

Online submission at: [www.editorialmanager.com/ber](http://www.editorialmanager.com/ber)

**Volume 104**  
**Issue 2**  
**April 2014**

**Bulletin of**  
*Entomological*  
*Research*



**CAMBRIDGE**  
UNIVERSITY PRESS

**ISSN 0007-4853**

# Bulletin of *Entomological Research*

journals.cambridge.org/ber

## Aims and Scope

The aims of *Bulletin of Entomological Research* are to further our global knowledge of entomology through the generalisation of research findings rather than providing more entomological exceptions. *Bulletin* publishes high-quality and original research papers, 'critiques' and review articles concerning insects, mites, ticks or other arthropods of economic importance in agriculture, forestry, stored products, biological control, medicine, animal health and natural resource management. The scope of papers addresses the biology, ecology, behaviour, physiology and systematics of individuals and populations. This includes the interactions between species (plants, hosts for parasites, natural enemies and whole communities), novel methodological developments, including molecular biology, in an applied context. *Bulletin* does not publish the results of pesticide testing or traditional taxonomic revisions.

*Bulletin of Entomological Research* is published bimonthly by  
Cambridge University Press

## Editor-in-Chief

Professor Bill Symondson

School of Biosciences, Cardiff University, Cardiff CF10 3TL, UK  
Email: entomology@cambridge.org

## Subject Editors

Dr N. Agusti, *IRTA, Spain*

Dr T. Backeljau, *Royal Belgian Institute of Natural Sciences, Belgium*

Dr D.A. Bohan, *Rothamsted Research, Hertfordshire, UK*

Dr C. Borgemeister, *International Centre of Insect Physiology and Ecology (ICIPE), Kenya*

Dr Chen Xue-Xin, *Zhejiang University, China*

Dr P.J. De Barro, *CSIRO Ecosystem Sciences, Brisbane, Australia*

Professor D. Giga, *Bulawayo, Zimbabwe*

Dr D. Gillespie, *Agriculture and Agri-Food Canada, Agassiz, B.C., Canada*

Dr M. Greenstone, *Invasive Insect Biocontrol & Behavior Laboratory, Beltsville, USA*

Professor G. Gurr, *Charles Sturt University, NSW, Australia*

Professor D.R. Hall, *University of Greenwich, UK*

Dr N.P. Havill, *USDA Forest Service, Northern Research Station, Hamden, USA*

Dr S. Hayward, *University of Birmingham, UK*

Dr B. Hoffmann, *CSIRO, Ecosystem Sciences, Australia*

Dr T.H. Jones, *Cardiff University, UK*

Dr J. Krzywinski, *Liverpool School of Tropical Medicine, UK*

Dr O. Kwon, *Kyungpook National University, Korea*

Dr B. Lavandero, *Universidad de Talca, Talca, Chile*

Dr C. Lavigne, *INRA-Unité PSH, France*

Dr S. Morin, *The Robert H. Smith Faculty of Agriculture, Food and Environment Rehovot, Israel*

Dr C. Phillips, *AGResearch, New Zealand*

Dr Liu Shu-Sheng, *Zhejiang University, China*

Professor P. Stevenson, *Royal Botanic Gardens, Kew, UK*

Dr A.J.A. Stewart, *University of Sussex, Brighton, UK*

Dr S.J. Torr, *Liverpool School of Tropical Medicine, UK*

Professor H. Townson, *Liverpool School of Tropical Medicine, UK*

Dr M. Traugott, *University of Innsbruck, Austria*

Dr M. Virant-Doberlet, *National Institute of Biology, Ljubljana, Slovenia*

Dr J. Vontas, *University of Crete, Greece*

Dr A. Wilby, *Lancaster University, UK*

Professor L. Winder, *UNITEC, Auckland, New Zealand*

Dr B.A. Woodcock, *University of Reading, UK*

© Cambridge University Press 2014.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information.

Cover image: Predatory ladybird, *Orcus australasiae* (Coleoptera: Coccinellidae) on twig of an orange tree.

Note the occupation scars of recently eaten red scale *Aonidiella aurantii* (Hemiptera: Diaspididae).

Photograph taken by T. H. Dao.

Review Paper

- A. Sharma, A.N. Khan, S. Subrahmanyam, A. Raman, G.S. Taylor and M.J. Fletcher**  
Salivary proteins of plant-feeding hemipteroids – implication in phytophagy 117

