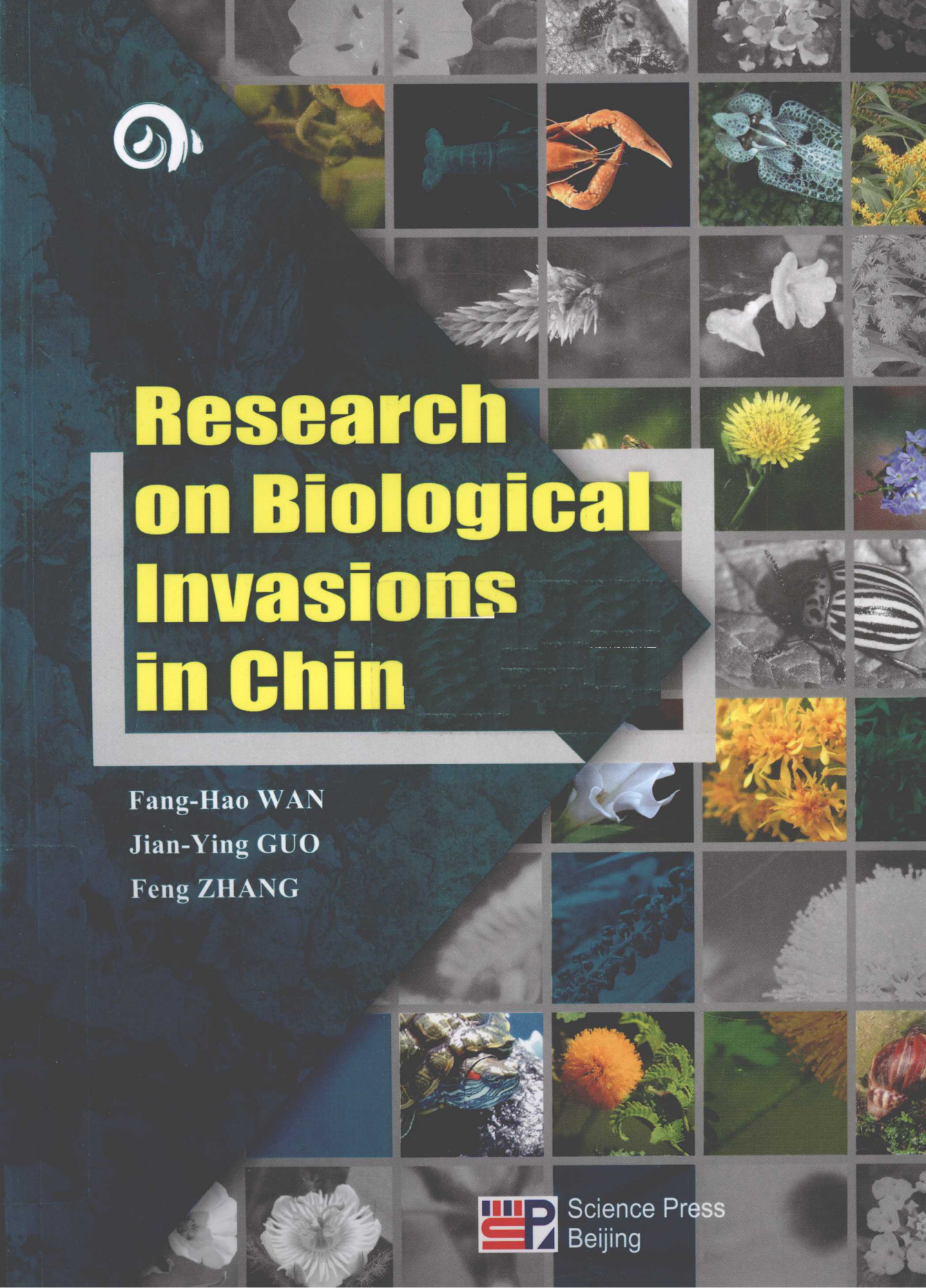

Research on Biological Invasions in Chin

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Science Press
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- Reproductive and Physiological Reaction Mechanisms of *Bemisia tabaci* Biotypes B and Q under High Temperature Stress (Grant no. 30800722)

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- Prevention and Management Strategies of Invasive Alien Species in the Agricultural and Forestry Ecosystems in China (2007)

EU Asia-Link Project:

- Tackling Biosecurity between Europe and Asia: Innovative Detection, Containment and Control Tools of Invasive Alien Species Potentially Affecting Food Production and Trade (BIOSEC) (CN/Asia-link/035 (129-036))

CABI Development Fund:

- Partnerships Project in Invasive Alien Species (VM60013)

Dr. Fang-Hao WAN

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Dr Fang-Hao Wan has being working on the research of invasion ecology and biological control of agricultural alien pests for more than 20 years. He has got extensive research experiences with prevention and management of invasive insects and weeds, especially in agriculture and natural ecosystems, and biological control of agricultural insect pests and weeds.

