BULLETIN OF ENTOMOLOGICAL RESEARCH

VOL. 74

ISSUED BY THE COMMONWEALTH INSTITUTE OF ENTOMOLOGY

EDITOR: THE DIRECTOR



LONDON

Commonwealth Institute of Entomology 56, Queen's Gate, SW7 5JR

1984

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

Director and Editor

N. C. PANT, M.Sc., Ph.D., D.I.C., F.N.A.

Assistant Director A. H. PARKER, M.Sc., Ph.D.

Assistant Editor

J. M. B. HARLEY, B.Sc.

Headquarters, Publication Office and Library—56 Queen's Gate, London SW7 5JR, UK. Telephone: 01-584-0067. Telegrams: Entinfo London SW7.

Identification Service—c/o British Museum (Natural History), Cromwell Road, London SW7 5BD, UK.

The Commonwealth Institute of Entomology is one of 10 Bureaux and 4 Institutes that together form the Commonwealth Agricultural Bureaux, an organisation sponsored by the Commonwealth governments for the dissemination of information on agricultural research.

The Bulletin of Entomological Research is a quarterly journal prepared by the Institute and published by the Commonwealth Agricultural Bureaux.

Annual Subscription Rate 1984

To subscribers in countries that are members of CAB	£46·25
To subscribers in countries that are not members of CAB	£71.50

Back Numbers

Back volumes of the *Bulletin of Entomological Research* are available and there are discounts up to a maximum of 20% on orders of more than 10 volumes.

Orders and enquiries concerning subscriptions and back numbers should be sent to

CENTRAL SALES,
COMMONWEALTH AGRICULTURAL BUREAUX,
FARNHAM ROYAL, SLOUGH SL2 3BN, UK.

[Note: Prices are subject to change without notice.]

© Commonwealth Agricultural Bureaux. 1983. All rights reserved. No part of this publication may be reproduced in any form or by any means, electronically, mechanically, by photo-copying, recording or otherwise, without the prior permission of the copyright owner.

The Executive Council of the Commonwealth Agricultural Bureaux is a signatory to the Fair Copying Declaration, details of which can be obtained from The Royal Society, 6 Carlton House Terrace, London S.W.1.

The Commonwealth Agricultural Bureaux organisation does not accept responsibility for any trade advertisement included in this publication.

Part 1 March 1984

Review article	PAGE
Allsopp, R. Control of tsetse flies (Diptera: Glossinidae) using insecticides: a review and future prospects	
Original articles	
FLINT, H. M. & MERKLE, J. R. Studies on disruption of sexual communication in the pink bollworm, <i>Pectinophora gossypiella</i> (Saunders) (Lepidoptera: Gelechiidae), with microencapsulated gossyplure or its component <i>Z</i> , <i>Z</i> -isomer	
Cannon, R. J. C. The development rate of <i>Metopolophium dirhodum</i> (Walker) (Hemiptera: Aphididae) on winter wheat	
DAY, K. Phenology, polymorphism and insect-plant relationships of the larch budmoth, Zeiraphera diniana (Guenée) (Lepidoptera: Tortricidae), on alternative conifer hosts in Britain	
MEEK, S. R. & MACDONALD, W. W. Crossing relationships among seven members of the group of <i>Aedes scutellaris</i> (Walker) (Diptera: Culicidae)	•
FINCH, S. & COLLIER, R. H. Parasitism of overwintering pupae of cabbage root fly, <i>Delio radicum</i> (L.) (Diptera: Anthomyiidae), in England and Wales	
FARROW, R. A. & Dowse, J. E. Method of using kites to carry tow nets in the upper air for sampling migrating insects and its application to radar entomology	87
Firempong, S. Laboratory and field evaluation of cocoa progenies for resistance to mealybug vectors (Hemiptera: Pseudococcidae) of swollen shoot virus	
Hall, M. J. R. Trap-orientated behaviour of red-banded blister beetles, <i>Mylabris designata</i> var. <i>hacolyssa</i> Rochebrune (Coleoptera: Meloidae), in the Sudan	103
HILLERTON, J. E., BRAMLEY, A. J. & BROOM, D. M. The distribution of five species of flies (Diptera: Muscidae) over the bodies of dairy heifers in England	
Mendel, Z., Golan, Y. & Madar, Z. Natural control of the eucalyptus borer, <i>Phoracantha semipunctata</i> (F.) (Coleoptera: Cerambycidae), by the Syrian woodpecker	
Hudson, J. E. Anopheles darlingi Root (Diptera: Culicidae) in the Suriname rain forest	
VALE, G. A. The responses of <i>Glossina</i> (Glossinidae) and other Diptera to odour plumes in the field	
Pungerl, N. B. Host preferences of <i>Aphidius</i> (Hymenoptera: Aphidiidae) populations parasitising pea and cereal aphids (Hemiptera: Aphididae)	153
CAMPBELL, C. A. M. The influence of overhead shade and fertilizers on the Homoptera of mature Upper-Amazon cocoa trees in Ghana	163
PART 2 JUNE 1984	PAGE
NARASIMHAM, A. U. Comparative studies on <i>Tetrastichus hagenowii</i> (Ratzeburg) and <i>T. asthenogmus</i> (Waterston), two primary parasites of cockroach oothecae, and on their hyperparasite <i>Tetrastichus</i> sp. (<i>T. miser</i> (Nees) group) (Hymenoptera: Eulophidae)	175

