Ref. to J. D. MAJER

WESTERN AUSTRALIAN ENTOMOLOGY WORKSHOP

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WESTERN AUSTRALIAN ENTOMOLOGY WORKSHOP

PROGRAMME FOR FRIDAY DECEMBER 2ND

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INTRODUCTION

This workshop was organized so that local entomologists could exchange ideas. To this end it has served its purpose.

The decision to produce a Preceedings was motivated by the need to provide a record of events for future and absent workers.

None of the material contained in these abstracts may be cited as a reference without specific permission of the authors concerned. In such cases the reference should be cited as a personal communication. It is hoped that this document may encourage persons to contact authors in order to gain further information on the topics covered.

The support of the School of Applied Science and the Department of Biology at WAIT in running the Workshop is gratefully acknowledged.

Jonathan D. Majer
(Regional Councillor of
A.E.S. for W.A.)

ABSTRACT

W.A. Ent. Soc. Workshop
Z. Mazanec, Division of Entomology, CSIRO, Perth.
Title: Jarrah leaf miner in space and time

ABSTRACT

The jarrah leaf miner, *Perthida glyphopa* Common (*Lepidoptera: Incurvariidae*), is a univoltine, native moth whose larva feeds within the leaves of jarrah, *Eucalyptus marginata* S.M. in the south west of Western Australia. It occurs at low population densities on the scarp of the Darling Range and in an outbreak condition on the coastal plain and in the inland forest east of Manjimup.

In some situations, low densities of the leaf miner are maintained by parasites and predators acting on the feeding larvae in leaves, while in others, where parasites are either absent or in small numbers, outbreaks are prevented largely by the predators. The latter situations are more vulnerable, however, and have been observed to deteriorate into outbreaks.

An outbreak develops when a large number of larvae complete their feeding in leaves and enter diapause in the soil, where they are relatively inaccessible to natural enemies. Their survival to the moth stage, coupled with the jarrah's recovery from damage, have maintained outbreaks of the leaf miner for many years.

ABSTRACT

W.A. Ent. Soc. Workshop

S.J. Curry, Western Australian Department of Agriculture, South Perth, W.A. 6151.

Title: Coleopterous tree borers of significance in Western Australia.

ABSTRACT

A general account is given of wood boring beetles of widespread occurrence in natural forest and plantations of Western Australia, including native Cerambycid genera *Phoracantha* and *Tryphocaria*, the Lymexylid pinhole borers of the genus *Attractocerus*, all common economic pests of eucalypts, and the introduced Scolytid beetles, consisting of bark beetles-predominantly *Ips grandicollis* from America-an important pest of Pines and ambrosia beetles, of which *Xyleborus saxeseni*, a pest of apples and stone fruit trees, is found attacking eucalypt trees and logs and probably Pines.

ABSTRACT

W.A. Ent. Soc. Workshop
Barbara York Main, Zoology Department, University of Western Australia, Nedlands, W.A. 6009.

Title: Trapdoor spiders as 'monitors' of habitat stability with special reference to the biology of *Anidiops villosus* (Rainb.).

ABSTRACT

A. GENERAL POINTS

Trapdoor spiders are absolutely dependent on a stable soil/litter structure. They have a long life cycle and after establishing a burrow live their entire life in it. With the exception of juveniles, they are incapable of initiating a new burrow if the old one is destroyed. Prey is caught within close range of the nest. Although opportunistic feeders, predominant prey is ants and termites especially of species in semi-arid habitats. In most species dispersion is confined to a restricted area near the parent burrow (only two Australian species disperse on gossamer, these two have a wide but 'patchy' distribution and do not 'aggregate' like other species). Spiders do not readily colonise disturbed areas as do other terrestrial spiders such as wolf spiders (Lycosoidae).

