

An inventory of invasive alien species in China

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Abstract

Invasive alien species (IAS) are a major global challenge requiring urgent action, and the Strategic Plan for Biodiversity (2011–2020) of the Convention on Biological Diversity (CBD) includes a target on the issue. Meeting the target requires an understanding of invasion patterns. However, national or regional analyses of invasions are limited to developed countries. We identified 488 IAS in China's terrestrial habitats, inland waters and marine ecosystems based on available literature and field work, including 171 animals, 265 plants, 26 fungi, 3 protists, 11 prokaryotes, and 12 viruses. Terrestrial plants account for 51.6% of the total number of IAS, and terrestrial invertebrates (104 species) for 21.3%. Of the total numbers, 67.9% of plant IAS and 34.8% of animal IAS were introduced intentionally. All other taxa were introduced unintentionally despite very few animal and plant species that invaded naturally. In terms of habitats, 64.3% of IAS occur on farmlands, 13.9% in forests, 8.4% in marine ecosystems, 7.3% in inland waters, and 6.1% in residential areas. Half of all IAS (51.1%) originate from North and South America, 18.3% from Europe, 17.3% from Asia not including China, 7.2% from Africa, 1.8% from Oceania, and the origin of the remaining 4.3% IAS is unknown. The distribution of IAS can be divided into three zones. Most IAS are distributed in coastal

provinces and the Yunnan province; provinces in Middle China have fewer IAS, and most provinces in West China have the least number of IAS. Sites where IAS were first detected are mainly distributed in the coastal region, the Yunnan Province and the Xinjiang Uyghur Autonomous Region. The number of newly emerged IAS has been increasing since 1850. The cumulative number of firstly detected IAS grew exponentially.

Keywords

Invasive plants and animals, distribution, origin, pathway, rate of introduction

Introduction

Invasive alien species (IAS) are considered one of the key pressures on world's biodiversity (Leprieur et al. 2008; Butchart et al. 2010; Rands et al. 2010), alter ecosystem services and processes (Hulme et al. 2009; Vilà et al. 2010, 2011), reduce native species abundance and richness (Cohen and Carlton 1998; Blackburn et al. 2004; Gaertner et al. 2009; Hejda et al. 2009), decrease genetic diversity of resident species (Ellstrand and Schierenbeck 2000; Daehler and Carino 2001), and cause substantial economic losses (Pimentel et al. 2005; Xu et al. 2006a; Kettunen et al. 2009). Responding to this threat is therefore particularly urgent (Lambertini et al. 2011). In October 2010, world leaders adopted the Strategic Plan for Biodiversity (2011–2020) under the Convention on Biological Diversity (CBD), including the Aichi Target 9 (Secretariat of the Convention on Biological Diversity 2010) calling to identify IAS and pathways, control and eradicate priority species, and to manage pathways in order to prevent further invasions. In order to evaluate achievements of the Aichi Targets, baseline data are needed. However, a global baseline of IAS is unavailable (Butchart et al. 2010; McGeoch et al. 2010), and national/regional data sets suitable for analysis of temporal patterns of biological invasions are rare for developing countries of the world, resulting a pattern that reflects geographical biases in information on invasion patterns (Pyšek et al. 2008; Nuñez and Pauchard 2010).

China is the world's most populous country with 1.34 billion people and one of the largest territories (Liu and Diamond 2005). China is also one of the mega-diversity countries, with half of its species found nowhere else (Liu et al. 2003; Xu et al. 2008). Its economy, ranked second, is growing at a very fast rate. The extraordinary biogeographic and economic characteristics of China make it ideal for understanding how biological invasions currently affect, and will affect in the future, the fastest growing economies in the world. Here, we present a comprehensive inventory of IAS in China, and analyze the temporal trends of biological invasions in the country in order to identify priority responses to the growing threat from biological invasions.

Methods

According to the CBD and IUCN definition, invasive alien species (IAS) are those alien species that became established in natural or semi-natural ecosystems or habitats, are

an agent of change, and threaten native biological diversity (IUCN 2000; Shine et al. 2000; McNeely et al. 2001). Alien species refers to a species, subspecies or lower taxon occurring outside its natural, past or present range and dispersal potential (i.e. outside the range it occupies naturally or in a range it could not occupy without direct or indirect introduction by humans) and includes any part, gametes, or propagules (IUCN 2000). Only species with evidence of their impact on biodiversity, human activities or economy were considered in the present assessment. We included IAS that established populations in terrestrial habitats, inland waters or marine ecosystems of China.

We identified IAS and pathways of their introductions based on available literature (Ding and Wang 1998; Xie et al. 2000; Li and Xie 2002; Xiang et al. 2002; Xu and Qiang 2004; Liu et al. 2005; Wan et al. 2005, 2008, 2009; Weber et al. 2008; Xie 2008; Zhang et al. 2008; Wu et al. 2010; Huang et al. 2012; see Liu et al. 2012 for an overview of research in plant invasions in China), including Flora of China (126 volumes edited by the Editorial Committee of Flora Sinica, Chinese Academy of Sciences and published by Science Press in Beijing, China), and Fauna of China (100 volumes edited by the Editorial Committee of Fauna Sinica, Chinese Academy of Sciences, and published by Science Press in Beijing, China), and on field work carried out in most provinces of China. All recorded IAS with evidence of negative impacts on biodiversity, human livelihood or economy were included in the inventory, with information on their presence or absence in particular provinces or autonomous regions. A preliminary inventory of IAS was first drafted, and subsequently verified through many internal reviews and field surveys. The year or period of the first detection of a species in China was recorded, providing information on the minimum residence time (Rejmánek 2000; Pyšek and Jarošík 2005); this information was available for 396 species.

Results

The inventory included 488 IAS in China's terrestrial habitats, inland waters and marine ecosystems. Of particular taxa, there are 171 animals, 265 plants, 26 fungi, 3 protists, 11 prokaryotes, and 12 viruses (Appendix). Terrestrial plants account for 51.6% of the total number of IAS, and terrestrial invertebrates (104 species) for 21.3% (Table 1). Intentional introductions accounted for 67.9% of plant IAS and 34.8% of animal IAS (Table 2), such as tropic ageratum (*Ageratum conyzoides*), common pokeweed (*Phytolacca americana*), and red-eared slider (*Trachemys scripta elegans*) introduced as ornamental species. Very few animal and plant species invaded via natural spread (such as *Ageratina adenophora* and *Ondatra zibethicus*). All other taxa were introduced unintentionally (Table 2), such as the oriental wood borer (*Heterobostrychus aequalis*), and the tropical fire ant (*Solenopsis geminata*) that invaded with trade products. In terms of habitats, 64.3% of IAS occur on farmlands, 13.9% in forests, 8.4% in marine ecosystems, 7.3% in inland waters, and 6.1% in residential areas. Half of all IAS (51.1%) originate from North and South America, 18.3% from Europe, 17.3% from Asia not including China, 7.2% from Africa, 1.8% from Oceania, and the origin of the remaining 4.3% IAS is unknown.

Table 1. Invasive alien species in China classified according to the taxonomic group and environment where they invade.

