



Occurrence and damage of invasive alien plants in Dehong Prefecture, western of Yunnan Province



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ABSTRACT

Alien invasive plants are a serious threat to natural and agricultural systems, especially in areas with sensitive habitats and high value crops. Dehong Prefecture, western Yunnan Province, China is vulnerable to invasive plants and its current status of invasive alien plants is assessed in this article. We compiled a comprehensive list of invasive alien plants with background information from 2013 to 2015, including origin, life form, habit, distribution, affected crop, and damage. The 90 invasive alien plant species in Dehong Prefecture are represented by 28 families and 66 genera, with the three largest families, Asteraceae, Poaceae and Fabaceae, accounting for 48.9% of all species. The proportion of invasive alien plants originating from the Americas, Europe, Asia, and Africa were 68%, 11%, 10%, and 9%, respectively. Almost all invasive alien plants were found in five cities or counties in Dehong Prefecture, and there were more invasive plant species in Ruili City, Luxi City, Yijiang County, and Longchuan County than Lianghe County. Most invasive alien plants were herbs (84.4%), with annual and perennial plants forming equal proportions (both comprised 43.3%). There were 44 invasive plant species rated as causing minor damage, destructive I grade (49% of all species), followed by 27 species rated at intermediate II grade (30%) and 19 species at heavy damage III grade (21%). Most invasive alien plants were both agricultural and environmental species thus negatively impacting both crop production and ecosystems, often significantly. The major infested crops were vegetables, sugarcane, maize, and orchard crops. Given the large number of alien plant invaders, it was concluded that Dehong Prefecture has become a major “window” for foreign alien plants entering in Yunnan Province and even for China as a whole. More attention should be paid to this issue, and effective measures should be developed to manage the expansion and damage caused by invasive alien plants.

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1. Introduction

An alien species is a species occurring outside its native distribution. An invasive alien species is a species which becomes established in natural or semi-natural ecosystems or habitats, is an agent of change, and threatens native biological diversity [1,2]. Invasive alien species have caused great economic harm, biodiversity loss, environmental problems, and even threatened human and animal health [1,3,4]. They alter ecosystem processes [5], decrease native species abundance and richness via competition, predation, hybridization and indirect effects [6,7], change community structure [8] and alter genetic diversity [9, 10]. Moreover, a great deal of evidence shows, as international trade and economic industrialization increases, the magnitude of this threat is increasing globally [11,12]. Due to particular local geological and

ecological conditions, Yunnan Province in southwest of China is especially vulnerable to the establishment of invasive species of foreign origin [13–15]. In terms of economic damage by invasive species, Yunnan Province is one of the most seriously affected areas in China and increased international trade and associated human disturbance threatens to further compound invasion risk [14]. As of 2012, Shen et al. [14] reported 186 invasive weeds belonging to 41 families and 122 genera occurring in farm fields in Yunnan Province. Biological invasion has resulted in significant ecological disasters and huge economic losses, and will continually threaten the biological and ecological security of Yunnan Province [13–15], especially in some border regions of Yunnan Province, such as Dehong Prefecture.

Dehong Prefecture is situated in the west boundary area of Yunnan Province, alongside neighboring Baoshan City to the east and northeast, and shares a boundary of 503.8 km with Burma in the south, west and northwest [16]. The region is part of the “Gold Cross” for biological diversity of the earth [17,18]. Dehong Prefecture is the “Bridgehead-Golden Port” of Chinese southern Indian Ocean strategy and an important

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Table 1
Summary of the invasive alien plants in Dehong Prefecture.