Grazing of stock has a deleterious effect on the litter/soil structure and (a) damages the habitat physically and (b) reduces prey potential. Effect on spider populations can be detected by <u>both</u> simple observation e.g. localities in Queensland (Eidsvold), Goldfields, pastoral areas and Wheatbelt of W.A. <u>and</u> by pit trap comparisons of contiguous grazed and ungrazed sites, example farm at Tammin. Conversely a few trees or shrubs protected from grazing (as along roadsides or around farm sheds) in an otherwise grazed area allows long persistence of spiders i.e. over 40 years (Cummins, Eyre Peninsula, Tammin W.A., Camp Mt Queensland). Spiders are at the top of the 'food pyramid' in many litter/soil habitats and if both mature and immature (of various ages) nests present at a predictable site this indicates a 'healthy' or stable habitat. If only old nests are present, this indicates disturbance which has prevented establishment of juveniles for (?) years. No spiders in a site where a species could be expected implies complete breakdown of habitat.

B. DISCUSSION OF A 'TAGGED POPULATION' of *Anidiops villosus* (in the Wheatbelt) of which the long life history and particular survival strategies illustrate the dependence on an undisturbed habitat.

Although adapted to drought (by aestivating) and able to survive occasional cyclic fires (due to brooding females sealing their nests during summer), populations cannot persist indefinitely if the litter or soil is badly disturbed. Spiders use litter to make twig-lines as accessories to feeding behaviour. Destruction of litter prevents establishment by emergent spiderlings and this ultimately causes the collapse of a population.

ABSTRACT

W.A. Ent. Soc. Workshop
R.P. McMillan, C/o Zoology Department, University of Western Australia, Nedlands, W.A. 6009
Title: Distribution of the stick mound ant, *Iridomyrmex conifer* Forel, in the Perth Metropolitan area.

ABSTRACT

The stick mound ant, *Iridomyrmex conifer* was once a common inhabitant of the sandy swamp environments on the Swan Coastal Plain. It is now becoming a rarity as a result, perhaps of urbanization and the consequent drainage of swamps causing ground water and vegetation changes.

At the moment the ant is common in undisturbed areas at Jandakot, Forrestfield, parts of Canning Vale and Armadale. It is widespread throughout the lower South West in the Karri/Marri belt and along the coast. It is present in the Sunklands and Stirling ranges. There are populations in damp sandy areas in the Darling Range and two *I. conifer* habitats are found on the Watning sand plain North of Toodyay.

In January 1977 I began a study of the Biology of *I. conifer* at the W.A. University Jandakot research station. The pattern of distribution in this environment appears to indicate a tie up with ground water and associated vegetation (*Leptospermum Melaleuca*).

The ant has interesting nest building behavior patterns which differ in the Winter and Summer seasons. This pattern may be controlled by soil moisture content. In the winter season a mound nest of twigs is constructed. This mound population "fragments" in the summer season to form a number of underground nests.

ABSTRACT

W.A. Ent. Soc. Workshop

J.D. Majer, Department of Biology, Western Australian Institute of Technology, Bentley, W.A. 6102

Title: The possible use of ant faunas as indicators of land use and of the success of revegetation attempts.

ABSTRACT

The author has performed a number of surveys of ant faunas in the South-west of W.A. over the past three years. The normal sampling tool is a pitfall trap. Large numbers of ant species and individuals are trapped by this method and, in the summer in relatively undisturbed areas, the nature of the ant fauna sampled is strikingly uniform. For instance, if 36-40 trpas are used, the mean species richness is 17.5, the mean species trapped per square metre is 3.85 and the mean species evenness is 0.68. The standard deviations of these values are small although in disturbed areas (mined, pine plantations, recreation areas, logged areas) certain ant parameters are greatly altered.

In view of this observation and the fact that ants are both influenced by, and have an influence on a number of aspects of the biota, it is here suggested that ants may be used as indicators of such factors as the 'ecological health' of nature reserves, the effect of various fire regimes and the 'success' of minesite revegetation programmes.

Three approaches to this possibility are discussed.

1) Ant fauna parameters - sample ant fauna and calculated species richness, mean number of species per square metre and species evenness. What do these values say about a particular area?

2) Ant fauna similarity - sample ant fauna from area of interest and compare it with fauna from undisturbed area using a similarity index based on a comparison of the species present. The magnitude of the similarity index may be used as an indicator of the degree of disturbance or success of revegetation.

3) Species indicators - the presence or absence certain ant species may indicate particular aspects of an area.

ABSTRACT

W.A. Ent. Soc. Workshop

W.J. Bailey, Department of Zoology, University of Western Australia,
Nedlands, W.A. 6009.

