

Volume 21 Number 1

January–March 2001

INSECT SCIENCE

AND ITS APPLICATION

The International Journal of Tropical Insect Science

Editor-in-Chief: *Hans R. Herren*



Founded by *Thomas R. Odhiambo*

INSECT SCIENCE

AND ITS APPLICATION

The International Journal of Tropical Insect Science

Sponsored by the International Centre of Insect Physiology and Ecology (ICIPE)
and the African Association of Insect Scientists (AAIS)

Founded by **Thomas R. Odhiambo**

Editor-in-Chief: **Hans R. Herren**

Associate Editor: **William A. Overholt**

Science Editor: **Daisy Ouya**

Coordinating Editor: **Annalee Ng'eny-Mengech**

The International Centre of Insect Physiology and Ecology (ICIPE), P.O. Box 30772, Nairobi, Kenya

Editorial Advisory Board

K. Afreh-Nuamah, Ghana
J. Beier, USA
W. Bowers, USA
C. Eardley, South Africa
P. Esbjerg, Denmark
I. Fagoonee, Mauritius
R. Galun, Israel
N. Jago, UK
J. Law, USA
B. Le Rü, Kenya
A. Mansingh, Jamaica

I. Mohyuddin, Pakistan
D. Munthali, Botswana
R. W. Mwangi, Kenya
J. A. Odebiyi, Nigeria
A. Odulaja, Kenya
W. A. Overholt, Kenya (*Assoc. Ed.*)
D. Pomeroy, Uganda
H. C. Sharma, India
H. F. van Emden, UK
A. van Huis, Netherlands

PUBLISHED QUARTERLY

Annual Subscription

For the first time, ISA is presenting a 3-tiered rate structure, in which subscribers have a choice of ordering the print, on-line, or print + on-line versions of the journal. **Print version:** For libraries, university departments, government laboratories, industrial and other multiple reader institutions US\$ 298 (2001); 2-year rate (2001–2002) US\$ 550.00 (including postage and insurance), private individuals US\$ 132 (2001); 2-year rate US\$ 210.00 (2001–2002). In the interest of maximising the dissemination of the results published in this important international journal, any individual whose institution takes out a library subscription may purchase a second or additional subscription for personal use at a much reduced rate of US\$ 98.00 (2001); 2-year rate (2001–2002) US\$ 176.00. Members of the International Centre of Insect Physiology and Ecology (ICIPE) and the African Association of Insect Scientists (AAIS) may purchase a subscription at the special rate of US\$ 60.00 (2001); 2-year rate (2001–2002) US\$ 100.00. **Print and on-line versions:** For libraries, university departments, government laboratories, industrial and other multiple reader institutions US\$ 330.00; private individuals US\$ 150.00; AAIS member (based in developing country) US\$ 70.00. **On-line only:** Specially reduced rates for all categories of readership available at <http://www.bioline.org.br>. AAIS membership application forms (registration fee US\$ 20.00; annual membership fee US\$ 20.00) may be obtained from: Honorary Secretary, African Association of Insect Scientists, P.O. Box 59862, Nairobi, Kenya.

Prices are subject to amendment without notice

Copyright © 2001 — The International Centre of Insect Physiology and Ecology

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organisations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the USA

The Item-fee Code for this publication indicates that authorisation to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided the stated fee for copying beyond that permitted by Section 107 or 108 of the US Copyright Law, is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works or for resale. Specific written permission must be obtained from the publisher of such copying.

The item-fee for this publication is 0191-9040/01 \$3.00+0.00

ICIPE SCIENCE PRESS

P. O. Box 72913, Nairobi, Kenya

INSECT SCIENCE
AND ITS APPLICATION

The International Journal of Tropical Insect Science

VOLUME 21 (2001)

INSECT SCIENCE

AND ITS APPLICATION

The International Journal of Tropical Insect Science

Sponsored by the International Centre of Insect Physiology and Ecology (ICIPE)
and the African Association of Insect Scientists (AAIS)

Founded by **Thomas R. Odhiambo**

Editor-in-Chief: **Hans R. Herren**

Associate Editor: **William A. Overholt**

Science Editor: **Daisy Ouya**

Coordinating Editor: **Annalee Ng'eny-Mengech**

The International Centre of Insect Physiology and Ecology (ICIPE), P.O. Box 30772, Nairobi, Kenya

Editorial Advisory Board

K. Afreh-Nuamah, Ghana
J. Beier, USA
W. Bowers, USA
C. Eardley, South Africa
P. Esbjerg, Denmark
I. Fagoonee, Mauritius
R. Galun, Israel
N. Jago, UK
J. Law, USA
B. Le Rü, Kenya
A. Mansingh, Jamaica

I. Mohyuddin, Pakistan
D. Munthali, Botswana
R. W. Mwangi, Kenya
J. A. Odebiyi, Nigeria
A. Odulaja, Kenya
W.A. Overholt, Kenya (*Assoc. Ed.*)
D. Pomeroy, Uganda
H. C. Sharma, India
H. F. van Emden, UK
A. van Huis, Netherlands

VOLUME 21 (2001)

ICIPE SCIENCE PRESS

P. O. Box 72913, Nairobi, Kenya

PUBLISHED QUARTERLY

Annual Subscription

For the first time, ISA is presenting a 3-tiered rate structure, in which subscribers have a choice of ordering the print, on-line, or print + on-line versions of the journal. **Print version:** For libraries, university departments, government laboratories, industrial and other multiple reader institutions US\$ 298 (2001); 2-year rate (2001–2002) US\$ 550.00 (including postage and insurance), private individuals US\$ 132 (2001); 2-year rate US\$ 210.00 (2001–2002). In the interest of maximising the dissemination of the results published in this important international journal, any individual whose institution takes out a library subscription may purchase a second or additional subscription for personal use at a much reduced rate of US\$ 98.00 (2001); 2-year rate (2001–2002) US\$ 176.00. Members of the International Centre of Insect Physiology and Ecology (ICIPE) and the African Association of Insect Scientists (AAIS) may purchase a subscription at the special rate of US\$ 60.00 (2001); 2-year rate (2001–2002) US\$ 100.00. **Print and on-line versions:** For libraries, university departments, government laboratories, industrial and other multiple reader institutions US\$ 330.00; private individuals US\$ 150.00; AAIS member (based in developing country) US\$ 70.00. **On-line only:** Specially reduced rates for all categories of readership available at <http://www.bioline.org.br>. AAIS membership application forms (registration fee US\$ 20.00; annual membership fee US\$ 20.00) may be obtained from: Honorary Secretary, African Association of Insect Scientists, P.O. Box 59862, Nairobi, Kenya.

Prices are subject to amendment without notice

Copyright © 2001 -- The International Centre of Insect Physiology and Ecology

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organisations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the USA

The Item-fee Code for this publication indicates that authorisation to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided the stated fee for copying beyond that permitted by Section 107 or 108 of the US Copyright Law, is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for other use

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works or for resale. Specific written permission must be obtained from the publisher of such copying.

The item-fee for this publication is 0191-9040/01 \$3.00+0.00

ICIPE SCIENCE PRESS
P. O. Box 72913, Nairobi, Kenya