	PAGE
RIDSDILL SMITH, T. J. & MATTHIESSEN, J. N. Field assessments of the impact of night-flying dung beetles (Coleoptera: Scarabaeidae) on the bush fly, Musca vetustissima Walker (Diptera: Muscidae), in south-western Australia	191
SAWICKI, R. M., DEVONSHIRE, A. L., FARNHAM, A. W., O'DELL, K. E., MOORES, G. D. & DENHOLM, I. Factors affecting resistance to insecticides in house-flies, <i>Musca domestica</i> L. (Diptera: Muscidae). II. Close linkage on autosome 2 between an esterase and resistance to trichlorphon and pyrethroids	197
BOWDEN, J., DIGBY, P. G. N. & SHERLOCK, P. L. Studies of elemental composition as a biological marker in insects. I. The influence of soil type and host-plant on elemental composition of <i>Noctua pronuba</i> (L.) (Lepidoptera: Noctuidae)	207
Lewis, G. A. & Madge, D. S. Esterase activity and associated insecticide resistance in the damson-hop aphid, <i>Phorodon humuli</i> (Schrank) (Hemiptera: Aphididae)	227
Modder, W. W. D. The attraction of Zonocerus variegatus (L.) (Orthoptera: Pyrgomorphidae) to the weed Chromolaena odorata and associated feeding behaviour	239
GOLDSON, S. L., FRAMPTON, E. R., BARRATT, B. I. P. & FERGUSON, C. M. The seasonal biology of <i>Sitona discoideus</i> Gyllenhal (Coleoptera: Curculionidae), an introduced pest of New Zealand lucerne	249
Schaefer, G. W. & Bent, G. A. An infra-red remote sensing system for the active detection and automatic determination of insect flight trajectories (IRADIT)	261
Bowden, J. Latitudinal and seasonal changes of nocturnal illumination with a hypothesis about their effect on catches of insects in light-traps	279
TURNER, D. A. & SNOW, W. F. Reproductive abnormality and loss in natural populations of Glossina pallidipes Austen (Diptera: Glossinidae) in Kenya.	299
RAWLINGS, P. & MAUDLIN, I. Sex ratio distortion in Glossina morsitans submorsitans Newstead (Diptera: Glossinidae)	311
LINES, J. D., AHMED, M. A. E. & CURTIS, C. F. Genetic studies of malathion resistance in <i>Anopheles arabiensis</i> Patton (Diptera: Culicidae)	317
WINDER, J. A., HARLEY, K. L. S. & KASSULKE, R. C. Uroplata lantanae Buzzi & Winder (Coleoptera: Chrysomelidae: Hispinae), a potential biological control agent of Lantana camara in Australia	227
Ol Lanuna camara ili Australia	327
Part 3 September 1984	
Review article Tyndale-Biscoe, M. Age-grading methods in adult insects: a review	PAGE 341
Original articles PADGHAM, D. E., COOK, A. G & HUTCHISON, D. Rubidium marking of the rice pests Nilaparvata lugens (Stål) and Sogatella furcifera (Horvath) (Hemiptera:	
Delphacidae) for field dispersal studies	379
(Hemiptera: Aphididae) outbreaks in summer in England	387
Aleyrodidae)	399
sinidae). I. Natural population regulation	403