Taxonomic group	Terrestrial	Freshwater	Marine	Total
Plants	252	7	6	265
Vertebrates	15	16	15	46
Invertebrates	104	4	17	125
Others				52
Total	371	27	38	488

Table 2. Pathways of introduction of IAS to China

Pathways	Plants		Animals		Others (Fungi, Protista, Prokaryotae, Vira)	
	No. of species	%	No. of species	%	No. of species	%
Unintentional introduction	84	31.7	110	64.0	52	100
Intentional introduction	180	67.9	60	34.8	0	
Natural spread	1	0.4	2	1.2	0	
Total	265		172		52	

The distribution of IAS can be divided into three zones. Most IAS are distributed in coastal provinces and the Yunnan province; provinces in Middle China have fewer IAS, and most provinces in West China have the least number of IAS (Fig. 1). Jimsonweed (*Datura stramonium*), cotton whitefly (*Bemisia tabaci*), two-spotted spider mite (*Tetranychus urticae*), American cockroach (*Periplaneta americana*), house mouse (*Mus musculus*), and brown rat (*Rattus norvegicus norvegicus*) occur in all provinces. Seventy IAS are distributed in more than half the number of provinces, and 105 IAS in more than one third of the provinces. Sites where IAS were first detected are mainly distributed in the coastal region, the Yunnan Province and the Xinjiang Uyghur Autonomous Region (Fig. 2), but there was a shift towards northern areas that became the main points of entry of IAS into China during the last two decades (Table 3).

Only 33 IAS invaded China before 1850, including spiny amaranth (*Amaranthus spinosus*), wattle (*Acacia farnesiana*) and common lantana (*Lantana camara*). The number of newly emerged IAS has been increasing since 1850 (Fig. 3). Two hundred and twelve new IAS (53.5% of IAS with known year or period of first detection) occurred since 1950, for example pine bast scale (*Matsucoccus matsumurae*), common cordgrass (*Spartina anglica*), and erythrina gall wasp (*Quadrastichus erythrinae*). The cumulative number of IAS grew exponentially (Fig. 3). It could be partially due to increased surveillance, but our figure is based on best estimates of species arrival dates.

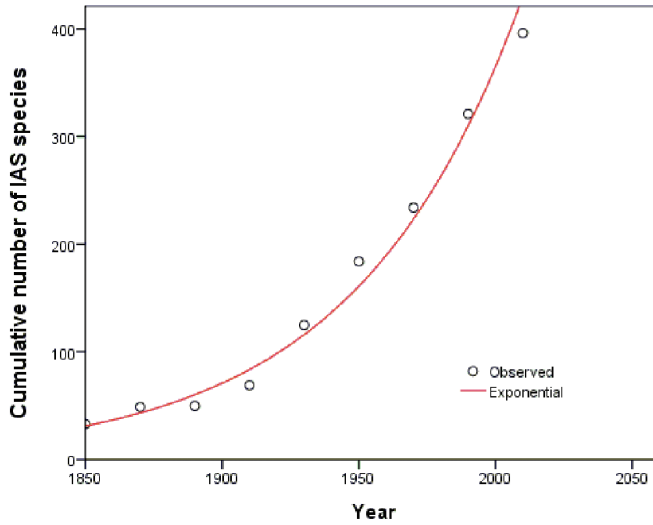


Figure 3. Temporal trends of invasions. Cumulative numbers of firstly detected IAS in China (exponential growth: $R^2=0.981$, $P<0.001$; $N=396$ IAS with known year or period of first detection in China) were analyzed. Only 33 IAS occurred in China before 1850, and 53.5% of the IAS were recorded after 1950.

Table 3. Temporal trends in the regions where invasive alien species were first detected in China. For each of the three periods since the 1950s, six top provinces or autonomous regions in which the most IAS were recorded are shown. The numbers are percentages of IAS that were firstly detected in the province, of the total number of species detected in China in the given period. Note that while southern areas were the most important points of entry in the first period, in the last two decades more invasions started in northern areas.

Province / region	1950–1969	Province / region	1970–1989	Province / region	1990–2009
Yunnan+	12.5	Taiwan+	21.8	Liaoning*	12.5
Taiwan+	12.5	Guangdong+	12.8	Shandong*	10.0
Guangdong+	12.5	Liaoning*	10.3	Taiwan+	10.0
Guangxi+	10.0	Shandong*	7.7	Hainan+	7.5
Xinjiang*	7.5	Beijing*	6.4	Guangdong+	7.5
Liaoning*	7.5	Yunnan+	6.4	Guangxi+	6.3

* northern provinces or autonomous regions; + southern provinces or autonomous regions

Discussion

The present study is, to our knowledge, the most up-to-date dataset of invasive species for China. However, we have to acknowledge biases that are inherent in the making of the inventory. For example, there are more plants than any other taxa, probably because plants are most numerous and easier to record. There may be biases in the timing of IAS discovery, as changes in resource allocation over time resulted in increasing opportunities for a more rigorous scientific research. It is likely that the survey pressure is not the same in all parts of China, depending on the staff numbers, among other parameters.

The cumulative number of IAS grew exponentially in China. Similar trends in historical accumulation of invasive forest insect pests and diseases have recently been reported from the United States (Aukema et al. 2010). An analysis of alien species in Europe has shown that human activity plays a key role in biological invasions (Pyšek et al. 2010, Jeschke and Genovesi 2011) and that the full effects of current socio-economic patterns on the numbers of alien species can be delayed by several decades, resulting in what has been called an “invasion debt” (Essl et al. 2010). Our result shows that China is severely affected by invasions, with a pace of increase higher than that recorded in Europe (DAISIE 2009). Considering the fast economic growth of China, and the rapidly increasing levels of trade, tourism and transport, it is very likely that the country will face huge problems from invasive species in the future, and has already accumulated an invasion debt. For example, Europe – with a total surface similar to that of China (10 vs. 9.6 million km²), but with about half the population of China (750 vs. 1340 million inhabitants) – hosts almost three times more IAS with ecological and/or economic impact than China (1347 species [Vilà et al. 2010] compared to the 488 reported in this paper). However, the number of IAS in China could be an underestimate due to the lower research intensity and limited monitoring activities. Nevertheless, the data from Europe and China, and taking into account China’s rapidly increasing economy suggest that the same trends will occur in other countries with fast growing economies where the levels of invasions are likely to increase as a result of economic activities. This imposes severe threats to global biodiversity and the ecosystem services of the concerned countries.

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Appendix

Brief information of IAS in China

No.	Taxon	Year when IAS was first detected	Places where IAS was first detected	Pathways	Habitats	No. provinces / regions where IAS distributed
Vira						
1	<i>Baculovirus midgut gland necrosis virus</i> (BMNV)	?	?	UI	OC	3
2	<i>Beet necrotic yellow vein virus</i> (BNYVV)	1978	Inner Mongolia	UI	FM	10
3	<i>Broad bean strain virus</i> (BBSV)	1998	Sichuan, Hubei, Jiangsu	UI	FM	5
4	<i>Cucumber green mottle mosaic virus</i> (CGMMV)	2005	Liaoning	UI	FM,	4
5	<i>Impatiens necrotic spot virus</i> (INSV)	2008	Yunnan	UI	FM	1
6	<i>Infectious hematopoietic necrosis virus</i> (IHNV)	1990	Liaoning	UI	OC	1
7	<i>Infectious pancreatic necrosis virus</i> (IPNV)	1980s	Liaoning, Shandong	UI	OC	5
8	<i>Lymphocystis disease virus</i> (LCDV)	1995	Shandong	UI	OC	14
9	<i>Poplar mosaic virus</i> (PMV)	1970s	Beijing	UI	FR	5
10	<i>Prunus necrotic ringspot ilarvirus</i> (PNRSV)	1999	Shaanxi	UI	FM	4
11	<i>Taura syndrome virus</i> , TSV	2000	Guangdong	UI	OC	3
12	<i>Tomato ringspot virus</i> , ToRSV	1986	Taiwan	UI	FM	1
Procaryotae						
Scotobacteria						
13	<i>Acidovorax avenae</i> subsp. <i>avenae</i> (Manns) Willems et al.	2003	Jiangsu	UI	FM	1
14	<i>Acidovorax avenae</i> subsp. <i>citrulli</i> (Schaad) Willems et al.	1986	?	UI	FM	8
15	<i>Pseudomonas savastanoi</i> (E.F.Smith) Stevens	1949	Guangxi	UI	FR	1
16	<i>Pseudomonas solanacearum</i> E.F.Smith	1982	Guangxi	UI	FR	3
17	<i>Pseudomonas syringae</i> pv. <i>actinidiae</i> Takikawa et al.	1986	Hunan	UI	FR	11
18	<i>Pseudomonas syringae</i> pv. <i>tomato</i> (Okabe) Young, Dye & Wilkie	1998	Jilin	UI	FM	7
19	<i>Xanthomonas oryzae</i> pv. <i>oryzae</i> Swings et al.	1950	Jiangsu	UI	FM	21
20	<i>Xanthomonas oryzae</i> pv. <i>oryzicola</i> (Fang et al.) Swings et al.	1953	Guangdong	UI	FM	11
21	<i>Xanthomonas vesicatoria</i> Vauterin et al.	1991	?	UI	FM	7
Firmibacteria						
22	<i>Clavibacter michiganensis</i> (Smith) Davis et al. subsp. <i>michiganensis</i> (Smith) Davis et al.	1981	Beijing	UI	FM	5
23	<i>Clavibacter michiganense</i> subsp. <i>sepedonicum</i> Davis et al.	1996	Heilongjiang	UI	FM	15
Protista						
Centricae						
24	<i>Chaetoceros concavicornis</i> Mangin	1996	Hongkong	UI	OC	1

