

Invasive Forest Insects, Introduced Forest Trees,
and Altered Ecosystems

Invasive Forest Insects, Introduced Forest Trees, and Altered Ecosystems

Ecological Pest Management in Global
Forests of a Changing World

Edited by

Timothy D. Paine

University of California, Riverside, U.S.A.



Springer

Library of Congress Control Number: 2008936124

ISBN 978-1-4020-9290-9 (PB)

ISBN 978-1-4020-5161-6 (HB)

ISBN 978-1-4020-5162-3 (e-book)

Published by Springer,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

www.springer.com

Printed on acid-free paper

Cover photo acknowledgement: The Greater St Lucia Wetland Park (GSLWP) in South Africa is a recently proclaimed World Heritage Site, 14200 ha of SiyaQhubeka land, 12000 ha commercial plantations and 2200 ha of natural vegetation, and has been incorporated into the GSLWP and game including elephant, rhino, buffalo, have unrestricted access into this area. The photograph is part of the original herd of 17 elephants that were introduced into the park in 2002.

The photograph was taken on SiyaQhubeka Forests land by Norman Neave for the Nyalazi Conservancy.

All Rights Reserved

© Springer Science+Business Media B.V. 2008

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work.

Table of Contents

Preface.....	vii
Acknowledgement.....	ix
Chapter 1 Are island forests vulnerable to invasive defoliators?.....	1
M.K. KAY	
Chapter 2 Changing forest communities: role of tree resistance to insects in insect invasions and tree introductions.....	15
F. LIEUTIER	
Chapter 3 Southern hemisphere exotic pine plantations threatened by insect pests and their associated fungal pathogens.....	53
M.J. WINGFIELD, B.P. HURLEY, S. GEBEYEHU, B. SLIPPERS, R. AHUMADA AND B.D. WINDFIELD	
Chapter 4 Native insects colonizing introduced tree species—patterns and potential risks.....	63
P. DALIN AND C. BJÖRKMAN	
Chapter 5 Biological pest control in mix and match forests.....	79
R.G. VAN DRIESCHE	
Chapter 6 Impacts of insects in forest landscapes: implications for forest health management.....	101
R.N. COULSON AND F.M. STEPHEN	
Chapter 7 Insect populations in relation to environmental change in forests of temperate Europe.....	127
A. BATTISTI	
Chapter 8 Synecology of <i>Wasmannia auropunctata</i> , an invasive ant species (Hymenoptera: Formicidae), in continuous and fragmented areas in the Brazilian Atlantic forest.....	141
C.R.F. BRANDÃO AND R.R. SILVA	

Chapter 9 Changing relationships among biodiversity, management, and
biosecurity in managed and unmanaged forests.....153
L.M. HANKS

Chapter 10 Changing the mix: new rules in regulating herbivore populations....161
T.D. PAINE

Keyword Index.....171

Species Index.....185

Preface

Movement of plant and animal species around the world has been characteristic of human activity for millennia. People have moved agricultural plants and domestic animals with them as populations have expanded and new areas are colonized. Polynesians moved food plants and animals in voyaging canoes across the Pacific. Europeans brought many domesticated animals and plants with them when they colonized the New World. They also took plants from the conquered lands back to Europe.

In addition to the intentional transport and introduction of new species, unintentional introduction of animals, plants, and diseases also occurred. The black rat and the house fly developed cosmopolitan distributions as a result of unintentional anthropogenic transport. The bacteria causing plague was unintentionally transported from Asia into North America where it is now resident in rodent populations and is occasionally transmitted to humans. Despite the regular accidental movement of species across geographic barriers, the pace of introductions was relatively slow for before the age of steam because the number of individuals moving between continents was relatively low and the speed of movement was relatively slow.

The development steam powered transport, both rail and ships, enabled more individuals and goods to move greater distances and at lower costs than had occurred previously. The movement of people and goods stimulated economic growth, development, and world trade. It also created greater stimulus for intentional movement of crops plants, livestock, domestic companion animals, game animals, and ornamental plants. Increased movement and increased trade also presented opportunities for unintentional introductions. The pace of movement accelerated once again with flight and the widespread movement of goods and people by air. Air transport shortened the travel time allowing more fragile organisms to survive transit times that would have prevented their movement under steam.

The global economy has facilitated a global flora and fauna. In particular, the global requirements for cellulose in the form of raw logs, dimension lumber, manufactured timber products, paper, paper products, and cellulose fiber have escalated dramatically in the last three decades. Many nations continue to harvest timber in their native forests, but many others have adopted plantation forest management to provide timber for their domestic and international markets. Native trees may be used in their plantations. Alternatively, timber companies may import tree species from different parts of the world to meet demand for timber with particular economic value. For example, *Eucalyptus* spp. are among the most widely planted trees in the world and form the basis for the timber industries in parts of South America, South Africa, countries around the Mediterranean, and parts of Asia. In addition, species of *Eucalyptus* are being used in plantations in Australia but well outside their native ranges on that continent. Monterey pine, *Pinus radiata*, is native to a narrow geographic range in coastal central California, but is now widely planted as a valuable plantation species in Chile, New Zealand, and South Africa.

Current plantation forestry creates environments that are very different from native forests. The trees are growing in different densities, in different age structures, in different levels of genetic variation, in different community mixes, on different

soils, in different physical environments, and often on different continents that they would in natural stands. Consequently, the trees often exhibit different patterns of growth, different physical form, and different levels of stress and resistance to herbivores or diseases. The plantation forests have different arthropod communities, including herbivores, predators and parasitoids, and saprophytes, and different microbial communities, including mycorrhizae and pathogens, than would be found in natural stands. These differences can include both reduced numbers of species as well as mixes of native and introduced species. As a result of different community compositions, the interactions among species, the communities with environmental conditions, and the ecological processes that occur in these forests may be very different and affect the trees in the stands in unpredictable ways.

The objective of this volume is to examine the ecological processes that are occurring in new forest environments. I am not referring to newly planted forests. Rather the authors of the chapters have been asked to address issues of new changes and the responses of communities to those changes. The global environment is changing, community compositions of herbivores, pathogens, or natural enemies are shifting as new species are introduced, populations of existing species are reduced in size, or host shifts occur in native species, the growing conditions are changing, all trees are being planted in new places. All of these factors have ecological, economic, and social implications that can be important for the future of new and existing forests.

Timothy D. Paine

Acknowledgement

I express my grateful appreciation and thanks for the tireless efforts of Dr. Darcy Reed, who spent countless hours reading and formatting the text of this volume and compiling the extensive index. I also thank all of the authors for their thought-provoking and timely contributions at the International Congress of Entomology in Brisbane, QLD, Australia and for their subsequent chapters. I thank them also for their patience in getting the volume into print. I also wish to thank the UC Riverside Center for Invasive Species Research and the College of Natural and Agricultural Sciences for their support.

Timothy D. Paine