

# Ecologically-based Management of Rodent Pests

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# ECOLOGICALLY-BASED MANAGEMENT OF RODENT PESTS

*Edited by:* Grant Singleton, Lyn Hinds, Herwig Leirs and Zhibin Zhang

Australian Centre for International Agricultural Research  
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# Author Contact Details

**Berdoy**, Manuel, Wildlife Conservation Research Unit, Department of Zoology, and Department of Veterinary Services, c/o University Laboratory of Physiology, University of Oxford, South Parks Road, Oxford, OX1 3PT, UK.

Email: manuel.berdoy@vet.ox.ac.uk

**Boonsong**, Puangtong, Agricultural Zoology Research Group, Division of Entomology and Zoology, Department of Agriculture, PO Box 9-34, Bangkok 10900, Thailand.

Email: agrizoo@bkk1.loxinfo.co.th

Fax: +662 9405396

**Bounnaphol**, Onechanh, Agriculture and Forestry Service, Luang Prabang, Lao PDR.

Fax: +856 71 212635

**Brown**, Peter R., CSIRO Wildlife and Ecology, GPO Box 284, Canberra, ACT 2601, Australia.

Email: peter.brown@dwe.csiro.au

Fax: +61 2 6242 1505

**Buckle**, Alan P., Zeneca Agrochemicals, Fernhurst, Haslemere, Surrey GU27 3JE, UK.

Email: Alan.Buckle@aguk.zeneca.com

Fax: +44 1428 6555668

**Chambers**, Lisa K., Vertebrate Biocontrol Cooperative Research Centre, CSIRO Wildlife and Ecology, GPO Box 284, Canberra, ACT 2601, Australia.

Email: lisa.chambers@dwe.csiro.au

Fax: +61 2 6242 1505

**Chen**, Anguo, Changsha Institute of Agriculture Modernization, Chinese Academy of Science, Changsha, Hunan 410125, P.R. China.

Fax: +86 731 4612685

**Chhorn**, Nel, Cambodia–IRRI–Australia Project (CIAP), PO Box 1, Phnom Penh, Cambodia.

Email: IRRI-CAMBODIA@CGIAR.ORG

Fax: +855 23 211728

**Colvin**, Bruce A., 16 Temple Road, Lynnfield, MA 01940, USA.

Email: bacolvin@juno.com

Fax: +1 781 334 5782

**Cooper**, Howard M., INSERM (Institut National pour la Santé et la Recherche Médicale), U371, Cerveau et Vision, Bron, France.

Email: cooper@albert.lyon51.inserm.fr

Fax: +33 47 2913461

**Cox**, Peter G., Cambodia–IRRI–Australia Project (CIAP), PO Box 1, Phnom Penh, Cambodia.

Email: Peter.Cox@bigpond.com.kh

Fax: +855 23 211728

**Diarra**, Wamian, CNRST (Centre National de la Recherche Scientifique et Technologique), BP 3052, Bamako, Mali.

**Dickman**, Chris R., Institute of Wildlife Research, School of Biological Sciences, University of Sydney, New South Wales 2006, Australia.

Email: cdickman@bio.usyd.edu.au

Fax: + 61 2 9351 4119

**Douang Boup**ha, Bounneuang, Department of Agriculture and Extension, Vientiane, Lao PDR.

Email: j.m.schiller@cgiar.org

Fax: +856 21 414373

**Duplantier**, Jean-Marc, Programme RAMSE, IRD (Institut de Recherche pour le Développement, ex ORSTOM), BP 434, Antananarivo, Madagascar.

Email: duplantier@ramse.ird.mg

Fax: +261 20 22 404 51



**Fan**, Naichang, Department of Biology, Zhejiang Normal University, Jinhua, Zhejiang 321004, P.R. China.

**Forrester**, Robert I., CSIRO Mathematical and Information Sciences, GPO Box 664, Canberra, ACT 2601, Australia.  
Email: bob.forrester@cmis.csiro.au  
Fax: 61 2 6216 7111

**Hamarit**, Greangsak, Agricultural Zoology Research Group, Division of Entomology and Zoology, Department of Agriculture, PO Box 9-34, Bangkok 10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 9405396

**Hinds**, Lyn A., Vertebrate Biocontrol Cooperative Research Centre, CSIRO Wildlife and Ecology, GPO Box 284, Canberra, ACT 2601, Australia.  
Email: lyn.hinds@dwe.csiro.au  
Fax: +61 2 6242 1505

**Hongnark**, Sermsakdi, Agricultural Zoology Research Group, Division of Entomology and Zoology, Department of Agriculture, PO Box 9-34, Bangkok 10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 9405396