Title: Acoustic problems in West Australian bush-crickets.

ABSTRACT

The production of sound in the Orthoptera appears to have at least two functions. The attraction of female conspecifics to a singing male and the production of aggregations of reproductively active males. The former has two identifiable connotations: the evolutionary significance of a pre-mating isolating mechanism in speciation, and the biophysical problem underlying the mechanism whereby females locate the males, i.e. orientation. Both aspects are being studied by the research group at the University of Western Australia. The Copiphorine tettigonnid, *Mygalopsis*, provided an excellent example of a genus divided into 4 species within W.A. A dramatic case is in the genus *Tympanophora* where 9 species have been determined on song and morphometrics.

Orientation involves a detailed knowledge of behaviour, the acoustic properties of the receptors and the neural output from those receptors. Recent work has produced entirely new evidence for an efficient acoustic/neural system to effect the accurate orientation acuity experienced in this group. Classical theory predicted that the slits in the foreleg could act as directional devices. Subsequently workers found an omnidirectional receptor pattern not comensurate with the slit dynamics eviden from the anatomy. By selecting an accurate carrier frequency we have found a lobed directional function linked to the slit morphology. Behaviourally this means the insect can hear all sounds omnidirectionally (predator response) and the carrier frequency of the conspecific in a highly directional manner (sex attraction).

ABSTRACT

W.A. Ent. Soc. Workshop

J.D. Sandow, Zoology Department, University of Western Australia, Nedlands, W.A. 6009.

Title: An experimental study of defensive stridulation in *Mygalopsis ferruginea* Redtenbacher (Orthoptera: Tettigoniidae)

ABSTRACT

Descriptions of insect defense reactions are common in the literature, but few have been investigated experimentally. Most "startle" displays are regarded as defensive behaviour not through any demonstrable ability to confer protection against predators, but rather because of the nature of the behaviour and the conditions under which it can be elicited. This is particularly so with regard to defensive stridulation. The defense response of *Mygalopsis ferruginea* Redtenbacher includes postures and stridulation; the survival value of the response was tested in controlled encounters with a reptilian predator. Anaesthetized insects survived significantly fewer encounters with the predator than active insects. Stridulating insects repelled the lizards more effectively than those whose stridulating organs had been removed. The experiments raise questions about the manner in which defensive stridulation might act and the way in which it could have evolved.

ABSTRACT

W.A. Ent. Soc. Workshop

A.N. Sproul, Western Australian Department of Agriculture, South Perth, W.A. 6151

Title: Commodity treatments of fresh fruit against the Mediterranean fruit fly.

ABSTRACT

Ceratitis capitata (Wied.), the Mediterranean fruit fly is recognised as the only fruit fly of economic importance in Western Australia.

Due to this pest the export of fresh fruit from this State is restricted by quarantine bans imposed by other States and overseas countries.

To obtain entry to these areas commodity treatments of the fruit need to be devised which ensure freedom from fruit fly.

Tests which have been carried out at the Department of Agriculture with fruit fly infested fruit demonstrate the efficiency of these treatments.

ABSTRACT

W.A. Ent. Soc. Workshop
D. Thiele, Zoology Department, University of Western Australia, Nedlands, W.A. 6009.
Title: Spacing in Male Bush Crickets

ABSTRACT

Male bush crickets use sound to space themselves i.e. to maintain 'territories'. The ability of previous workers in the northern hemisphere to test this idea has been restricted by the short summer season, high mobility of the bush crickets used and complex song interactions, e.g. alternation.

The system we are working with involves the bush cricket *Mygalopsis* which is common in the sandplain heath from Dongara to Busselton. This insect is non-vagile, relatively sedentary, has a comparatively simple song structure and can be found during most of the year. It is thus ideal for long term studies of the mechanics of spacing.

The work presented in the seminar deals with:-

(1) The spacing of singing males within natural populations.

(2) The experimental release of males to determine the function of sound.

(3) The behavioural response of males to sound.

Consideration will also be given to the influence of the environment on male spacing.

