalidae). *Aust. ent. Mag.* 10(2, 3): 21-27, 3 tables.

1983. A revised key to the species of *Psilopsocus* Enderlein (Psocoptera: Psilopsocidae) with new records of *Ps. mimulus* Smithers, a probably phragomotic species. *Aust. ent. Mag.* 10(2, 3): 33-34.

1983. Migration records in Australia. 4. Pieridae (Lepidoptera) other than *Anaphaeis java teutonia* (F.). *Aust. ent. Mag.* 10(4): 47-54, 5 tables.

1983. A new species of *Lasiopsocus* Enderlein (Psocoptera: Psocidae) from New South Wales. *Aust. ent. Mag.* 10(5): 61-63, text-figs 1-4.

1984. New Australian records of Psyllipsocidae, with comment on the spelling of *Psocathropos* Ribaga (Psocoptera: Psyllipsocidae). *Aust. ent. Mag.* 11(1): 1-4.

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