Research Papers

- H.T. Dao, A. Meats, G.A.C. Beattie and R. Spooner-Hart**  
Ant-coccid mutualism in citrus canopies and its effect on natural enemies of red scale, *Aonidiella aurantii* (Maskell) (Hemiptera: Diaspididae) 137
- B.A. Omondi, J. van den Berg, D. Masiga and F. Schulthess**  
Molecular markers reveal narrow genetic base and culturing-associated genetic drift in *Teretrius nigrescens* Lewis populations released for the biological control of the larger grain borer in Africa 143
- A. Zibae and D. Malagoli**  
Immune response of *Chilo suppressalis* Walker (Lepidoptera: Crambidae) larvae to different entomopathogenic fungi 155
- Ling-Yi Jia, Jin-Hua Xiao, Li-Ming Niu, Guang-Chang Ma, Yue-Guan Fu, Derek W. Dunn and Da-Wei Huang**  
Delimitation and description of the immature stages of a pollinating fig wasp, *Ceratosolen solmsi marchali* Mayr (Hymenoptera: Agaonidae) 164
- D. Rao, S. Aguilar-Argüello, P. Montoya and F. Díaz-Fleischer**  
The effect of irradiation and mass rearing on the anti-predator behaviour of the Mexican fruit fly, *Anastrepha ludens* (Diptera: Tephritidae) 176
- J.A. Rubiano-Rodríguez, E. Fuentes-Contreras, C.C. Figueroa, J.T. Margaritopoulos, L.M. Briones and C.C. Ramírez**  
Genetic diversity and insecticide resistance during the growing season in the green peach aphid (Hemiptera: Aphididae) on primary and secondary hosts: a farm-scale study in Central Chile 182
- A. Bordbar, S. Soleimani, F. Fardid, M.R. Zolfaghari and P. Parvizi**  
Three strains of *Wolbachia pipientis* and high rates of infection in Iranian sandfly species 195
- A. Valigurová, V. Michalková, P. Koník, M.L. Dindo, M. Gelnar and J. Vaňhara**  
Penetration and encapsulation of the larval endoparasitoid *Exorista larvarum* (Diptera: Tachinidae) in the factitious host *Galleria mellonella* (Lepidoptera: Pyralidae) 203
- M.C.G. Correa, T. Zaviezo, J. Le Maguet, E. Herrbach and T. Malausa**  
Characterization of microsatellite DNA libraries from three mealybug species and development of microsatellite markers for *Pseudococcus viburni* (Hemiptera: Pseudococcidae) 213
- Hao-Sen Li, Xiao-Feng Xue and Xiao-Yue Hong**  
Cryptic diversity in host-associated populations of *Tetra pinnatifidae* (Acari: Eriophyoidea): What do morphometric, mitochondrial and nuclear data reveal and conceal? 221
- M. Juan-Blasco, B. Sabater-Muñoz, I. Pla, R. Argilés, P. Castañera, J. A. Jacas, M. V. Ibáñez-Gual and A. Urbaneja**  
Estimating SIT-driven population reduction in the Mediterranean fruit fly, *Ceratitidis capitata*, from sterile mating 233

<b>X. Meng, G. C. Ouyang, H. Liu, B. H. Hou, S. S. Huang and M. F. Guo</b> Molecular screening and predation evaluation of the key predators of <i>Conopomorpha sinensis</i> Bradley (Lepidoptera: Gracilariidae) in litchi orchards	243
<b>O.L. Reynolds, B.A. Orchard, S.R. Collins and P.W. Taylor</b> Yeast hydrolysate supplementation increases field abundance and persistence of sexually mature sterile Queensland fruit fly, <i>Bactrocera tryoni</i> (Froggatt)	251
<b>Corrigendum</b>	262

**Subscribing organisations are encouraged to copy and distribute this  
table of contents for non-commercial purposes**

# Bulletin of *Entomological Research*

Volume 104 2014

ISSN: 0007-4853

[journals.cambridge.org/ber](http://journals.cambridge.org/ber)

**Publishing, Production, Marketing, and  
Subscription Sales Office:**  
Cambridge University Press  
The Edinburgh Building  
Shaftesbury Road  
Cambridge CB2 8RU  
UK

**For Customers in North America:**  
Cambridge University Press  
Journals Fulfillment Dept  
100 Brook Hill Drive  
West Nyack  
New York 10994-2133  
USA

**Publisher:** Katy Christomanou

*Bulletin of Entomological Research* is an international journal published bimonthly by Cambridge University Press in February, April, June, August, October and December.

**Subscription information:**

The subscription rates for Volume 104, 2014 (6 issues):  
Print and electronic access: £1263 (UK), (USA, Canada and Mexico US \$2148)  
Electronic-only price: £936 (UK), (USA, Canada and Mexico US \$1594)  
Print only: £1185 (UK), (USA, Canada and Mexico US \$1897)  
The online edition is available at [www.journals.cambridge.org/ber](http://www.journals.cambridge.org/ber) with free table of contents alert (upon registration).

Any **supplements** to this journal published in the course of the annual volume are normally supplied to subscribers at no extra charge.

**Back Volumes** are available. Please contact Cambridge University Press for further information.

**Claims** for non-receipt of journal issues will be considered on their merit and only if the claim is received within six months of publication. Replacement copies supplied after this date will be chargeable.

**US Postmasters:** please send address corrections to Bulletin of Entomological Research  
Cambridge University Press  
100 Brook Hill Drive  
West Nyack  
New York 10994-2133  
USA

**Information for Authors**

Manuscripts should be submitted online at <http://www.editorialmanager.com/ber>. New users should register before submitting a manuscript. Further information about submission is available from the publisher at the given address and is printed on the inside back cover.

**Offprints:** The author (or main author) of an accepted paper will receive a free PDF of their paper. Paper offprints are available for a fee and should be ordered at proof stage. No page charges are levied by this journal.

**Copying:** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA. Organisations in the USA who are registered with the CCC may therefore copy material (beyond the limits permitted by sections 107 and 108 of USA copyright law) subject to payment to the CCC of the per copy fee of \$16.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0007-4853/2014/\$16.00. Organisations authorised by the Copyright Licensing Agency may also copy material subject to the usual conditions. *For all other use*, permission must be sought from Cambridge or the American Branch of Cambridge University Press.

**Disclaimer:** The information contained herein, including any expression of opinion and any projection or forecast, has been obtained from or is based upon sources believed by us to be reliable, but is not guaranteed as to accuracy or completeness. The information is supplied without obligation and on the understanding that any person who acts upon it or otherwise changes his/her position in reliance thereon does so entirely at his/her own risk.

Cambridge University Press does not accept responsibility for any trade advertisement included in this publication.

Typeset by SR Nova Pvt Ltd., Bangalore, India, and printed by Latimer Trend, Plymouth, UK.