Because of his distinctive contribution to the development of research and management of invasive alien species (IAS) in China, Dr Wan has been reconginzed as a National Chief Leading Scientist in Biological Invasions. Since 2002, being a chief-scientist of national-wide research projects on IAS in China, he has been organizing more than 12 national research teams to focus on the basic and applied research on understanding invasive mechanisms of IAS, and developing management technologies for risk assessment, early-warning system, rapid detection, field surveillance, biological control of agricultural and forest invaders, and eco-restoration of invaded environments.

Between 2002 and 2008, Dr Wan, with his seven national working groups, has completed the first phase study for "Invasion Biology and Control Strategy of Alien Species in Agriculture and Forestry" under the National Basic Research and Development Program funded by Chinese Ministry of Science and Technology (MOST). Building up on that, he has successfully got funding support from MOST for the next five years research "Invasion Mechanisms and Management of Major Alien Species". Since 2006, the other five national working groups have been also established to work on the MOST-funded project of "Field Survey and Bio-security Assessment of IAS in China".

Dr Wan has established wide international collaborations on a number of projects on IAS and biological control of agricultural pests. He has been working closely with CABI scientists on management and risk analysis of IAS. His research group has also participated in the Asia Link Project - Tackling Biosecurity between Europe and Asia: Innovative Detection, Containment and Control Tools of Invasive Alien Species Potentially Affecting Food Production and Trade (2007-2010, funded by EC).

Dr Wan has published over 230 papers in peer-reviewed journals. Recently, he with his national core members of IAS working groups are working on a series of books on Invasion Biology, and planning to set up Invasion Biology discipline in China. He has chaired the Sub-Society for Biological Invasion, Chinese Society of Plant Protection since 2008.

Dr Wan is a Deputy Editor-in-chief of *Acta Entomologica Sinica*, and an Editor of *Agricultural Sciences in China, Biodiversity Science, Chinese Journal of Biological Control, Journal of Environmental Entomology* and *Chinese Bulletin of Entomology* etc, respectively.

Dr. Jian-Ying GUO

Associate Professor, Vice Director of Department of Biological Invasion, Institute of Plant Protection, Chinese Academy of Agricultural Sciences

Dr Jian-Ying Guo has being working on the invasion biology and management of agricultural invasive alien pests and weeds, ecological evaluation of transgenic crops, biological control and integrated pest management for over 10 years.

Dr Guo is leading relevant projects such as National Key Technologies Research and Development Program of China "Sustainable Management of Important Invasive Alien Species in Agriculture", and National Natural Science Foundation Project "Reproductive and Physiological Reaction Mechanisms of *Bemisia tabaci* Biotypes B and Q under High Temperature Stress". She has also been involved in the National Basic Research and Development Program of China "Invasion Mechanisms and Management of Major Alien Species" and "Invasion Biology and Control Strategy of Alien Species in Agriculture and Forestry", EU Asia-Link Project "Tackling BIOSECurity between Europe and Asia: innovative detection, containment and control tools of Invasive Alien Species potentially affecting food production and trade (BIOSEC)", and EU project "Assessment of the Environmental and Agronomic Appropriateness of Bt Transgenic Cotton in Small-producer IPM Systems in China", etc.

Dr Guo received her BSc and MSc in Department of Biology, Nanjing University in 1995 and 1997, respectively. She got her PhD in Department of Agricultural Entomology and Pest Management, Nanjing Agricultural University in 2007. She started her research career in Institute of Biological Control, Chinese Academy of Agricultural Suiences in 1997.

Her peer-reviewed papers have been published on *Environmental Entomology, Journal of Applied Entomology, The Veliger, Zootaxa, Science in China (C. Life Sciences), Chinese Bulletin of Entomology, Chinese Journal of Applied Ecology, Acta Phytophylacica Sinica, Chinese Journal of Eco-Agriculture, Cotton Science*, etc. Besides, she got three Scientific Progress Awards, namely "Constructing IPM System for Management of Tobacco Pests" awarded from the National Tobacco Bureau in 2004, "Mass Production Techniques of Natural Enemies" awarded from Beijing Science & Technology Society in 2005, and "Key Techniques of Industrialization for Natural Enemies" awarded from China Society of Plant Protection in 2008.

Dr. Feng ZHANG

Scientific Project Coordinator of CABI Southeast and East Asia – China

Dr Feng Zhang's research has focused on classical biological control of invasive alien species, specializing host specificity tests of arthropod biological control agents in the context of evaluation of potential biological control agents for management of invasive alien pests.