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Pennatae						
25	<i>Pinnularia viridis</i> Nitzsch	1996	Hongkong	UI	OC	1
Dinophyceae						
26	<i>Alexandrium minutum</i> Halim	1990s	Taiwan	UI	OC	2
Fungi						
Chytridiomycetes						
27	<i>Synchytrium endobioticum</i> (Schilbersky) Percival	1975	Yunnan	UI	FM	3
Oomycetes						
28	<i>Albugo tragopogonis</i> (Pers.) S.F.Gray	2001	Xinjiang	UI	FM	1
29	<i>Peronosclerospora maydis</i> (Racib.) Shaw	1974	Shandong	UI	FM	6
30	<i>Peronosclerospora sorghi</i> (Weston & Uppal) Shaw	1974	Shandong	UI	FM	6
31	<i>Peronosclerospora philipinensis</i> (Weston) Shaw	1974	Shandong	UI	FM	6
32	<i>Peronosclerospora sacchari</i> (Miyake) Shirai & Hara	1974	Shandong	UI	FM	6
33	<i>Phytophthora parasitica</i> var. <i>nicotianae</i> (Breda de Haan) Tucker	1950	?	UI	FM	10
34	<i>Phytophthora sojae</i> Kaufm. & Gerd	1991	Heilongjiang	UI	FM	5
Pyrenomycetes						
35	<i>Cryptodiaporthe populea</i> (Sacc.) Butinm, <i>Dothichiza populea</i> Sacc. & Br	1978	Jiangsu	UI	FR	6
Loculoascomycetes						
36	<i>Botryosphaeria loricina</i> (Sawada) Shang	1970	Heilongjiang	UI	FR	8
37	<i>Mycosphaerella fijiensis</i> Morelet	?	?	UI	FM	1
38	<i>Venturia inaequalis</i> (Cooke) Wint, <i>Fusicladium dendriticum</i> (Wallr)	1927	Hebei	UI	FM	11
Discomycetes						
39	<i>Lachnellula willkommii</i> (Hart.) Dennis	1975	Heilongjiang	UI	FR	5
Teliomycetes						
40	<i>Cronartium ribicola</i> J.C.Fischer ex Rabenhorst	1958	Liaoning	UI	FR	15
Hyphomycetes						
41	<i>Cephalosporium maydis</i> Samra, Sabet & Hingorani	1999	Taiwan	UI	FM	1
42	<i>Cylindrocladium scoparium</i> Morgan Hodges	1992	Guangxi	UI	FR	3
43	<i>Verticillium albo-atrum</i> Reinke & Berthold	1996	Xinjiang	UI	FM	1
44	<i>Fusarium oxysporum</i> Schlecht. f. sp. <i>asparagi</i> Cohen & Heald	1990	Taiwan	UI	FM	1
45	<i>Spilocaea oleaginea</i> (Cast.) Hugh	1964	Yunnan	UI	FR	7
46	<i>Verticillium dahliae</i> Kleb.	1935	?	UI	FM	20
47	<i>Fusarium oxysporum</i> f. sp. <i>cubense</i> Snyder & Hansen	1960	Guangxi	UI	FM	4
48	<i>Fusarium oxysporum</i> f. sp. <i>dianthi</i> (Prill. & Del) Snyd. & Hans	?	Shanghai	UI	FM	2

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49	<i>Fusarium oxysporium</i> Schl. f. sp. <i>vasinfectum</i> (Atk) Snyder & Hanson	1931	?	UI	FM	15
Coelomycetes						
50	<i>Mycosphaerella pini</i> E. Rostrup	1982	Heilongjiang	UI	FR	5
51	<i>Phoma macdonaldii</i> Boerma	2008	Xinjiang	UI	FM	1
52	<i>Phomopsis asparagi</i> (Sacc.) Bubak	1993	Jiangsu	UI	FM	11
Plantae						
Rhodophyceae						
53	<i>Eucheuma striatum</i> Schmitz	1985	Hainan	II	OC	2
Phaeophyta						
54	<i>Laminaria japonica</i> Aresch	1927	Liaoning	II	OC	8
55	<i>Macrocystis pyrifera</i> Agardh	1978	?	II	OC	2
56	<i>Undaria pinnatifida</i> Suringar	1984	?	II	OC	4
57	<i>Desmarestia ligulata</i> Lamouroux	2000	Liaoning	UI	OC	2
Leptosporangiopsida						
58	<i>Salvinia molesta</i> D. S. Mitchell	?	Taiwan	UI	IW, OC	1
Dicotyledoneae						
Nymphaeales						
59	<i>Cabomba caroliniana</i> A. Gray	1993	Zhejiang	II	IW	3
Ranunculales						
60	<i>Ranunculus arvensis</i> L.	Modern Times	Anhui	UI	FM	3
Piperales						
61	<i>Peperomia pellucida</i> (L.) Kunth	Beginning of 20 th century	Hongkong	UI	FR, FM	9
Leguminosales						
62	<i>Acacia farnesiana</i> (L.) Willd.	1645	Taiwan	II	FM	9
63	<i>Chamaecrista minosoides</i> (L.) Green	Ming Dynasty	?	II	FM	8
64	<i>Crotalaria incana</i> L.	1953	Guangxi	II	FM	7
65	<i>Crotalaria juncea</i> L.	End of 19 th century	Taiwan	II	FM, FR	8
66	<i>Crotalaria lanceolata</i> E. Mey.	Middle 20 th century	?	II	FM	3
67	<i>Crotalaria mincans</i> L.	1910	Taiwan	II	FM	7
68	<i>Crotalaria ochroleuca</i> G. Don	1955	Guangxi	II	FM	4
69	<i>Crotalaria trichotoma</i> Bojer	1931	Taiwan	II	FM	8
70	<i>Desmodium tortuosum</i> (Sw.) DC.	1963	Hongkong	II	FM	2
71	<i>Indigofera suffruticosa</i> Mill.	1861	Hongkong	II	FM, FR	0
72	<i>Leucaena leucocephala</i> (Lam.) de Wit	1945	Taiwan	II	FM, FR	11
73	<i>Macroptilium atropurpureum</i> (Moc. & Sessé ex DC.) Urb.	1969	Guangdong	II	FM	3
74	<i>Medicago minima</i> Lam.	1910	Jiangxi	UI	FM	11
75	<i>Medicago polymorpha</i> L.	?	?	II	FM	8