Family	Scientific name	Life form and habit	Origin	Distributed county or city	Main affected crops	Destructive grade
Amaranthaceae	<i>Alternanthera philoxeroides</i>	PH	South and Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Rice, vegetable, sugarcane, orchard	III
	<i>Alternanthera pungens</i>	PH	Central America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Rice, sugarcane	I
	<i>Amaranthus hybridus</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, sugarcane, vegetable, orchard	II
	<i>Amaranthus blitum</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, sugarcane, vegetable, orchard	I
	<i>Amaranthus tricolor</i>	AH	Tropical Asia	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, sugarcane, vegetable	I
	<i>Bassia scoparia</i>	AH	Southeast Russia	Luxi, Ruili, Yingjiang	Orchard	I
	<i>Celosia argentea</i>	AH	Africa	Luxi, Ruili, Yingjiang, Longchuan	Vegetable, orchard	I
	<i>Chenopodium hybridum</i>	AH/PH	Europe and West Asia	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	II
	<i>Dysphania ambrosioides</i>	AH/PH	South and Central America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	II
Apiaceae	<i>Coriandrum sativum</i>	AH/BH	Europe	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Vegetable	I
Araceae	<i>Pistia stratiotes</i>	AH/PH	Brazil	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Rice	I
Asparagaceae	<i>Agave sisalana</i>	PH	Mexico	Luxi, Ruili, Yingjiang, Longchuan	Orchard	I
Asteraceae	<i>Ageratina adenophora</i>	PS	Mexico	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Orchard, sugarcane	III
	<i>Ageratum conyzoides</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Aster subulatus</i>	AH	North America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Vegetable, sugarcane	II
	<i>Bidens frondosa</i>	AH	North America	Luxi, Ruili, Yingjiang, Longchuan	Rice	I
	<i>Bidens pilosa</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Bidens pilosa</i> var. <i>radiata</i>	AH	South and Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Chromolaena odorata</i>	PH	South and Central America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Sugarcane, orchard	III
	<i>Cosmos bipinnatus</i>	AH	Central America	Luxi, Ruili	Orchard	I
	<i>Crassocephalum crepidioides</i>	AH	Tropical Africa	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	I
	<i>Erigeron bonariensis</i>	AH/BH	South and Tropical America	Luxi, Ruili, Longchuan	Orchard	I
	<i>Erigeron canadensis</i>	AH	North America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Vegetable, orchard, sugarcane, maize	I
	<i>Erigeron sumatrensis</i>	AH/BH	South America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Vegetable, orchard, sugarcane, maize	III
	<i>Galinsoga quadriradiata</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Galinsoga parviflora</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Mikania micrantha</i>	PV	South and Central America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard, sugarcane	III
	<i>Parthenium hysterophorus</i>	AH	South and Tropical America	Luxi, Ruili, Yingjiang	Sugarcane, vegetable	I
	<i>Praxelis clematidea</i>	AH	South America	Luxi, Ruili, Yingjiang	Sugarcane	I
	<i>Sonchus oleraceus</i>	AH/BH	Europe	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, vegetable, orchard	I
	<i>Synedrella nodiflora</i>	AH	South America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, orchard, sugarcane	III
	<i>Tagetes erecta</i>	AH	Mexico	Luxi, Ruili, Yingjiang, Longchuan	Vegetable, orchard	I
<i>Tithonia diversifolia</i>	PS	Mexico	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Sugarcane, orchard	III	
Brassicaceae	<i>Tridax procumbens</i>	PH	Tropical America	Luxi, Ruili	Orchard	I
	<i>Lepidium virginicum</i>	AH/BH	North America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Vegetable, wheat, sugarcane	I
Cactaceae	<i>Opuntia stricta</i> var. <i>dillenii</i>	PH	America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Orchard	II
Cannabaceae	<i>Cannabis sativa</i>	AH	Asia	Luxi, Ruili	Orchard	I
Convolvulaceae	<i>Cuscuta japonica</i>	AV	Japan	Luxi, Ruili, Longchuan	Orchard	II
	<i>Ipomoea batatas</i>	AH/PH	South America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, orchard	I
	<i>Ipomoea cairica</i>	PV	Cape Verde and Arabian Peninsula	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Maize, Orchard	III
	<i>Ipomoea nil</i>	AV	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Orchard, sugarcane	II
	<i>Ipomoea purpurea</i>	AH	Tropical America	Luxi, Ruili, Yingjiang, Lianghe, Longchuan	Orchard, sugarcane	II
Crassulaceae	<i>Bryophyllum pinnatum</i>	PH	Tropical Africa	Ruili, Luxi, Yingjiang	Orchard	I
Cucurbitaceae	<i>Coccinia grandis</i>	PH	North America	Luxi, Ruili, Yingjiang, Lianghe,	Vegetable	I

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