Dr Zhang has a broad background in agriculture with major research experience in biological control of insect pests, ecology-based integrated pest management (IPM), chemical ecology of insects, plant-insect and insect-parasitoid interactions. He has insect quarantine and rearing experience. His field extension experience includes field IPM work and consultancy visits in East Asian countries (China, DPR Korea). He has also extensive experience on mass production technology of biological control agents (e.g., *Trichogramma* wasps) and biopesticides (e.g., *Bacillus thuringiensis*).

Dr Zhang received his BSc in Agriculture from Qingdao Agricultural University (former Laiyang Agricultural College, Shandong Province, China) in 1994. He went on to earn an MSc in Plant Medicine at Institute of Medicinal Plant, the Chinese Academy of Medical Sciences / Peking Union Medical College in 1997, and a PhD in Zoology at Institute of Zoology, The Chinese Academy of Sciences (CAS) in 2000, Beijing, China. Prior to present position, he was a Post-doc Research Scientist at the CABI Europe - Switzerland, and Assistant Professor at the Institute of Zoology, CAS. He also serves as a liaison secretary of MoA-CABI Joint Laboratory for Biosafety, located at Institute of Plant Protection, Chinese Academy of Agricultural Sciences.

His peer-reviewed papers have been published on *Physiological Entomology, Biological Control, Biocontrol Science and Technology, Bulletin of Entomological Research, Chinese Science Bulletin* and *Acta Ecologia Sinica* etc. He has also been involved in organising a number of international conferences on invasive alien species, such as APEC Workshop on Invasive Alien Species (19-22 September 2005, Beijing, China) and International Congress on Biological Invasions (2-6 November 2009, Fuzhou, China).

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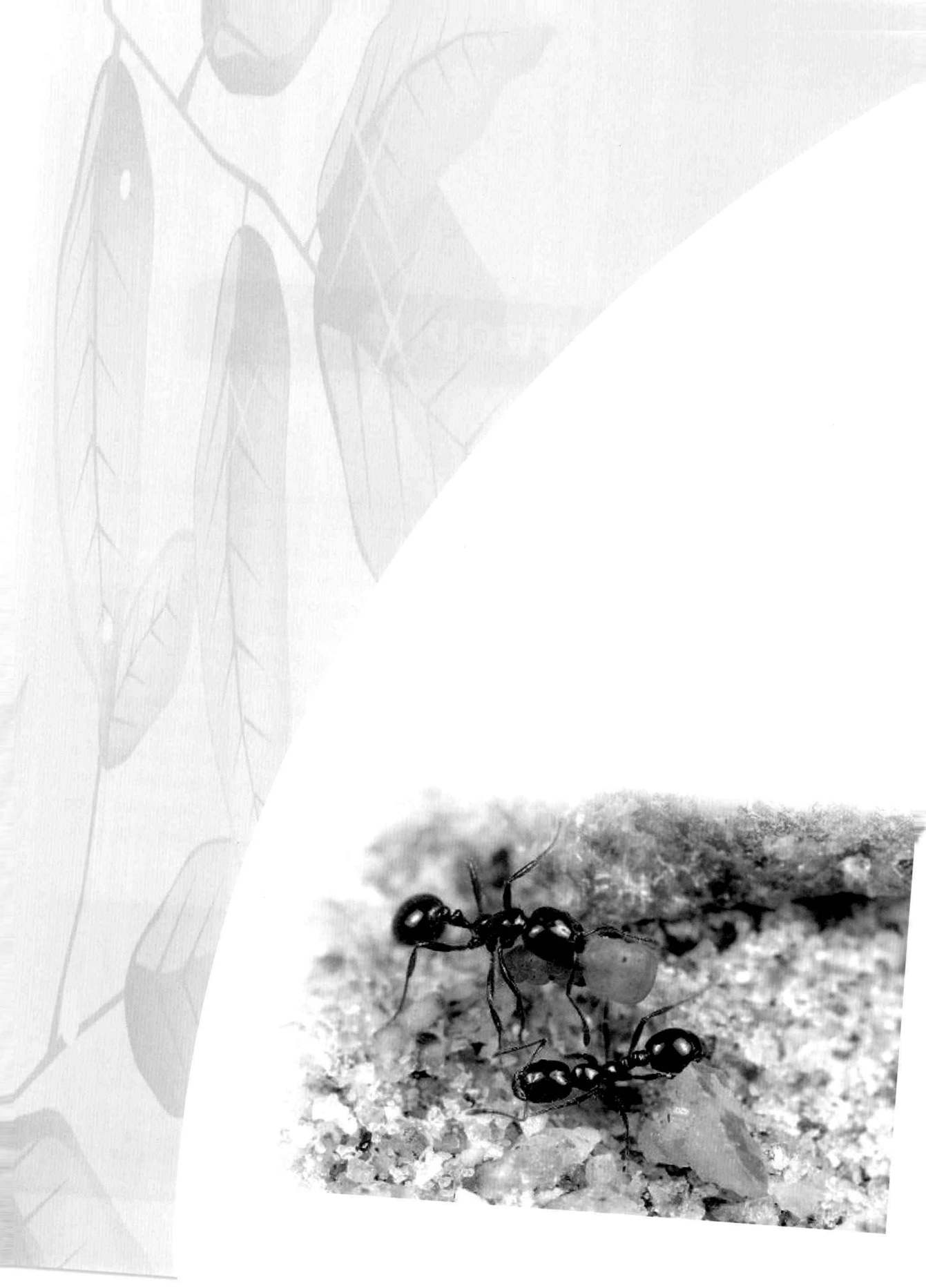
CONTENTS