	PAGE
RANDOLPH, S. E., ROGERS, D. J. & KUZOE, F. A. S. Local variation in the population dynamics of Glossina palpalis palpalis (Robineau-Desvoidy) (Diptera: Glossinidae). II. The effect of insecticidal spray programmes	425
island	439
Tyndale-Biscoe, M. Adaptive significance of brood care of <i>Copris diversus</i> Waterhouse (Coleoptera: Scarabaeidae)	453
the bioassay of changes in cattle dung as insect food, using the bush fly, Musca vetustissima Walker (Diptera: Muscidae)	463
from rice in India, with taxonomic notes on other Indian <i>Numicia</i> species Dolling, W. R. Pentatomid bugs (Hemiptera) that transmit a flagellate disease of	469
cultivated palms in South America	473
(Isoptera: Rhinotermitidae & Termitidae) NASR, EL-SAYED A., TUCKER, M. R. & CAMPION, D. G. Distribution of moths of the Egyptian cotton leafworm, Spodoptera littoralis (Boisduval) (Lepidoptera: Noctuidae), in the Nile Delta interpreted from catches in a pheromone trap network in relation to meteorological factors	477 487
WATSON, J. A. L., DAI, Z. R. & BARRETT, R. A. Comparative studies on the resistance of materials to species of <i>Coptotermes</i> (Isoptera: Rhinotermitidae). I. The susceptibilities of various plastics to <i>C. acinaciformis</i> (Froggatt) from Australia and <i>C. formosanus</i> Shiraki from China	495
ROOM, P. M., FORNO, I. W. & TAYLOR, M. F. J. Establishment in Australia of two	,,,,
insects for biological control of the floating weed Salvinia molesta KIDD, N. A. C. & CLEAVER, A. M. The relationship between pre-flight reproduction	505
and migratory urge in alatae of <i>Aphis fabae</i> Scopoli (Hemiptera: Aphididae) Noves, J. S. A new genus and species of encyrtid (Hymenoptera: Chalcidoidea) parasitic on the cassava mealybug, <i>Phenacoccus manihoti</i> Matile-Ferrero	517
(Hemiptera: Pseudococcidae)	529
Tamarix from Pakistan	535
Papua New Guinea. I. Descriptions of the immature and adult stages	541
Part 4 December 1984	
	PAGE
AUSTIN, A. D. New species of Platygastridae (Hymenoptera) from India which parasitise pests of mango, particularly <i>Procontarinia</i> spp. (Diptera: Cecidomyiidae)	549
Subra, R. & Dransfield, R. D. Field observations on competitive displacement, at the preimaginal stage, of <i>Culex quinquefasciatus</i> Say by <i>Culex cinereus</i> Theobald (Diptera: Culicidae) at the Kenya Coast	559
YATES, M. G. The biology of the oak bark beetle, Scolytus intricatus (Ratzeburg)	339
(Coleoptera: Scolytidae), in southern England	569

