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Volume 11

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Biological Invasions and Its Management in China

Volume 1

Springer

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Invading Nature - Springer Series in Invasion Ecology
ISBN 978-94-024-0946-8 ISBN 978-94-024-0948-2 (eBook)
DOI 10.1007/978-94-024-0948-2

Library of Congress Control Number: 2017930663

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer Science+Business Media B.V.
The registered company address is: Van Godewijckstraat 30, 3311 GX Dordrecht, The Netherlands

Foreword

China is one of the countries severely affected by biological invasions. By the end of 2016, at least 610 alien invasive species (AIS) had been identified in China, 50 of which are on the list of the world's 100 worst invasive species (IUCN). AIS have caused huge economic losses, estimated to be 17 billion US dollars per year. In addition, AIS negatively influence multiple ecosystems and biodiversity, leading to large-scale degradation of invaded ecosystems. Thus, biological invasions are considered as one of the biggest biosecurity issues in China.

To cope with biological invasions, a great number of research projects have been awarded by central and local governments in China since the beginning of the twenty-first century. These projects cover all aspects of biological invasions, from surveys of species distribution and damage to conducting advanced research on the mechanisms of invasion success and developing control techniques/strategies. Great progress has been made in several fields, including identifying which species have the highest possibility of being introduced into China, why AIS are successful in invasions in different regions/environments, and where they would have a high risk of causing serious damage. Moreover, Chinese scientists have successfully developed techniques for rapid early detection and field monitoring, and most importantly, effective control methods have been developed for highly invasive species. So far, we have clarified the mechanisms underlying successful invasions for several AIS, such as the asymmetric mating interactions in the whitefly *Bemisia tabaci*, and communication between pinewood nematodes, insect vectors, and associated microbes.

As an outcome of extensive researches in this field, Chinese scientists have published more than 1400 papers in ISI-indexed journals. There are also a large number of papers published in Chinese journals. Furthermore, numerous field examples of successful control activities have been implemented but not reported. To present a comprehensive view of these results, the publication of an English monograph that summarizes the major findings/experiences in China is timely. The book *Biological Invasions and Its Management in China* edited by Fanghao Wan, Mingxing Jiang, and Aibin Zhan and their colleagues covers topics of current interest and research progress in the field of biological invasions in China.

The book contains several important themes, such as what invasion problems have occurred in Chinese major ecosystems, what has been done to solve current problems, and what are the major research directions in China. In addition, the book includes findings from other parts of the world to provide comprehensive information to readers. Therefore, readers will find many areas of interesting research in this book. We expect this book to appeal widely to scientists and staff who work in the field of biological invasions.

The arrival of alien species in China and their impacts will undoubtedly continue, mainly owing to increased international trade and travel. The invasions may escalate as some of the plans to open up the country are implemented in China, such as the "One Belt and One Road" (OBOR) policy. As a result, the issues of biological invasions faced by China will also affect other countries, such as those along the OBOR. It is, therefore, crucial to promote exchanges and collaborations between Chinese scientists/governments and those overseas in the field of AIS. From this point of view, this book is expected to become a very valuable shared source of information.

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Preface

During the past decades, China has been greatly challenged by a dramatic increase in alien invasive species (AIS), leading to significant negative impacts on the economy, ecology, and even social development. Many ecosystems in China have been seriously affected by AIS, including agricultural and forest ecosystems. As a consequence, biological invasions have become a major focus for scientific research and administrative management in China, in particular since the beginning of the twenty-first century.

Our purpose in editing this book stems from the research advances that have been achieved in the last two decades in the field of biological invasions in China. These advances relate not only to scientific research but also to the management of invasive species. Our book will provide readers with information on what we have already done and what we propose to do in future studies, by reviewing a large volume of research findings and management experiences in China.

Exchanges between China and other countries are increasing. China has a very diverse range of ecosystems and is developing extensive trade in multiple categories of products. These trends are predicted to persist for the next few decades, particularly after the implementation of "One Belt and One Road" strategy. Human-mediated introductions of AIS create some features of biological invasions specific to China. Clearly, studying the trend of new types of invasions, as well as the possible mechanisms underlying invasions, will contribute to the control and management of AIS and will also enhance international collaborations to mitigate the negative impacts of AIS.

Despite the enormous efforts dedicated to control, the level and rate of invasions are continuing to increase due to the dramatic growth in international trade and travel, as well as in the nationwide transport of multiple categories of products and materials. Central and local governments need to exert more efforts on regulatory and administrative activities. The public will need to increase their awareness of biological invasions and to be more extensively involved in the control of AIS. Overall, some serious invasive species have not been effectively managed and are still causing serious damage to China, while new ones are being introduced that are not yet recognized because their populations are small or they have not caused

environmental problems. There is little doubt that many fundamental topics remain to be answered in invasion biology. All these problems are examined in our book, which will benefit readers who want a comprehensive understanding of the position on biological invasions and relevant research in China.

Although we aim to provide a thorough coverage of the topic to readers, this book cannot cover all aspects of biological invasions in China. Articles by Chinese scientists are being published at a rapid rate, and thus readers may find that some valuable results are not included in our book. Moreover, as biological invasion itself is a fast-growing field, readers will find that some issues in the book have not yet been solved or even examined in detail. We hope that this book will promote active discussions in the field and draw attention to the problem of invasive species in China.

This book consists of two major parts: first, Chaps. 2, 3, 4, 5 and 6 that represent biological invasions in different types of ecosystems and, second, Chaps. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32 and 33 that address the invasion and management of representative invasive species. For each chapter, we include the results of the most relevant studies and management strategies/techniques. An index at the end of the book will help readers to find topics of interest to them. The book will be of interest to researchers, regulatory administrators, environmental managers, and the public.

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Acknowledgments

We would like to thank foremost all authors for their huge efforts dedicated to this book, which finally makes the book a reality. We are very grateful to the scientists who generously provided the information, figures, photos, and articles we requested. We wish to appreciate the reviewers who kindly read the drafts and provided invaluable suggestions and comments for our chapters. We also offer special thanks to the series editor, Abbey Huang at Springer, for her invaluable assistance in preparing this volume and to Atma Biswal and his colleagues for their assistance during the production process.

Numerous scientific findings described in our book are generated from the research projects financially supported since 2002 by the Ministry of Science and Technology (MOST), Ministry of Agriculture (MOA), National Natural Science Foundation of China (NSFC), etc., particularly the national projects of "National Key Research and Development Programs" (2016YFC1200600, 2016YFC1202100, 2016YFC1201200) and the "948 Program" (2016-X48).

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