ABSTRACT

W.A. Ent. Soc. Workshop
J.C. Taylor, Department of Zoology, University of Western Australia, Nedlands, W.A. 6009.
Title: Native and exotic species at Jandakot, near Perth, W.A.

ABSTRACT

Introduced species are often thought to be able to colonize new areas with considerable ease, because Australia has suffered so many invasions by exotic animals and plants. However, most invasions are caused by human disturbance of the environment: this action has the effect of disadvantaging native species in competition with exotic forms because the latter are pre-adapted to human disturbance. Some exotics, however, are able to stand on their own; these are mainly species exploiting a vacant niche, such as that of a large herbivore in arid areas, or those able to create their own disturbed environment, such as the rabbit.

The existence of exotic species in the Australian environment sets in motion a chain of events resembling the merging of biogeographical zones. Thus observational and experimental studies are useful in understanding the evolutionary and ecological processes involved. These include competition,habitat partitioning between allied species, the role of disease and predators in changing the status of native species, adaptation in colonizing species, and the construction of new ecosystems from native and exotic species.

These are long term processes which escape most detailed studies because of the time factor and lack of historical data. A programme was started in 1971 at the U.W.A. Zoology Department's Marsupial Breeding Station, near Jandakot with the aim of monitoring populations and using observed changes to suggest rewarding lines of study. These centre on plants and invertebrates, which are under most pressure from invading propagules because the area is rapidly becoming a small island within a sea of exotic habitat (market gardens and new suburbs).

It is interesting to see how resistent the area is to invasion. Many exotic plants exist in the area, but are largely dependant upon old human disturbance. Even the wind-dispersed annuals seem to depend to a large extent on disturbance set in motion by fire. While common exotic insects are notable in their absence: e.g. mosquito spp. and blowflies. This may be caused by the absence of suitable habitat or the existence of many better adapted local species: there are several native blowflies and the mosquito niche is well taken by native species. However, some niches exist which are under-used or are new. The wind-dispersed annual *Hypochaeris glabra* makes ephemeral use of bare ground, and in being widely distributed it forms a habitat for insects adapted to this species, thus the area is colonised by the european gall-forming cynopid *Aylax hypochoeridis*. Similarly there is a vacant niche for aphids adapted to native and exotic plants, because few native aphids exist. Nevertheless it is doubtful whether they are adapted to the Australian climate and growing seasons, to persist long without annual migration from surrounding gardens and crops.

The invertebrates at Jandakot have been sampled by means of a suction trap which has been operating continuously since 1971; and each week, all the insects have been taken out and put in storage. There is therefore a collection spanning six years of all invertebrates which commonly fly or drift at a height of five feet. This collection is open to examination for population changes in any group. The aphids look to be one of the groups which are most interesting because they include both native and exotic species. This has been made possible by Dr. Mary Carver who has very kindly been doing the taxonomy for me, and provided interesting data on the species.

The native aphid species are of particular interest because they are rarely collected, are very aberrant, and have biogeographical importance. When I started there were only three known W.A. aphids: two of these are found at Jandakot and two new species have been added to the fauna; a form of *Sensoriaphis*, a genus normally associated with *Nothofagus*, and a 2nd species of *Anomalaphis*, so aberrant as to have uncertain affinities. These species are therefore worth preserving, and interactions between introduced and natives are of particular interest. Are they likely to become extinct, in a small reserve

open to conolization by large populations drifting in from the surrounding countryside?

Exotic aphids, at first site, may appear to have nothing to do with population changes, because, although some are polyphagous, they are not found on host plants used by the native species: competition is therefore ruled out. However, the interaction may be more complex. Native populations are attacked by many syrphid larvae and other parasites and predators. Do large numbers of these predators appear in the reserve seeking hosts at the time of year when exotic species are declining, thus attacking native species living on later growing native shrubs and trees?

The collections are being examined for population changes in aphids and predators to look for trends. Other factors include the fire which swept through in March 1977 the subsequent new growth encouraged both exotic and native aphids. *Anomalaphis* has a parasite, probably confined to the species which in itself may prove to be more difficult to conserve than the aphid itself. Some plants are being seriously affected by exotic aphids (e.g. *Persoonia saccata*) which may in the end push the plant to extinction and encourage exotic plants to replace it.