INTRODUCTION

The 21st century has witnessed enormously global changes. The rapid development of international trade, tourism and transportation are facilitating the migration, invasion, spread and dispersal of alien species to a new environment. Therefore, exchange and migration of alien species among continents have been accelerated with increasing dangers of biological invasions. Invasive alien species (IAS) have put great threats on living species and ecological safety in various ecosystems of the planet. Meanwhile, modern agricultural production (including agriculture, forestry, animal husbandry and aquiculture etc) relies partly on introduction and exchange of species resources. Purposeful share of biological diversity brings enormous economic benefits as well as concomitant hazards of IAS. Hence, prevention and control of IAS has become a common issue to be tackled for sustainable development of global agriculture (Wan *et al.*, 2008a).

China Encounters Severe Challenge from Biological Invasions

China is a big agricultural country where natural and biological disasters frequently break out. Without any doubt, IAS would make the already serious situation even worse and cause greater pressure on agricultural production and fragile ecosystem. In fact, China suffers huge damage from biological invasions. IAS have already put serious threats on the economy, ecological security, social well-being and national interest. IAS has caused economic losses and ecological disasters in various ecosystems – agricultural lands, forests, grasslands, islands, fishery, wetlands, rivers, marine and natural reserves. IAS has also caused decrease of wildlife resources, bio-pollution of environment and negative effects on public health.

Invasive Alien Species Reduce Biological Diversity in China

China is one of the world's hotspots of biodiversity. However, 4,000-5,000 higher plants species are at the edge of extinction or nearly extinction, which account for 12% to 20% of all the higher plants species in China (Lin, 2008). This phenomenon has been worsened by IAS in recent years. There are about 520 IAS invading into China in last century, in which 50 species are listed among "100 of the world's worst invasive alien species" published by the World Conservation Union (IUCN). These invaders severely threaten

Crofton weed [*Eupatorium adenophorum* (*Ageratina adenophora*. Syn)]

China's biodiversity and protection of genetic resources (Wan *et al.*, 2002, 2005, 2008a, 2008b). For example, crofton weed (*Eupatorium adenophorum*), an invasive alien weed has formed mono-dominant community in the area invaded by its strong reproductive capacity and rapid dispersal of seeds as well as its competition and allelopathy effects to repel surrounding native plants (Liu, 1989; Yang *et al.*, 2006). The weed spreads in large areas in southwestern China, excluding a large number of native plants and simplifies flora composition as well as corresponding fauna.

Invasive Alien Species Aggravate Ecological Erosion in Specific Areas in China

Smooth cordgrass (*Spartina alterniflora*)

China is a vast country with complex climates. It covers five climate zones: cold-temperate, temperate, warm-temperate, subtropical, and tropical. China has had varied ecosystems: natural forest protection zones, natural reserves, water and soil conservation zones, shelterbelts, deserts, wetlands, forests, grasslands, agricultural ecosystems and alpine ecosystems of Qinghai-Tibet Plateau (Liu, 1995). IAS can interfere and jeopardize both ecosystem structure and function, and result in irreversible catastrophe of specific ecosystems in extreme cases. In recent years, native species have been repressed or excluded by invasion and fast spread of crofton weed, smooth cordgrass (*Spartina alterniflora*), mile-a-minute (*Mikania micrantha*), Canada goldenrod (*Solidago canadensis*), etc. These invaders give rise to vanishing and extinction of native species, and thus lead to degradation of native biocommunity and loss of biodiversity. For example, extensive spread of smooth cordgrass has not only destroyed habitat of neritic organisms, but also competed with native plants for growing space, which finally led to disappearance of mangrove trees and impossible restoration of habitat conditions in such areas that had been invaded (Chen *et al.*, 2004).

Invasive Alien Species Intensify Greater Losses from Agricultural Pests

Grain and economic crops are vital to China. Agricultural crops such as grains, oil crops, cotton, bast fiber crops, sugar crops, tobacco, herbs, fruits and vegetables were planted in total 153,463.9 kilohectares (kha) with gross product RMB 2,465.887 billion in 2007. Among them, 365,342.4 kha crops were infested by plant diseases