**Hood**, Greg M., CSIRO Wildlife and Ecology, GPO Box 284, Canberra, ACT 2601, Australia.  
Email: greg.hood@dwe.csiro.au  
Fax: +61 2 6242 1505

**Huang**, Xiuqing, Guandong Institute of Plant Protection, Chinese Academy of Agricultural Science, Guangzhou, Guangdong 510640, P.R. China.  
Fax: +86 20 87561757

**Hung**, Nguyen Manh, Institute of Agricultural Science of South Vietnam, Ho Chi Minh City, Vietnam.  
Email: ias.hung@hcm.vnn.vn  
Fax: +84 8 829 7650

**Hung**, Nguyen Quy, Institute of Agricultural Science of South Vietnam, Ho Chi Minh City, Vietnam.  
Email: ias.hung@hcm.vnn.vn  
Fax: +84 8 829 7650

**Jackson**, William B., Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403, USA.  
Fax: +1 419 372 2024

**Jahn**, Gary C., Cambodia-IRRI-Australia Project (CIAP), PO Box 1, Phnom Penh, Cambodia.  
Email: G.JAHN@cgiar.org  
Fax: +855 23 211728

**Jäkel**, Thomas, German Technical Cooperation (GTZ, Deutsche Gesellschaft für Technische Zusammenarbeit), 65726 Eschborn, Germany.  
Email: tojack@uni-hohenheim.de

**Jiang**, Yongjin, Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Xining 810001, P.R. China.  
Fax: +86 971 6143282

**Jumanta**, Research Institute for Rice, West Java, Indonesia.  
Email: sudarmaji@vision.net.id  
Fax: +62 260 520157

**Khoprasert**, Yuvaluk, Agricultural Zoology Research Group, Division of Entomology and Zoology, Department of Agriculture, PO Box 9-34, Bangkok 10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 9405396

**Krebs**, Charles, J. Department of Zoology, University of British Columbia, Vancouver, B.C. V6T 1Z4, Canada.  
Email: krebs@zoology.ubc.ca  
Fax: +1 604 822 2416

**Lawson**, Malcolm A., Vertebrate Biocontrol Cooperative Research Centre, Microbiology Department, University of Western Australia, QEII Medical Centre, Nedlands, WA 6009, Australia.  
Email: mlawson@cylle.uwa.edu.au  
Fax: +61 8 9346 2912

**Leirs**, Herwig, Danish Pest Infestation Laboratory, Skovbrynet 14, DK-2800 Lyngby, Denmark.  
Email: h.leirs@ssl.dk  
Fax: +45 45 931155

**Leung**, Luke K.-P., CSIRO Wildlife and Ecology,  
GPO Box 284, Canberra, ACT 2601, Australia.  
Email: lukeleung@telstra.easymail.com.au

**Macdonald**, David W., Wildlife Conservation  
Research Unit, Department of Zoology, University of  
Oxford, South Parks Road, Oxford, OX1 3PT, UK.  
Fax: +44 1865 310447

**Mak**, Solieng, Cambodia-IRRI-Australia Project  
(CIAP), PO Box 1, Phnom Penh, Cambodia.  
Email: msolieng@bigpond.com.kh  
Fax: +855 23 211728

**Makundi**, Rhodes H., Rodent Research Unit,  
Sokoine University of Agriculture, PO Box 3110,  
Morogoro, Tanzania.  
Email: rmakundi@suanet.ac.tz  
Fax: +255 56 3748

**Mathews**, Fiona, Wildlife Conservation Research  
Unit, Department of Zoology, University of Oxford,  
South Parks Road, Oxford, OX1 3PT, UK.  
Email: fmathews@ermine.ox.ac.uk  
Fax: +44 1865 310447

**Mills**, James N., Special Pathogens Branch, Division  
of Viral and Rickettsial Diseases, National Center for  
Infectious Diseases, Centers for Disease Control and  
Prevention (Mailstop G-14), 1600 Clifton Road,  
Atlanta, Georgia 30333, USA.  
Email: jum0@cdc.gov  
Fax: +1 404 639 1118

**Mwanjabe**, Patrick S., Rodent Control Centre, PO  
Box 3047, Morogoro, Tanzania.  
Email: Rodent@suanet.ac.tz

**Ning**, Zhendong, Shanxi Institute of Plant  
Protection, Chinese Academy of Agricultural  
Science, Taiyuan, Shanxi 030031, P.R. China.  
Fax: +86 0351 7127683

**Nookarn**, Piyanee, Agricultural Zoology Research  
Group, Division of Entomology and Zoology,  
Department of Agriculture, PO Box 9-34, Bangkok  
10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 405396