	PAGE
FARNHAM, A. W., O'Dell, K. E., Denholm, I. & Sawicki, R. M. Factors affecting resistance to insecticides in house-flies, <i>Musca domestica</i> L. (Diptera: Muscidae). III. Relationship between the level of resistance to pyrethroids, control failure in the field and the frequency of gene <i>kdr</i>	581
AMIN, A. M. & WHITE, G. B. Relative fitness of organophosphate-resistant and susceptible strains of <i>Culex quinquefasciatus</i> Say (Diptera: Culicidae)	591
TUCKER, M. R. Possible sources of outbreaks of the armyworm, Spodoptera exempta (Walker) (Leopidoptera: Noctuidae), in East Africa at the beginning of the season	599
FORNO, I. W. & BOURNE, A. S. Studies in South America of arthropods on the Salvinia auriculata complex of floating ferns and their effect on S. molesta	609
HOLMES, P. R. A field study of the predators of the grain aphid, Sitobion avenae (F.) (Hemiptera: Aphididae), in winter wheat in Britain	623
HARRINGTON, R. & CHENG, X. N. Winter mortality, development and reproduction in a field population of Myzus persicae (Sulzer) (Hemiptera: Aphididae) in England	633
READY, P. D., LAINSON, R., WILKES, T. J. & KILLICK-KENDRICK, R. On the accuracy of age-grading neotropical phlebotomines by counting follicular dilatations: first laboratory experiments, using colonies of <i>Lutzomyia flaviscutellata</i> (Mangabeira) and <i>L. furcata</i> (Mangabeira) (Diptera: Psychodidae)	641
CAMERON, P. J., POWELL, W. & LOXDALE, H. D. Reservoirs for Aphidius ervi Haliday (Hymenoptera: Aphidiidae), as a polyphagous parasitoid of cereal aphids (Hemiptera: Aphididae)	647
GUILLOT, F. S. & WRIGHT, F. C. Reduced fecundity of <i>Psoroptes ovis</i> (Hering) (Acari: Psoroptidae) on calves treated with ivermectin	657
CHISHOLM, I. F. & LEWIS, T. A new look at thrips (Thysanoptera) mouthparts, their action and effects of feeding on plant tissue	663
WOOD, R. J., PASTEUR, N. & SINÈGRE, G. Carbamate and organophosphate resistance in <i>Culex pipiens</i> L. (Diptera: Culicidae) in southern France and the significance of <i>Est-3</i> A	677
RANDOLPH, S. E. & ROGERS, D. J. Movement patterns of the tsetse fly <i>Glossina</i> palpalis palpalis (Robineau-Desvoidy) (Diptera: Glossinidae) around villages in the pre-forest zone of Ivory Coast	689
CHAMBERS, J., McKevitt, N. J. & Stubbs, M. R. Nuclear magnetic resonance spectroscopy for studying the development and detection of the grain weevil, Sitophilus granarius (L.) (Coleoptera: Curculionidae), within wheat kernels	707
Index of Authors	725
INDEX OF GENERA AND SPECIES	731

Dates of Publication in Parts

Part 1, pp. 1–174	. 20 March	1984
Part 2, pp. 175–340	22 May	1984
Part 3, pp. 341–547	29 August	1984
Part 4, pp. 549–741	December	1984

ERRATA (VOL. 74)

- p. 12, line 5, for J.E. read J.C.
- p. 136, line 3 in Fig. 3 caption, for darlingii read darlingi.
 p. 250, line 11 to p. 252 line 12, insert this section on p. 253 following line 15.
- p. 342, line 30, p. 352, lines 26, 28, 33, 35, 43, p. 366, lines 40, 42 and p. 377, line 19, for Morky read Mokry.

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

Director and Editor

N. C. PANT, M.Sc., PH.D., D.I.C., F.N.A.

Assistant Editor

J. M. B. HARLEY, B.Sc.

Headquarters, Publication Office and Library—56 Queen's Gate, London SW7 5JR, UK. Telephone: 01–584–0067. Telegrams: Entinfo London SW7. Telex: 847964.

Identification Service—c/o British Museum (Natural History), Cromwell Road, London SW7 5BD, UK.

The Commonwealth Institute of Entomology is one of 10 Bureaux and 4 Institutes that together form the Commonwealth Agricultural Bureaux, an organisation sponsored by the Commonwealth governments for the dissemination of information on agricultural research.