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76	<i>Medicago sativa</i> L.	100 B.C	Shaanxi	II	FM	26
77	<i>Melilotus albus</i> Desr.	1918	Shandong	II	FM	17
78	<i>Melilotus indicus</i> (L.) All.	1918	Shandong	II	FM	18
79	<i>Mimosa bimucronata</i> (DC.) Kuntze	1950s	Guangdong	II	FM	3
80	<i>Mimosa invisa</i> Mart. ex Colla	1950	Guangdong	II	FM	3
81	<i>Mimosa pudica</i> L.	Ming Dynasty	?	II	FM, FR	9
82	<i>Neptunia plena</i> (L.) Benth.	1963	Guangdong	II	FM	1
83	<i>Robinia pseudoacacia</i> L.	1903	Shandong	II	FM	20
84	<i>Senna alata</i> (L.) Roxb.	1909	Taiwan	II	FM, FR	4
85	<i>Senna hirsuta</i> (L.) H. S. Irwin & Barneby	1927	Guangdong	II	FM	5
86	<i>Senna occidentalis</i> (L.) Link	16 th century	?	II	FM, FR	10
87	<i>Senna tora</i> (L.) Roxb.	16 th century	Shaanxi	II	FM	12
88	<i>Sesbania cannabina</i> (Retz.) Pers.	1910	Jiangsu	II	IW	10
89	<i>Trifolium fragiferum</i> L.	1931	Xinjiang	II	FM	1
90	<i>Trifolium hybridum</i> L.	1930	Shanghai	II	FM	6
91	<i>Trifolium incarnatum</i> L.	1950s	?	II	FM	15
92	<i>Trifolium pratense</i> L.	19 th century		II	FM	15
93	<i>Trifolium repens</i> L.	19 th century		II	FM	27
94	<i>Ulex europaeus</i> L.	1862	Sichuan	II	FM	1
95	<i>Vicia sativa</i> L.	1940s	Gansu, Jiangsu	II	FM	30
96	<i>Vicia villosa</i> Roth	1932	Shandong	II	FM	22
Urticales						
97	<i>Cannabis sativa</i> L.	?	?	II	FM	28
98	<i>Pilea microphylla</i> (L.) Liebm.	1928	Taiwan	UI	FM	11
Capparales						
99	<i>Cleome rutidosperma</i> DC.	1958	Yunnan	II	FM, FR	7
100	<i>Reseda lutea</i> L.	1974	Liaoning	II	FM	1
Passiflorales						
101	<i>Passiflora foetida</i> L.	1861	Hongkong	II	FM	7
102	<i>Passiflora suberosa</i> L.	1907	Taiwan	II	FM	3
Cucurbitales						
103	<i>Sicyos angulatus</i> L.	1999	Taiwan	II	FM, FR	4
Cactales						
104	<i>Opuntia ficus-indica</i> (L.) Mill.	1945	Taiwan	II	FM	5
105	<i>Opuntia monacantha</i> (Willd.) Haw.	1625	Yunnan	II	FM	6
106	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>dillenii</i> (Ker Gawl.) L. D. Benson	1702	Guangdong	II	FM, FR	5
Tiliales						
107	<i>Waltheria indica</i> L.	1861	Hongkong	UI	FM	7
Malvales						
108	<i>Herissantia crispa</i> (L.) Brizicky	1932	Hainan	UI	FM, FR	1

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109	<i>Hibiscus trionum</i> L.	?	?	UI	FM	29
110	<i>Malvastrum coromandelianum</i> (L.) Garcke	19 th century	Hongkong	UI	FM	8
Euphorbiales						
111	<i>Euphorbia dentata</i> Michx.	1976	Beijing	II	FM	6
112	<i>Euphorbia hirta</i> L.	1820	Macco	UI	FM	14
113	<i>Euphorbia maculata</i> L.	1940s	Shanghai	UI	FM	12
114	<i>Euphorbia marginata</i> Pursh	1935	Beijing	II	FM	3
115	<i>Euphorbia nutans</i> (Lag.) Small	20 th century	Liaoning, Jiangsu, Anhui	UI	FM	5
116	<i>Jatropha curcas</i> L.	300 year ago	?	II	FM	8
117	<i>Ricinus communis</i> L.	?	?	II	FM	18
Myrtales						
118	<i>Eucalyptus robusta</i> Sm.	1890	Guangdong	II	FM	5
119	<i>Syzygium jambos</i> (L.) Alston	Before 17 th century	?	II	FM	6
120	<i>Clarkia pulchella</i> Pursh.	1965	Tibet	II	FM	1
121	<i>Gaura parviflora</i> Douglas ex Lehm.	1930	Shandong	II	FM, FR	7
122	<i>Oenothera biennis</i> L.	1918	Shandong	II	FM, FR	10
123	<i>Oenothera drummondii</i> Hook.	1930	Fujian	II	FM	4
124	<i>Oenothera glazioviana</i> Micheli	17 th century	Yunnan, Jiangsu	II	FM	20
125	<i>Oenothera laciniata</i> Hill.	1985	Taiwan	II	FM	3
126	<i>Oenothera oakesiana</i> (A. Gray) J. W. Robbins ex S. Watson & J. M. Coult.	20 th century	Fujian	II	FM	1
127	<i>Oenothera parviflora</i> L.	1951	Liaoning	II	FM	1
128	<i>Oenothera rosea</i> L'Hér. ex Ait.	1957	Jiangsu	II	FM	5
129	<i>Oenothera stricta</i> Ledeb. & Link	1917	Zhejiang	II	FM	9
130	<i>Oenothera tetraptera</i> Cav.	1935	Guizhou	II	FM	3
131	<i>Oenothera villosa</i> Thunb.	1959	Heilongjiang	II	FM	7
Rhamnales						
132	<i>Parthenocissus quinquefolia</i> (L.) Planch.	1951	Liaoning	II	FM, FR	7
Apocynales						
133	<i>Catharanthus roseus</i> (L.) G. Don	1661	?	II	FM	9
134	<i>Asclepias curassavica</i> L.	1928	Guangdong	II	FM	10
Rubiales						
135	<i>Borreria latifolia</i> (Aubl.) K. Schum	1937	Guangdong	II	FM	7
Verbenales						
136	<i>Duranta erecta</i> L.	Ming Dynasty	Taiwan	II	FM	6
137	<i>Lantana camara</i> L.	1645	Taiwan	II	FM	9
138	<i>Lantana montevidensis</i> (Spreng.) Briq.	1928	Taiwan	II	FM	5
139	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Beginning of 19 th century	Hongkong	UI	FM	8