**Oguge**, Nicholas O., Department of Zoology,  
Kenyatta University, PO Box 43844, Nairobi, Kenya.  
Email: noguge1@excite.com *or*  
noguge@africaOnline.co.ke

**Pech**, Roger P., CSIRO Wildlife and Ecology, GPO  
Box 284, Canberra, ACT 2601, Australia.  
Email: roger.pech@dwe.csiro.au  
Fax: +61 2 6242 1505

**Promkerd**, Prasarttong, Agricultural Zoology  
Research Group, Division of Entomology and  
Zoology, Department of Agriculture, PO Box 9-34,  
Bangkok 10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 9405396

**Rahmini**, Research Institute for Rice, Departemen  
Pertanian, Jl. Raya No. 9, Sukamandi, Subang 41256,  
Indonesia.  
Email: sudarmaji@vision.net.id  
Fax: +62 260 520157

**Rakotondravony**, Daniel, Département de Biologie  
Animale, Université d'Antananarivo, BP 906,  
Antananarivo, Madagascar.

**Salmon**, Elizabeth, CSIRO Plant Industry, GPO Box  
1600, Canberra, ACT 2601, Australia.  
Email: Libby.Salmon@pi.csiro.au  
Fax: +61 2 6246 5000

**Schiller**, John M., Lao-IRRI Project, PO Box 4195,  
Vientiane, Lao PDR.  
Email: j.m.schiller@cgiar.org  
Fax: +856 21 414373

**Sicard**, Bruno, Laboratoire de Mammalogie, IRD-  
ORSTOM (Institut de Recherche pour le  
Développement, French Scientific Research Institute  
for Development through Cooperation), BP 84,  
Bamako, Mali.  
Email: sicard@ird.ml  
Fax: +223 227588

**Singleton**, Grant R., CSIRO Wildlife and Ecology,  
GPO Box 284, Canberra, ACT 2601, Australia.  
Email: grant.singleton@dwe.csiro.au  
Fax: +61 2 6242 1505

**Suasa-ard**, Kornkaew, Agricultural Zoology Research Group, Division of Entomology and Zoology, Department of Agriculture, PO Box 9-34, Bangkok 10900, Thailand.  
Email: agrizoo@bkk1.loxinfo.co.th  
Fax: +66 2 9405396

**Sudarmaji**, Research Institute for Rice, Departemen Pertanian, Jl. Raya No. 9, Sukamandi, Subang 41256, Indonesia.  
Email: sudarmaji@vision.net.id  
Fax: +62 260520157

**Tan**, Tran Quang, National Institute for Plant Protection, Hanoi, Vietnam.  
Email: tuat@hn.vnn.vn  
Fax: +84 4 836 3563

**van Wensveen**, Monica, CSIRO Wildlife and Ecology, GPO Box 284, Canberra, ACT 2601, Australia.  
Email: Monicavw@dwe.csiro.au  
Fax: +61 2 6242 1505

**Wan**, Xinrong, Institute of Zoology, Chinese Academy of Sciences, Beijing 100080, P.R. China.  
Email: xwan@public.east.cn.net  
Fax: +86 10 62555689

**Wang**, Mengjun, Institute of Zoology, Chinese Academy of Sciences, Beijing 100080, P.R. China.  
Fax: +86 10 62555689

**Wang**, Quanye, Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Xining 810001, P.R. China.

**Wei**, Wanhong, Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Xining 810001, P.R. China.  
Fax: +86 971 6143282

**Zhang**, Zhibin, National Key Laboratory of Integrated Pest Management on Insects and Rodents, Institute of Zoology, Chinese Academy of Sciences, Zhongguancun Lu #19, Haidian District, Beijing 100080, People's Republic of China.  
Email: zhangzb@panda.ioz.ac.cn  
Fax: +86 10 62556418

**Zhong**, Wenqin, Institute of Zoology, Chinese Academy of Sciences, Beijing 100080, People's Republic of China.  
Email: zhongwq@panda.ioz.ac.cn  
Fax: +86 10 62555689

