

Hai Ren *Editor*

Conservation and Reintroduction of Rare and Endangered Plants in China



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KUNMING, CHINA



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Hai Ren

South China Botanical Garden, CAS

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Preface

In the face of unprecedented biodiversity losses and global change, effective approaches for the conservation of rare and endangered plant species are urgently required. The major approaches to integrative plant conservation include in situ conservation, ex situ conservation, and reintroduction. Reintroduction may be especially effective at protecting and rescuing rare and endangered plants.

China has protected about 65% of the vascular plant communities through in situ conservation in natural reserves and national park systems and has preserved about 60% of the plant species through ex situ conservation in botanical gardens and other ex situ conservation facilities. However, we know less about reintroduction in China. Throughout the book, we and our invited authors explore to what extent information about reintroduction of plants is currently available in China.

This book is composed of two parts. Part I introduces the plant diversity and its conservation in China, and Part II displays some cases of reintroduction of rare and endangered plants in China. The majority of the chapters in the book are devoted to the case studies of reintroduction.

Books such as this one become a reality only with the support and involvement of many people. The editors are indebted to the team of enthusiastic authors, all famous experts in the fields in China, who have made available experience. The editors divide their work as follows: Prof. Hai Ren designed the contents and organized the manuscripts. Prof. Hongfang Lu edited Chaps. 1–4, Dr. Hongxiao Liu edited Chaps. 5–20, Director Ju Zhou co-organized the manuscripts and co-conceived the contents, Prof. Yan Zeng edited tables, photos, and figures. Thanks to Prof. Elizabeth Platt Hamblin for editing English. We thank the anonymous reviewers for their constructive comments. We are very grateful to Dr. Xin Zhu and Beracah John Martyn for their careful fine-tuning of the editorial work at press.

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that this small book will be of value in stemming the tide of plant diversity loss and unsustainable development in China and even in the world. This book is dedicated to Convention on Biological Diversity-COP 15, which will be held in 2021 in Kunming, China.

Guangzhou, China
November 12, 2019

Hai Ren

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Prof. Hongfang Lu, Dr. Hongxiao Liu, Director Ju Zhou, and Prof. Yan Zeng are Associate Editor-in-Chief.

Prof. Hongfang Lu edited Chaps. 1–4, Dr. Hongxiao Liu edited Chaps. 5–20, Director Ju Zhou co-organized the manuscripts and co-conceived the contents, Prof. Yan Zeng edited tables, photos, and figures.

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Conservation Translocation of the Rare and Endangered Tree *Euryodendron excelsum* in South China



Hai Ren, Qianmei Zhang, Yiming Fan, Zeyuan Zou, and Yi Xu

Abstract *Euryodendron excelsum* H. T. Chang is an evergreen tree and a wild plant with extremely small populations. There are no more than 200 individuals of this species at ten isolated sites in the wild. The distribution, conservation status, ecological and biological characteristics, genetic diversity, reproductive biology and technique, seed biology, and cultivation of *E. excelsum* were studied. Reintroduction experiments including augmentation and translocation were conducted at Yangchun City and Guangzhou City of Guangdong, Hekou County, and Jinghong City of Yunna. The survival rate of cuttings was about 20%. Both the survival rate and growing speed of the augmentation individuals were greater than that of the translocated individuals. As a species with high level of genetic variation, rational collocation of subpopulation individuals of *E. excelsum* during reintroduction is needed.

Keywords Augmentation · Genetic diversity · Wild plant with extremely small population · Cutting

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1 Introduction

Euryodendron excelsum H. T. Chang is an evergreen tree in the *Euryodendron* genus of family Theaceae (Fig. 1). It has been listed as a critically endangered species by the International Union for Conservation of Nature (IUCN) and, as a wild plant with extremely small populations, is considered as a second-class protected plant in China (Shen et al. 2009). *E. excelsum* generally grows under forests with latosol or lateritic red soil. There are no more than 200 individuals of this species in the wild (Fig. 2). They distribute at ten isolated sites in Yangchun City, Guangdong Province, South China. Individuals of *E. excelsum* show a high level of genetic variation both within and between populations because of habitat fragmentation (Ren et al. 2019). Two populations in neighboring Guangxi Zhuang Autonomous Region have become extinct because of human destruction (Shen et al. 2007).



Fig. 1 The individual, flowers, and fruit of *Euryodendron excelsum*



Fig. 2 The habitat of *Euryodendron excelsum*

2 Description of Reintroduction

2.1 Feasibility

Professor Wang Yuehua at Yunnan University and Professor Ren Hai at South China Botanical Garden of Chinese Academy of Sciences have studied the distribution, conservation status, ecological and biological characteristics, genetic diversity, reproductive biology and technique, seed biology, and cultivation of *E. excelsum* since 2000 (Shen et al. 2016; Ren et al. 2019). They established reintroduction sites at Yangchun City and Guangzhou City of Guangdong, Hekou County, and Jinghong City of Yunnan after 2002. *E. excelsum* seeds are nondormant, and about 70% germinate. The survival rate of cuttings is about 20% (Shen et al. 2016). Zhang (2018) reported a successful tissue culture for this species.

2.2 Implementation

They obtained about 400 seedlings by seed germination and conducted two experimental translocations. In one case, they augmented an existing population (Ehuangzhang Nature Reserve, Yangchun City). In the other case, they conducted conservation introduction, i.e., they introduced the species at a site outside of its known historical range (Hekou County of Yunnan Province; Jinghong City of Yunnan; South China Botanical Garden, Guangzhou City). The initial height of all 3-year-old seedlings was 35.1 ± 2.1 cm at the time of transplantation. The seedlings were watered and fertilized during the first month after transplanting. The experimental sites were not fenced. In addition, they proposed successfully to the local government to establish small protected sites for conserving the remaining wild individuals in 2012. They also established an ex situ conservation section at Ehuangzhang Nature Reserve in 2012 (Zhang 2014).

2.3 Post-planting Monitoring

After transplantation, they monitored the survival and height of all individuals (Fig. 3). The monitoring was carried out once per month during the first year and once per year thereafter. Microhabitats and soils were also monitored. About 90% of the seedlings survived after 38 months. The height of the augment individuals was



Fig. 3 Monitoring the growth of *Euryodendron excelsum* conservation translocation individuals

85.2 ± 5.1 cm, and that of the conservation introduced individuals was 56.5 ± 8.3 cm after 38 months. Both the survival rate and growing speed of the augmentation individuals were greater than that of the introduced individuals (Ren et al. 2019). The individuals at Ehuangzhang Nature Reserve grow up to 8 m and blossomed and yielded fruits after 2014.

3 Problems and Recommendations

- The local farmers or thieves occasionally intentionally stole the wild individuals.
- *E. excelsum* grows slowly, but arbuscular mycorrhizal fungi can increase seedling survival and growth.
- The endemic, rare, and endangered plants with narrow distributions may adapt to climate change by rapidly altering their morphological, anatomical, and physiological traits.
- As a species with high level of genetic variation, rational collocation of subpopulation individuals during reintroduction is needed.

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