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Cruciales						
140	<i>Armoracia rusticana</i> (Lam.) Gaertn., B. Mey. & Scherb.	Beginning of 20 th century	Shanghai	II	FM	4
141	<i>Coronopus didymus</i> (L.) Sm.	1930s	Jiangsu	UI	FM	13
142	<i>Diplotaxis muralis</i> (L.) DC	1907	?	UI	FM	1
143	<i>Lepidium campestre</i> (L.) R.Br.	1925	Liaoning	UI	FM	8
144	<i>Lepidium densiflorum</i> Schrad	1931	Liaoning	UI	FM	2
145	<i>Lepidium virginicum</i> L.	1933	Hubei	UI	FM	23
146	<i>Raphanus raphanistrum</i> L.	1959	Sichuan	UI	FM	2
147	<i>Sinapis alba</i> L.	?	?	II	FM	6
148	<i>Sinapis arvensis</i> L.	?	?	II	FM	24
Caryophyllales						
149	<i>Agrostemma githago</i> L.	19 th century	?	UI	FM	6
150	<i>Saponaria officinalis</i> L.	1928	Liaoning	II	FM, FR	3
151	<i>Stellaria pallida</i> (Dumort.) Crép.	1949	Shanghai	UI	FM	5
152	<i>Vaccaria hispanica</i> (Mill.) Rauschert	?	?	UI	FM	15
153	<i>Portulaca pilosa</i> L.	1929	Taiwan	II	FM	6
154	<i>Talinum paniculatum</i> (Jacq.) Gaertn.	16 th century	Jiangsu	II	FM	4
155	<i>Mirabilis jalapa</i> L.	16 th century	Zhejiang	II	FM	14
156	<i>Anredera cordifolia</i> (Ten.) Steenis	1976	Taiwan	II	FM	11
Chenopodiales						
157	<i>Phytolacca americana</i> L.	1935	Zhejiang	II	FM	21
158	<i>Chenopodium ambrosioides</i> L.	1864	Taiwan	UI	FM	11
159	<i>Chenopodium hybridum</i> L.	1864	Hebei	UI	FM	19
160	<i>Salicornia bigelovii</i> Torr.	2001	Guangxi	II	FM	5
161	<i>Alternanthera paronychioides</i> A.St.-Hil.	1969	Taiwan	II	FM	4
162	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	1930s	Shanghai	II	FM, IW	20
163	<i>Alternanthera pungens</i> Kunth	1950s	Fujian	UI	FM	5
164	<i>Amaranthus albus</i> L.	1929	Tianjin	UI	FM	5
165	<i>Amaranthus blitoides</i> S. Watson	1857	Liaoning	UI	FM	6
166	<i>Amaranthus caudatus</i> L.	Qing Dynasty	Heilongjiang	II	FM	29
167	<i>Amaranthus cruentus</i> L.	1848	?	II	FM	0
168	<i>Amaranthus hybridus</i> L.	1848	?	UI	FM	10
169	<i>Amaranthus palmeri</i> S. Watson	1985	Beijing	UI	FM, FR	4
170	<i>Amaranthus polygonoides</i> L.	1979	Shandong	UI	FM	4
171	<i>Amaranthus retroflexus</i> L.	Middle of 19 th century	Hebei, Shandong	II	FM	28
172	<i>Amaranthus spinosus</i> L.	1836	Macco	UI	FM	24
173	<i>Amaranthus tricolor</i> L.	10 th century	?	II	FM	29
174	<i>Amaranthus viridis</i> L.	1864	Taiwan	UI	FM	19

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175	<i>Gomphrena celosiooides</i> Mart.	1968	Hongkong	II	FM	4
Lythrales						
176	<i>Cuphea carthagenensis</i> (Jacq.) J. F. Macbr.	1960	Taiwan	II	FM	2
Plantaginales						
177	<i>Plantago aristata</i> Michx.	1929	Shandong	UI	FM	2
178	<i>Plantago virginica</i> L.	1951	Jiangxi	UI	FM, FR	10
Saxifragales						
179	<i>Bryophyllum pinnatum</i> (Lam.) Oken	1861	Hongkong	II	FM	7
Umbelliflorae						
180	<i>Coriandrum sativum</i> L.	?	?	II	FM	8
181	<i>Cyclosporum leptophyllum</i> (Pers.) Sprague	Beginning of 20 th century	Hongkong	UI	FM	11
182	<i>Daucus carota</i> L.	?	?	UI	FM	30
183	<i>Eryngium foetidum</i> L.	1897	Yunnan	II	FM, FR	4
Campanulales						
184	<i>Triodanis biflora</i> (Ruiz & Pav.) Greene	1981	Anhui	UI	FM	4
185	<i>Triodanis perfoliata</i> (L.) Nieuwl.	1974	Fujian	UI	FM	3
Asterales						
186	<i>Acanthospermum australe</i> (Loefl.) Kuntze	1936	Yunnan	UI	FM	2
187	<i>Achillea millefolium</i> L.	1918	Shandong	II	FM	7
188	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H. Rob.	1940s	Yunnan	NS	FM, FR	5
189	<i>Ageratum conyzoides</i> L.	19 th century	Hongkong	II	FM, FR	16
190	<i>Ageratum houstonianum</i> Mill.	1911	Taiwan	II	FM	11
191	<i>Ambrosia artemisiifolia</i> L.	1930s	Zhejiang	UI	FM	18
192	<i>Ambrosia trifida</i> L.	1930s	Liaoning	UI	FM	5
193	<i>Anthemis arvensis</i> L.	1918	Shandong	II	FM	2
194	<i>Aster subulatus</i> Michx.	1947	Hubei	UI	FM	9
195	<i>Bidens frondosa</i> L.	1926	Jiangsu	UI	FM	6
196	<i>Bidens pilosa</i> L.	1857	Hongkong	UI	FM	13
197	<i>Centaurea cyanus</i> L.	1918	Shandong	II	FM	2
198	<i>Chromolaena odorata</i> (L.) R.M.King & H. Rob.	1936	Yunnan	II	FM	4
199	<i>Chrysanthemum carinatum</i> Schousb.	1914	Hunan	II	FM	6
200	<i>Chrysanthemum coronarium</i> L.	?	?	II	FM	8
201	<i>Cichorium intybus</i> L.	1918	Shandong	II	FM	6
202	<i>Conyza bonariensis</i> (L.) Cronquist	1857	Hongkong	UI	FM	10
203	<i>Conyza canadensis</i> (L.) Cronquist	1860	Shandong	UI	FM	21
204	<i>Conyza sumatrensis</i> (Retz.) E. Walker	Middle of 19 th century	?	UI	FM, FR	18
205	<i>Coreopsis grandiflora</i> Hogg ex Sweet	1932	Shandong	II	FM	2
206	<i>Coreopsis lanceolata</i> L.	1911	Taiwan	II	FM	8
207	<i>Coreopsis tinctoria</i> Nutt.	1911	Taiwan	II	FM	5

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208	<i>Cosmos bipinnatus</i> Cav.	1911	Taiwan	II	FM	8
209	<i>Cosmos sulphureus</i> Cav.	1938	Taiwan	II	FM	8
210	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	1930s	?	UI	FM	19
211	<i>Crassocephalum rubens</i> (Juss. ex Jacq.) S. Moore	2008	Yunnan	II	FM	1
212	<i>Erechtites hieracifolia</i> (L.) Raf. ex DC.	1933	Hainan	II	FM, FR	8
213	<i>Erechtites valerianifolia</i> (Wolf) DC.	1920s	Taiwan	II	FM	4
214	<i>Erigeron annuus</i> (L.) Pers.	1886	Shanghai	UI	FM	20
215	<i>Erigeron philadelphicus</i> L.	End of 19 th century		UI	FM, FR	4
216	<i>Eupatorium catarium</i> Veldkamp	1980s	Hongkong	UI	FM, FR	8
217	<i>Flaveria bidentis</i> (L.) Kuntze	1980s -1990s	Tianjin	II	FM, FR	3
218	<i>Galinsoga parviflora</i> Cav.	1915	Yunan, Sichuan	UI	FM	21
219	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	1943	Sichuan	II	FM, FR	10
220	<i>Gnaphalium pensylvanicum</i> (Willd.) Cabrera	1932	Hainan	UI	FM	11
221	<i>Gymnocoronis spilanthoides</i> (D. Don ex Hook. & Arn.) DC.	2006	Guangxi	II	FM	1
222	<i>Halianthus tuberosus</i> L.	1918	Shandong	II	FM	20
223	<i>Helenium autumnale</i> L.	Morden Times	?	II	FM	9
224	<i>Leucanthemum vulgare</i> Lam.	1910	Jiangxi	II	FM	5
225	<i>Mikania micrantha</i> Kunth	1919	Hongkong	II	FM	5
226	<i>Parthenium hysterophorus</i> L.	1926	Yunnan	II	FM	8
227	<i>Pluchea sagittalis</i> (Lam.) Cabrera	End of 20 th century	Taiwan	UI	FM	2
228	<i>Pseudelephantopus spicatus</i> (B. Juss. ex Aubl.) C.F. Baker	1932	Taiwan	UI	FM	2
229	<i>Pyrethrum parthenifolium</i> Willd.	1933	Yunnan	II	FM	1
230	<i>Senecio vulgaris</i> L.	19 th century		UI	FM	14
231	<i>Silybum marianum</i> (L.) Gaertn.	1941	Yunnan	II	FM	3
232	<i>Solidago canadensis</i> L.	1935	Shanghai	II	FM, FR	9
233	<i>Soliva anthemifolia</i> (Juss.) R.Br.	1912	Hongkong	UI	FM	5
234	<i>Sonchus asper</i> (L.) Hill.	?	?	UI	FM	30
235	<i>Sonchus oleraceus</i> L.	?	?	UI	FM	31
236	<i>Synedrella nodiflora</i> (L.) Gaertn.	1912	Hongkong	UI	FM	9
237	<i>Tagetes erecta</i> L.	?	Yunnan	II	FM	5
238	<i>Tagetes patula</i> L.	1931	Guangdong	II	FM	3
239	<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	1910	Taiwan	II	FM	6
240	<i>Tridax procumbens</i> L.	1947	Hainan, Guangdong	UI	FM	8
241	<i>Wedelia trilobata</i> (L.) Hitchc.	1970s	?	II	FM	7
242	<i>Xanthium italicum</i> Moretti	1991	Beijing	UI	FM	3