Complex interactions of this sort are to be expected, and are likely to be turned up whatever group is examined e.g. dung beetles. Results may have application in elicidating the causes of widespread local extinctions of native mammals during the earlier part of the century and in planning their conservation within small reserves surrounded by alienated countryside, and its included predator-prey, pathogen-host systems.

ABSTRACT

W.A. Ent. Soc. Workshop

T.J. Ridsdill Smith, J.N. Matthiessen and J.A. Mahon[1], Division of Entomology, CSIRO, Perth.

Title: New approaches to dung beetle and bushfly research in South-Western Australia

ABSTRACT

The qualities required in an introduced dung beetle will depend on the job that the beetle is to perform. To control bushflies, the beetle would need to disperse dung in the summer when the bushfly is active, but pasture fouling by dung accumulation is probably more important during the winter when most of the pasture growth occurs in the winter rainfall areas. CSIRO's new research project in Western Australia will be concerned at first with problems in the temperate areas of the south-west of the state. This is the area in which cattle density and dung quantity are greatest. It is the areas of greatest human populations where the presence of bushflies is most likely to be a nuisance. The benefits from introducing new dung beetles are likely to be greater in this south-west area.

Dung beetles

The dung beetles (of the tribes Onthophagini and Scarabaeini) of south-western Australia are endemic and are confined mostly by the 380 mm (15 in) isohyet. The most widespread native species is *Onthophagus ferox* which is a large beetle (12-20 mm) found in grasslands. Adults are active at night and mostly during the winter (March to November). The life cycle is probably completed in one year, the hot dry summer being spent in some sort of quiescent stage. The presence of *O. ferox* in pads is recognizable by the size and shape of the soil casts which it produces while burrowing. Beetle numbers per pad are usually not sufficient to fully utilize it; around Perth numbers are 2-6 beetles per pad, but there may be 10-20 beetles per pad around Albany.

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1. J.A. Mahon retired from the Division in October, 1977. His work over many years collecting data on the bushfly and dung beetles has formed an important basis for the present study, which commenced in September, 1977.

Onthophagus binodis is an introduced species (9-12 mm) from southern Africa which is now well established near Perth, Bunbury and Albany. Adults fly during the day and are active in the summer (September to April), with possibly two generations per year. The species is restricted to damp situations in sandy or loam soils. From the first releases in 1972 it has taken until last year before substantial populations were noted. *O. binodis* is active inside the pads leaving little external sign of activity despite the presence of up to 300-500 beetles per pad. In the southern areas where the two species (*O. binodis* and *O. ferox*) are present together, nearly all the dung is being removed. While this shows that native and introduced beetles can achieve the results we desire in the south-west, this occurs in very restricted areas at present. We intend to investigate the factors limiting the abundance of dung beetles.

There are other types of niches to be filled. We will be studying beetle activity patterns on both a seasonal and a daily basis at Armadale, Bakers Hills, Bunbury and Albany. Beetles to be imported to south-western Australia will be selected from areas overseas with similar climates using the Weltatlas of Walter and Leith as a basis for matching climatic areas. At present, Karen Paschalidis in Athens, Greece and Alan Kirk in Montpellier, France are carrying out similar studies to the one here looking at niches filled by beetles in the mediterranean region. On the basis of the findings of the three studies, suitable beetles will be chosen to fill the niches at present vacant in Western Australia. In this way it is hoped to avoid the unnecessary duplication of beetle species in the one niche.

The bushfly

The bushfly (*Musca vetustissima*) is absent from southern Australia during winter when temperatures are below the breeding threshold. Initial results in Western Australia indicate that the

bushfly is permanently present north of 30°S latitude (near Coorow), and probably further south with increasing distance inland. The southern areas are repopulated during spring and this year the flies reached the south coast by the end of October. For the last six years, bushflies have arrived at Perth in early October. The apparent uniformity of bushfly movements in western Australia contrasts with the variability observed in eastern Australia. The principal aim early in the Western Australian bushfly study is to determine the occurrence, timing and magnitude of mass movements of the bushfly by large-scale surveys.