The Bulletin of Entomological Research is a quarterly journal prepared by the Institute and published by the Commonwealth Agricultural Bureaux.

Annual Subscription Rate

To subscribers in countries that are members of CAB	£46·25
To subscribers in countries that are not members of CAB	£71.50

Back Numbers

Back volumes of the *Bulletin of Entomological Research* are available and there are discounts up to a maximum of 20% on orders of more than 10 volumes.

Orders and enquiries concerning subscriptions and back numbers should be sent to

CENTRAL SALES,
COMMONWEALTH AGRICULTURAL BUREAUX,
FARNHAM ROYAL, SLOUGH SL2 3BN, UK.

[Note: Prices are subject to change without notice.]

© Commonwealth Agricultural Bureaux. 1984. All rights reserved. No part of this publication may be reproduced in any form or by any means, electronically, mechanically, by photo-copying, recording or otherwise, without the prior permission of the copyright owner.

The Executive Council of the Commonwealth Agricultural Bureaux is a signatory to the Fair Copying Declaration, details of which can be obtained from The Royal Society, 6 Carlton House Terrace, London S.W.1.

The Commonwealth Agricultural Bureaux organisation does not accept responsibility for any trade advertisement included in this publication.

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

Proceedings of the 1st International
Workshop on Biotaxonomy,
Classification and Biology of
Leafhoppers and Planthoppers
(Auchenorrhyncha) of Economic
Importance

LONDON, 4 OCTOBER-7 OCTOBER 1982

published by the Commonwealth Institute of Entomology

The leafhoppers and planthoppers (Auchenorrhyncha) have become increasingly important in recent years both as vectors of plant diseases and because of the direct damage they cause to crops, including rice, the staple diet of a large proportion of the world's human population.

Progress in their control has been hindered by problems of taxonomy, classification and biology, and in October 1982 an international workshop was held in London to study these problems. The proceedings are now available and contain about 40 papers presented by contributors from countries worldwide.

Paperback, 210×150 mm, approx 500 pp. (April 1983)

Price (including surface postage and packing), £6.50

Obtainable from:

Commonwealth Institute of Entomology, 56 Queen's Gate, London, SW7 5JR, UK.

Tel.: 01-584 0067 Telex: 847964 Cables: ENTINFO, London SW7

Review of Applied Entomology

prepared by the Commonwealth Institute of Entomology

A monthly abstracting journal in two parts: Series A (Agricultural) covering the world literature on insects, mites and other arthropods harmful to cultivated plants of every kind including forest trees, and also beneficial arthropods; Series B (Medical and Veterinary) covering the world literature on insects, mites, ticks and other arthropods that transmit diseases to man or livestock or cause any other form of injury to them.

Annual subscriptions: Series A £144, Series B £71.50 (£93.50 and 46.25 in member countries of the Commonwealth Agricultural Bureaux).

Further details and free sample copies from: Central Sales, Commonwealth Agricultural Bureaux, Farnham House, Farnham Royal, Slough SL2 3BN, UK.

Journal of Plantation Crops

- Official publication of the Indian Society for Plantation Crops, published twice annually in June and December. Volume IV in 1976.
- Publishes speedily original research articles and reviews on all aspects of all plantation crops including spices and condiments.
- —— Subscription: Rs.40 in India, US \$12.00 or £6.00 elsewhere.
- Special publication: Proceedings of the First Indian National Symposium on Plantation Crops held at Trivandrum in December 1972. Contains the full text together with the discussions that followed each of more than 50 papers presented at the Symposium. 220 pp.; Rs.50.00 (US \$20.00 or £10.00); February 1974.
- Editorial correspondence, manuscripts, and books for review to the Editor, Journal of Plantation Crops, Central Plantation Crops Research Institute, Regional Station, Vittal-574 243, Karnataka State, India.
- Correspondence regarding subscription and membership to the Secretary, Indian Society for Plantation Crops, Central Plantation Crops Research Institute, Kasaragod-670 124, Kerala State, India.