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243	<i>Xanthium spinosum</i> L.	1974	Beijing	UI	FM	5
244	<i>Zinnia peruviana</i> (L.) L.	1919		II	FM	8
Solanales						
245	<i>Datura innoxia</i> Mill.	1905	Beijing	II	FM	10
246	<i>Datura metel</i> L.	?	?	II	FM	17
247	<i>Datura stramonium</i> L.	?	?	II	FM	34
248	<i>Nicandra physalodes</i> (L.) Gaertn.	1840s	Hongkong	II	FM	14
249	<i>Physalis angulata</i> L.	Middle of 19 th century	Hongkong	UI	FM	19
250	<i>Solanum aculeatissimum</i> Jacq.	end of 19 th century	Guizhou	UI	FM	11
251	<i>Solanum capsicoides</i> All.	1895	Hongkong	UI	FM, FR	11
252	<i>Solanum erianthum</i> D. Don	1857	Fujian	UI	FM, FR	10
253	<i>Solanum rostratum</i> Dunal	1895	Hongkong	UI	FM	5
254	<i>Solanum sisymbriifolium</i> Lam.	1980s	Yunnan	II	FM	1
255	<i>Solanum torvum</i> Sw.	1827	Macco	II	FM, FR	10
256	<i>Ipomoea cairica</i> (L.) Sweet	1912	Hongkong	II	FM, FR	8
257	<i>Ipomoea indica</i> (Burm.) Merr.	1942	Taiwan	II	FM, FR	2
258	<i>Ipomoea nil</i> (L.) Roth	Ming Dynasty	Zhejiang	II	FM	23
259	<i>Ipomoea purpurea</i> (L.) Roth	1890	?	II	FM, FR	9
260	<i>Ipomoea triloba</i> L.	1970s	Taiwan	II	FM, FR	5
261	<i>Jacquemontia tamnifolia</i> (L.) Griseb.	End of 20 th century	Guangdong	II	FM	2
Scrophulariales						
262	<i>Scoparia dulcis</i> L.	Middle of 19 th century	Hongkong	II	FM	8
263	<i>Veronica arvensis</i> L.	1910	Jiangxi	UI	FM	9
264	<i>Veronica hederifolia</i> L.	1980s	Jiangsu	UI	FM, FR	2
265	<i>Veronica peregrina</i> L.	?	?	UI	FM	15
266	<i>Veronica persica</i> Poir.	1933	Hubei	UI	FM	12
267	<i>Veronica polita</i> Fr.	?	?	UI	FM	2
268	<i>Justicia adhatoda</i> L.	1850	Hongkong	II	FM	6
269	<i>Orobanche brassicae</i> Novopokr.	1977	Fujian	UI	FM	1
270	<i>Martynia annua</i> L.	1964	Yunnan	II	FM	1
271	<i>Macfadyena unguis-cati</i> (L.) A.H.Gentry	1840	Fujian	II	FR	2
Geraniales						
272	<i>Geranium carolinianum</i> L.	1926	Jiangsu	II	FM	15
273	<i>Oxalis corymbosa</i> DC.	Middle of 19 th century	Hongkong	II	FM	31
Boraginales						
274	<i>Heliotropium europaeum</i> L.	1934	Shanxi	UI	FM	6
Lamiales						
275	<i>Hyptis brevipes</i> Poit.	1925	Taiwan	II	FM	3

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276	<i>Hyptis rhomboidea</i> Mart. & Galeotti	1992	Hainan	II	FM	3
277	<i>Hyptis suaveolens</i> (L.) Poit.	End of 19 th century	Taiwan	II	FM, FR	7
278	<i>Stachys arvensis</i> L.	1864	Taiwan	II	FM	6
Monocotyledoneae						
Alismatales						
279	<i>Limnocharis flava</i> (L.) Buchenau	Modern Times	?	II	IW	3
Liliflorae						
280	<i>Eichhornia crassipes</i> (Mart.) Solms	Beginning of 20 th century	Taiwan	II	IW	16
Arales						
281	<i>Pistia stratiotes</i> L.	Ming Dynasty	?	II	IW	18
Graminales						
282	<i>Aegilops tauschii</i> Coss.	?	?	II	FM	6
283	<i>Avena fatua</i> L.	Middle of 19 th century	Hongkong, Fujian	UI	FM	30
284	<i>Axonopus compressus</i> (Sw.) P. Beauv.	1940	Taiwan	II	FM, FR	7
285	<i>Brachiaria mutica</i> (Forsk.) Stapf	1930s	Taiwan	II	FM	2
286	<i>Bromus catharticus</i> Vahl	Middle of 20 th century	Jiangsu, Yunnan	II	FM	2
287	<i>Buchloe dactyloides</i> (Nutt.) Engelm.	1950s	Beijing	II	FM	2
288	<i>Cenchrus echinatus</i> L.	1934	Taiwan	UI	FM	7
289	<i>Cenchrus incertus</i> M. A. Curtis	Beginning of 20 th century	Taiwan	UI	FM	10
290	<i>Ehrharta erecta</i> Lam.	1998	Yunnan	II	FM	1
291	<i>Hordeum jubatum</i> L.	?	?	II	FM	3
292	<i>Lolium multiflorum</i> Lam.	18 th century	?	II	FM	20
293	<i>Lolium perenne</i> L.	1918	Shandong	II	FM	20
294	<i>Lolium persicum</i> Boiss. & Hohen. ex Boiss.	1958	Xinjiang	II	FM	2
295	<i>Lolium temulentum</i> L.	1940s		UI	FM	17
296	<i>Lolium temulentum</i> L. var. <i>arvense</i> (With.) Lilj.	Modern Times		II	FM	6
297	<i>Lolium temulentum</i> L. var. <i>longiaristatum</i> Parnell	1940s	Qinghai	UI	FM	6
298	<i>Panicum dichotomiflorum</i> Michx.	1908	Taiwan	UI	FM	3
299	<i>Panicum maximum</i> Jacq.	1908	Taiwan	II	FM, FR	7
300	<i>Panicum repens</i> L.	1857	Hongkong	II	FM	6
301	<i>Paspalum conjugatum</i> P. J. Bergius	1912	Hongkong	II	FM	12
302	<i>Paspalum dilatatum</i> Poir.	1953		II	FM	7
303	<i>Paspalum fimbriatum</i> Kunth	1971	Taiwan	II	FM	1
304	<i>Pennisetum clandestinum</i> Hochst. ex Chiov.	1958	Taiwan	II	FM, FR	1