The physiological age and reproductive condition of female bushflies can be determined by examination of the ovaries. Results from the 1977 spring show that, in common with eastern Australia, the first flies to appear in southern areas are physiologically old. This supports the conclusion that, in each year, old flies (flies that have already laid a batch or two of eggs) move southwards to re-occupy areas where the bushfly was unable to survive the winter. Subsequently, there is a reduction in the mean population age index and an increase in abundance associated with local breeding. Seasonal fluctuations in population size and the physiological condition of the flies will be examined in detail at several fixed sites in south-western Australia.

The rate of bushfly population increase varies with temperature and the quality of the larval food, which is exclusively dung. Seasonal changes in the growth of pasture on which the cattle are feeding results in dung which is more, or less, favourable as a rearing medium for the bushfly. The effect of these changes on the bushfly in western Australia will be assessed in the laboratory, using survival and size as a bioassay.

Mites

The limited changes in bushfly populations which have occurred following successful introduction of dung beetles in other parts of Australia has caused a re-examination of the dung beetle/bushfly interaction. The mites carried by dung beetles may be important predators of fly eggs and larvae in the dung. This role will be investigated.

Initial results show that the most common species of mites are of the genus *Parasitus* which are thought to be less effective as predators of flies than the *Macrocheles* spp. The *Macrocheles* which we do find in western Australia are mostly too small to be effective as bushfly predators. It seems that western Australia has a shortage of mites which are effective fly predators.

Relationships between mites and beetles are fairly specific. The stage of mite carried by beetles is the adult female for macrochelids and the deutonymph for parasitids. The other stages inhabit the dung. Because introduced beetles may not carry the same mite species as the native beetles, it could be desirable to introduce other mite species to the south-west.

Future work

By studying the factors influencing the abundance and distribution of dung beetles, the bushfly and the predacious mites which are phoretic on the beetles it should be possible to identify the type of beetle needed for introduction. Evaluation of beetles will also be carried out after they have been introduced, to determine their effectiveness in the new environment. These types of approaches to the problem should enhance the chances of success.

ABSTRACT

W.A. Ent. Soc. Workshop.

J.G. Penniket, Western Australian Institute of Technology, Bentley, W.A. 6102

Title: The primitive Protomecopteran *Austromerope poultoni*.

ABSTRACT

Austromerope poultoni Killington 1933 from West Australia was until recently known from only two specimens: the ♂ holotype presently in Britain, and a ♀ now in America. One ♂ and two ♀♀, taken by the author in 1974 near Manjimup, were shown at the Workshop. On two occasions in 1976, other adults were taken east of Busselton and at Dwellingup by the Entomology Section, Agriculture Department W.A.; some of this material was sent to the Entomology Division, C.S.I.R.O., Canberra.

The only other members of the suborder, Protomecoptera, are two North American species of *Merope*. Apparently the larvae are unknown. The group is important because of the presumed mecopteran ancestry of Trichoptera, Lepidoptera, Diptera and Siphonptera (Fig. 1).

An immediate search for the larvae of *Austromerope poultoni* will be made, which, if successful, will be followed by an investigation of the life history. The present and any further material will eventually be deposited with the West Australian Museum and the Australian National Insect Collection.

Importance of Austromerope poultoni in Insect Evolution

SIPHONAPTERA

DIPTERA

LEPIDOPTERA

TRICHOPTERA

(latest common ancestor of above orders widely held to have been a Mecopteran, or near)

MECOPTERA - Suborder PROTOMECOPTERA - { Merope 2 spp. NE USA ; Austromerope poultoni WA

Suborder EUMECOPTERA

Note: PROTOMECOPTERA considered the more primitive suborder.

Larvae of PROTOMECOPTERA unknown.

Austromerope hitherto known from only 2 specimens:

♂ holotype held in a British collection.

♀ held in USA.

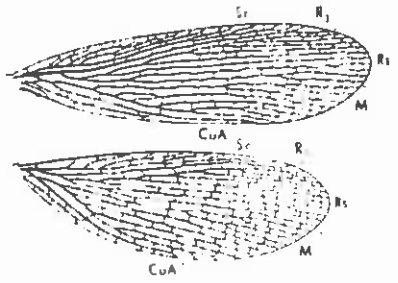

Fig. 1.