**Zhou**, Wenyang, Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Xining 810001, P.R. China.  
Fax: +86 971 6143282

# Abbreviations

ACIAR	Australian Centre for International Agricultural Research	IPM	integrated pest management
AHF	Argentine haemorrhagic fever	IRD-ORSTOM	Institut de Recherche pour le Développement; the French Scientific Research Institute for Development through Cooperation
AZRG	Agricultural Zoology Research Group (Thailand)	IRRI	International Rice Research Institute
CIAP	Cambodia–IRRI–Australia Project	Lao PDR	Lao People’s Democratic Republic
CRS	Catholic Relief Service	MCMV	murine cytomegalovirus
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)	MIA	Murrumbidgee Irrigation Area (Australia)
EBRM	ecologically-based rodent management	PICA	Predict, Inform, Control, Assess (strategy)
ECC	endogenous circadian clock	RPM	rodent pest management
ECTV	ectromelia virus	SNV	Sin Nombre virus
EWS	early wet season (crop)	TBS	trap–barrier system
GMO	genetically modified organism	TBS+TC	TBS plus trap crop
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)	TBW	total body water
HFRS	haemorrhagic fever with renal syndrome	VVIC	viral-vectored immunocontraception
HPS	hantavirus pulmonary syndrome	ZP	zona pellucida (glycoproteins)

# List of Species

Species name	Common Name	Species name	Common Name
<i>Acomys caharinus</i>		<i>Hystrix cristata</i>	crested porcupine
<i>Apodemus agrarius</i>	striped field mouse	<i>Hystrix indica</i>	Indian crested porcupine
<i>Apodemus flavicollis</i>	yellow-necked field mouse		
<i>Apodemus sylvaticus</i>	wood mouse; long-tailed field mouse	<i>Liomys salvini</i>	Salvin's spiny pocket mouse
<i>Arvicanthis niloticus</i>	unstriped grass rat; Nile grass rat		
<i>Bandicota bengalensis</i>	lesser bandicoot rat	<i>Mastomys coucha</i>	multimammate rat
<i>Bandicota indica</i>	large bandicoot rat	<i>Mastomys erythroleucus</i>	multimammate rat
<i>Bandicota savilei</i>		<i>Mastomys huberti</i>	multimammate rat
<i>Bolomys obscurus</i>	dark field mouse	<i>Mastomys natalensis</i>	multimammate rat
<i>Brachyuromys ramirohitra</i>		<i>Marmota himalayana</i>	Himalayan marmot
		<i>Meriones unguiculatus</i>	Mongolian gerbil; clawed jird
<i>Calomys callosus</i>	"laucha grande"	<i>Micromys minutus</i>	harvest mouse
<i>Calomys musculus</i>	corn mouse	<i>Microtus brandti</i>	Brandt's vole
<i>Castor canadensis</i>	North American beaver	<i>Microtus californicus</i>	California vole
		<i>Microtus fortis</i>	oriental vole
<i>Castor fiber</i>	Eurasian beaver	<i>Microtus mandarinus</i>	brown vole
<i>Citellus dauricus</i>	Daure ground squirrel	<i>Microtus oeconomus</i>	root vole
<i>Clethrionomys glareolus</i>	bank vole	<i>Microtus pennsylvanicus</i>	meadow vole
<i>Clethrionomys rufocanus</i>	red backed vole	<i>Mus caroli</i>	rice mouse
<i>Cricetomys gambianus</i>	African giant pouched rat	<i>Mus cervicolor</i>	ryukyu mouse
		<i>Mus domesticus</i>	house mouse
<i>Cricetulus barabensis</i>	striped hamster	<i>Mus musculus</i>	house mouse
<i>Cricetulus longicaudatus</i>	lesser long-tailed hamster	<i>Muscardinus avellanarius</i>	dormouse
<i>Cricetulus triton</i>	rat-like hamster	<i>Myocastor coypus</i>	coypu; nutria
<i>Cynomys ludovicianus</i>	plains prairie dog	<i>Myospalax baileyi</i>	plateau zokor
		<i>Myospalax fontanieri</i>	Chinese zokor
<i>Dipodomys panamintinus</i>	Panamint kangaroo rat	<i>Nesokia indica</i>	short-tailed bandicoot rat
		<i>Nesomys rufus</i>	
<i>Geomys bursarius</i>	eastern American pocket gopher; plains pocket gopher	<i>Notomys alexis</i>	spinifex hopping mouse
<i>Gerbillus nigeriae</i>	Nigerian gerbil		
		<i>Ochotona cansus</i>	Gansu pika
		<i>Ochotona curzoniae</i>	plateau pika; black-lipped pika
		<i>Ochotona daurica</i>	Daurian pika