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305	<i>Pennisetum polystachyon</i> (L.) Schult.	1961	Taiwan	II	FM	3
306	<i>Pennisetum purpureum</i> Schumach.	1930s	Guangdong, Sichuan	II	FM	9
307	<i>Phalaris minor</i> Retz.	1958	Beijing	II	FM	1
308	<i>Phalaris paradoxa</i> L.	1958	Beijing	II	FM	1
309	<i>Phleum pratense</i> L.	1925	Henan	II	FM	8
310	<i>Poa compressa</i> L.	1914	Hebei	II	FM	5
311	<i>Rhynchelytrum repens</i> (Willd.) C.E.Hubb.	1950s	?	II	FM	5
312	<i>Sorghum alnum</i> Parodi	2009	Guangxi	UI	FM	1
313	<i>Sorghum halepense</i> (L.) Pers.	Beginning of 20 th century	Taiwan	UI	FM	17
314	<i>Sorghum sudanense</i> (Piper) Stapf	1922	Jiangxi	II	FM	16
315	<i>Spartina alterniflora</i> Loisel.	1979	Fujian	II	OC	7
316	<i>Spartina anglica</i> C.E. Hubb.	1964	Jiangsu	II	OC	9
317	<i>Vetiveria zizanioides</i> L.	1936	Hainan	II	FM	3
Animalia						
Nematoda						
Aphelenchida						
318	<i>Aphelenchoides besseyi</i> Christie	?	?	UI	FM	13
319	<i>Aphelenchoides ritzema-bosi</i> (Schwartz) Steiner	1970s	Jiangsu	UI	FM	9
320	<i>Bursaphelenchus xylophilus</i> (Steiner & Buhner) Nickle	1982	Jiangsu	UI	FR	9
321	<i>Anguina agrostis</i> (Steinbuch) Filipjev	1987	Inner Mongolia	UI	FM	3
322	<i>Ditylenchus dispaci</i> (Khn) Filipjev	?	?	UI	FM	4
323	<i>Radopholus similes</i> (Cobb) Thorne	?	?	UI	FM	1
324	<i>Heterodera glycines</i> Ichinohe	1899	?	UI	FM	12
325	<i>Meloidogyne hispanica</i> Hirschmann	2007	Hainan	UI	FM	1
Gastropoda						
Archaeogastropoda						
326	<i>Haliotis laevigata</i> Donovan	1998	Guangdong	II	OC	1
327	<i>Haliotis discus discus</i> Reeve	1986	Guangdong	II	OC	3
328	<i>Haliotis gigantea</i> Gmelin	1997	Liaoning	II	OC	2
329	<i>Haliotis rufescens</i> Swainson	1985	Liaoning	II	OC	2
330	<i>Haliotis fulgens</i> Philippi	1985	Liaoning	II	OC	3
Mesogastropoda						
331	<i>Crepidula onyx</i> Sowerby	1979	Hongkong	UI	OC	2
332	<i>Pomacea canaliculata</i> Lamark	?	Taiwan	II	IW	13
Stylommatophora						
333	<i>Achatina fulica</i> Bowdich	1920s	Fujian	II	FM	6
334	<i>Lehmannia valentiana</i> (Férussac)	?	?	UI	FM	5
Bivalvia						
Pterioida						
335	<i>Argopecten irradians</i> Lamarck	1982	?	II	OC	3
336	<i>Patinopecten yessoensis</i> Jay	1981	Liaoning	II	OC	1

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Ostreoida						
337	<i>Crassostrea gigas</i> Thunberg	1979	Zhejiang	II	OC	14
Veneroida						
338	<i>Mercenaria mercenaria</i> L.	1997	Shandong	II	OC	2
339	<i>Mytilopsis sallei</i> Recluz	1977	Taiwan	UI	OC	5
Myoidea						
340	<i>Panopea abrupta</i> Conrad	1998	Shandong	II	OC	1
Malacostraca						
341	<i>Litopenaeus stylirostris</i> Stimpson	2000	Shandong, Jiangsu, Zhejiang	II	OC	3
342	<i>Litopenaeus vannamei</i> Boone	1988	?	II	OC	9
343	<i>Marsupenaeus japonicus</i> Bate	?	?	II	OC	
344	<i>Procambarus clarkii</i> Girard	1929	Jiangsu	UI	IW	10
345	<i>Cherax quadricarinatus</i> Von Martens	1980s	Jiangxi	II	IW	2
Arachnida						
346	<i>Aculops lycopersici</i> (Maass)	1980	Guangxi	UI	FM	5
347	<i>Tetranychus urticae</i> Koch	1978	Taiwan	UI	FM	34
Insecta						
Blattodea						
348	<i>Blattella germanica</i> (L.)	1935	?	UI	RS	28
349	<i>Periplaneta americana</i> (L.)	?	?	UI	RS	34
350	<i>Periplaneta australasiae</i> Fabricius	?	?	UI	RS	10
Isoptera						
351	<i>Cryptotermes domesticus</i> (Haviland)	1917	Taiwan	UI	FR, RS	5
352	<i>Incisitermes minor</i> (Hagen)	1937	HongKong	UI	RS	3
Thysanoptera						
353	<i>Frankliniella occidentalis</i> (Pergande)	2000	Taiwan	UI	FM	6
354	<i>Taeniothrips simplex</i> (Morison)	1987	Taiwan	UI	FM	11
Hemiptera						
355	<i>Eurygaster integriceps</i> Puton	?	?	UI	FM	4
356	<i>Corythucha ciliata</i> Say	2006	Hubei	UI	FR	7
357	<i>Heterosylla cubana</i> Crauford	1985	Taiwan	UI	FR	5
358	<i>Aleurodicus dispersus</i> Russell	1988	Taiwan	UI	FM	2
359	<i>Bemisia tabaci</i> (Gennadius)	1949	Taiwan, Yunnan	UI	FM	34
360	<i>Trialeurodes vaporariorum</i> (Westwood)	?	?	UI	FM	25
361	<i>Aphanostigma piri</i> Cholodkovsky	1979	Taiwan	UI	FM	1
362	<i>Moritziaella castaneivora</i> Miyazaki	1997	Shandong	UI	FR	3
363	<i>Viteus vitifoliae</i> (Fiech)	1892	Shandong	UI	FM	5
364	<i>Eriosoma lanigerum</i> (Hausmann)	1914	Shandong	UI	FM	10
365	<i>Icerya purchasi</i> Maskell	1904	Taiwan	UI	FM	18
366	<i>Dysmicoccus brevipes</i> Cockerell	1921	Taiwan	UI	FM	7
367	<i>Dysmicoccus neobrevipes</i> (Beardsley)	1998	Hainan	UI	FM	3
368	<i>Oracella acuta</i> (Lobdell)	1990	Guangdong	UI	FR	3