Species name	Common Name	Species name	Common Name
<i>Oligoryzomys longicaudatus</i>	long-tailed pygmy rice rat	<i>Rattus rattus diardii</i>	Malaysian house rat
<i>Ondatra zibethicus</i>	muskrat	<i>Rattus rattus mindanensis</i> = <i>Rattus tanezumi</i>	Philippine rice-field rat
<i>Onychomys</i> spp.	grasshopper mice	<i>Rattus tiomanicus</i>	Malayan wood rat
<i>Perognathus parvus</i>	Great Basin pocket mouse	<i>Rattus villosissimus</i>	long haired rat
<i>Peromyscus boylii</i>		<i>Rhabdomys pumilio</i>	
<i>Peromyscus maniculatus</i>	deer mouse	<i>Sigmodon alstoni</i>	Alston's cotton rat
<i>Peromyscus truei</i>	big eared cliff mouse; Pinyon mouse	<i>Sigmodon hispidus</i>	cotton rat; Hispid cotton rat
<i>Pitymys irene</i>		<i>Solomys</i> spp.	tree rats
<i>Pseudomys hermannsburgensis</i>	sandy inland mouse	<i>Spalax ehrenbergi</i>	blind mole-rat
		<i>Suncus murinus</i>	common shrew
<i>Rattus argentiventer</i>	rice-field rat	<i>Tachyoryctes splendens</i>	African mole rat
<i>Rattus bowersi</i>	Bower's rat	<i>Tatera indica</i>	
<i>Rattus colletti</i>	dusky rat	<i>Taterillus gracilis</i>	gerbil
<i>Rattus exulans</i>	Polynesian rat	<i>Taterillus petteri</i>	gerbil
<i>Rattus flavipectus</i>	buff breasted rat	<i>Taterillus pygargus</i>	gerbil
<i>Rattus germani</i>		<i>Thomomys bottae</i>	western American pocket gopher; valley pocket gopher
<i>Rattus koratensis</i>	Sladen's rat		northern pocket gopher
<i>Rattus losea</i>	lesser rice-field rat	<i>Thomomys talpoides</i>	gopher
<i>Rattus nitidus</i>	Himalayan rat		
<i>Rattus norvegicus</i>	Norway rat; brown rat	<i>Thryonomys</i> spp.	
<i>Rattus rattoides</i>	Synonym for lesser rice-field rat and Turkestan rat		
<i>Rattus rattus</i>	black rat; house rat; roof rat	<i>Xerus erythropus</i>	ground squirrel
		<i>Zygodontomys brevicauda</i>	cane mouse

# PREFACE

The seed for this book was sown in Morogoro, Tanzania, in 1996, following the strong ecological theme that emerged at an international workshop: Rodent Biology and Integrated Pest Management in Africa. Herwig Leirs and Grant Singleton were encouraged that the theme of ecologically-based rodent research came through strongly as the future direction for rodent management in developing countries in both Africa and Asia. The opportunity to germinate the seed arose in 1997 when Zhibin Zhang approached Grant Singleton and Lyn Hinds to co-convene an international conference on rodent biology and management. The focus would be broader than the Morogoro workshop and it was obvious that to augment the charm and appeal of Beijing in early autumn, an impressive line-up of international speakers would be required to attract participants to the conference. The Australian Centre for International Agricultural Research (ACIAR), the Chinese Academy of Sciences and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Wildlife and Ecology each pledged support for the conference. This led to a successful recruiting drive with all the speakers we approached accepting an invitation to present a paper at the First International Conference on Rodent Biology and Management held in Beijing in October 1998.

In January 1998, the editors approached ACIAR with the concept of a book on ecologically-based management that would bring together leading researchers of the basic biology of rodents and those charged with developing and implementing management strategies for rodent pests, especially in developing countries.

The book consists primarily of a selection of papers presented at the Beijing conference and comprises three sections. Section 1 sets the scene with contributions from leading small mammal biologists interested in theory and current paradigms of rodent biology and management. Section 2 covers state-of-the-art technologies of the different approaches to management of rodent pests—rodenticides, physical control, urban management and biological control. Section 3 describes regional case studies of rodent pest problems and progress with their management for a selection of developing countries in Asia and Africa.

Internationally, there have been two previous books of note on rodent pest management: one edited by Ishwar Prakash, published in 1988, the other edited by Alan Buckle and Robert Smith, published in 1994. Both provided a good mix of papers on the principles and practices of rodent pest management, and are compulsory reading for students and practitioners of

rodent biology and management. Our book differs from these two books in providing a considerably stronger emphasis on (i) ecologically-based management, (ii) recent developments in innovative approaches to biological control, and (iii) the problems, progress and challenges of rodent pest management in developing countries. One important element missing in our book, and in the previous two books, is a substantial contribution on rodent management in Central and South America. We hope that this void is filled in the near future. In the interim, we hope that our book is of interest and practical value to researchers in that region of the world.

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*Grant Singleton*

*Lyn Hinds*

*Herwig Leirs*

*Zhibin Zhang*

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