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369	<i>Phenacoccus solenopsis</i> Tinsley	2008	Guangdong	UI	FM	2
370	<i>Parasaissetia nigra</i> Nietner	1989	Yunnan	UI	FM	6
371	<i>Matsucoccus matsumurae</i> (Kuwana.)	1950	Shandong	UI	FR	7
372	<i>Hemiberlesia pityophila</i> Takagi	1982	Guangdong	UI	FR	4
Coleoptera						
373	<i>Agrilus mali</i> Matsumura	1934	Liaoning	UI	FM	13
374	<i>Anthrenus verbasci</i> L.	?	?	UI	RS	23
375	<i>Trogoderma granarium</i> Everts	1962	?	UI	RS, FM	1
376	<i>Lasioderma serricorne</i> (Fabricius)	1931	Taiwan	UI	RS	32
377	<i>Heterobostrychus aequalis</i> (Waterhouse)	1988	Guangdong	UI	RS	6
378	<i>Rhyzopertha dominica</i> (Fabricius)	?	?	UI	RS	31
379	<i>Necrobia ruficollis</i> (Fabricius)	?	?	UI	RS	9
380	<i>Necrobia rufipes</i> Degger	?	?	UI	RS	18
381	<i>Cathartus advena</i> Walterl	?	?	UI	RS	32
382	<i>Tribolium confusum</i> Jacquelin du Val	?	?	UI	RS	19
383	<i>Pharaxonotha kirschii</i> Reitter	1987	Yunnan	UI	RS	2
384	<i>Xylotrechus rusticus</i> L.	1970s	Liaoning	UI	FR	5
385	<i>Acanthoscelides macrophthalmus</i> Schaeffer	1999	Hainan	UI	FR	7
386	<i>Acanthoscelides obtectus</i> Say	1990	Jilin	UI	RS, FM	2
387	<i>Acanthoscelides pallidipennis</i> Motschulsky	1980	Hebei	UI	FR	11
388	<i>Bruchidius dorsalis</i> Fabricius	?	?	UI	RS, FR	16
389	<i>Bruchus pisorum</i> (L.)	?	?	UI	RS, FM	32
390	<i>Bruchus rufimanus</i> Boheman	1930s – 1940s	?	UI	RS, FM	7
391	<i>Callosobruchus analis</i> (Fabricius)	?	?	UI	RS, FM	1
392	<i>Callosobruchus maculatus</i> (Fabricius)	?	Hongkong	UI	RS	12
393	<i>Callosobruchus phaseoli</i> (Chevrolate)	1998	Zhejiang	UI	RS	2
394	<i>Zabrotes subfasciatus</i> (Boheman)	1987	Chongqing	UI	RS	2
395	<i>Araecerus fasciculatus</i> (Degeer)	?	?	UI	RS	18
396	<i>Leptinotarsa decemlineata</i> (Say)	1993	Xinjiang	UI	FM	1
397	<i>Brontispa longissima</i> (Gestro)	1975	Taiwan	UI	FM	7
398	<i>Octodonta nipae</i> (Maulik)	2001	Hainan	UI	FM	1
399	<i>Cosmopolites sordidus</i> Germar	1909	Taiwan	UI	FM	6
400	<i>Cryptorhynchus lapathi</i> L.	1953	Jilin	UI	FR	9
401	<i>Diocalandra frumenti</i> (Fabricius)	1977	Taiwan	UI	FM	2
402	<i>Hypera postica</i> (Gyllenhal)	1950s	Xinjiang	UI	FM	2
403	<i>Lissorhoptrus oryzophilus</i> Kuschel	1988	Hebei	UI	FM	8
404	<i>Rhabdoscelus lineaticollis</i> (Heller)	1986	Taiwan	UI	FM	3
405	<i>Rhynchophorus ferrugineus</i> (Oliver)	?	Hainan	UI	FM	9
406	<i>Sitophilus granarius</i> (L.)	?	Xinjiang	UI	RS, FM	5
407	<i>Sternochetus frigidus</i> Fabricius	?	?	UI	FM	4
408	<i>Sternochetus mangiferae</i> Fabricius	?	?	UI	FM	2
409	<i>Sternochetus olivieri</i> (Faust)	1914	Yunnan	UI	FM	3
410	<i>Cylas formicarius</i> (Summers)	1965	Zhejiang	UI	FM	10
411	<i>Dendroctonus valens</i> Leconte	1998	Shanxi	UI	FR	4

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Diptera						
412	<i>Contarinia sorghicola</i> (Coquillett)	?	?	UI	FM	13
413	<i>Mayetiola destructor</i> (Say)	1960 – 1970	Xinjiang	UI	FM	1
414	<i>Obolodiplosis robiniae</i> Haldemann	2005	Liaoning	UI	FR	5
415	<i>Liriomyza bryoniae</i> (Kaltenbach)	1984	Taiwan	UI	FM	10
416	<i>Liriomyza huidobrensis</i> (Blanchard)	1993	Yunnan	UI	FM	21
417	<i>Liriomyza sativae</i> Blanchard	1993	Hainan	UI	FM	33
418	<i>Liriomyza trifolii</i> (Burgess)	1988	Taiwan	UI	FM	3
419	<i>Bactrocera correcta</i> (Bezzi)	1989	Yunnan	UI	FM	2
420	<i>Bactrocera (Zeugodacus) cucuribitae</i> (Coquillett)	?	?	UI	FM	10
421	<i>Bactrocera dorsalis</i> (Hendel)	1911	Taiwan	UI	FM	15
422	<i>Bactrocera tsuneonis</i> Miy	1956	Guangxi	UI	FM	19
423	<i>Carpomya vesuviana</i> Costa	2007	Xinjiang	UI	FM	1
Lepidoptera						
424	<i>Anarsia lineatella</i> Zeller	?	?	UI	FM	3
425	<i>Pectinophora gossypiella</i> (Saunders)	1988	Hebei	UI	FM	18
426	<i>Phthorimaea operculella</i> (Zeller)	1937	Guangxi	UI	FM, RS	14
427	<i>Sitotroga cerealella</i> Olivier	?	?	UI	FM, RS	32
428	<i>Opogona sacchari</i> (Bojer)	1987	Guangdong	UI	FR, FM	10
429	<i>Laspeyresia pomonella</i> (L.)	?	Xinjiang	UI	FM	2
430	<i>Corcyra cephalonica</i> Stainton	?	?	UI	RS	8
431	<i>Paralipsa gularis</i> (Zeller)	?	?	UI	RS	30
432	<i>Plodia interpunctella</i> (Zeller)	?	?	UI	RS, FM	33
433	<i>Hyphantria cunea</i> (Drury)	1979	Liaoning	UI	FR, FM	6
434	<i>Erionota torus</i> Evans	1940s	Fujian	UI	FM	8
Hymenoptera						
435	<i>Leptocybe invasa</i> Fisher & LaSalle	2007	Guangxi	NS/UI	FR	3
436	<i>Quadrastichus erythrinae</i> Kim	2003	Taiwan	UI	FR, FM	4
437	<i>Bruchophagus gibbus</i> Boheman	?	Xinjiang	UI	FM	4
438	<i>Urocerus gigas taiganus</i> Benson	1984	Xinjiang	UI	FR	9
439	<i>Solenopsis geminate</i> Fabricius	1920	Guangdong	UI	FR, FM	4
440	<i>Solenopsis invicta</i> Buren	2003	Taiwan	UI	FR, FM	7
Echinoidea						
441	<i>Strongylocentrotus intermedius</i> A. Agassiz	1989	Liaoning	II	FM	1
Ascidacea						
442	<i>Halocynthia roretzi</i> Drasche	2006	Liaoning, Shandong	II	OC	2
Pisces						
Salmoniformes						
443	<i>Oncorhynchus kisutch</i> Walbaum	1982	Liaoning	II	IW	1
444	<i>Oncorhynchus mykiss</i> Walbaum	1959	Heilongjiang	II	IW, OC	2
445	<i>Salmo salar</i> L.	2004	Liaoning	II	IW, OC	1
Cyprinodontiformes						
446	<i>Gambusia affinis</i> Baird & Girard	1911	Taiwan	II	IW	

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Cypriniformes						
447	<i>Carassius cuvieri</i> Temminck & Schlegel	1959	Taiwan	II	IW	34
448	<i>Cirrhina mrigala</i> Hamilton	1982	Guangdong	II	IW	
449	<i>Labeo rohita</i> Hamilton	1971		II	IW	
450	<i>Tinca tinca</i> L.	1998	Hubei	II	IW	5
451	<i>Ictiobus cypinellus</i> Valenciennes	?	?	II	IW	
Characiformes						
452	<i>Colossoma brachypomum</i> Cuvier	1982	Taiwan	II	IW	
453	<i>Serrasalmus nattereri</i> Kner	2002	?	II	IW	
Siluriformes						
454	<i>Clarias batrachus</i> L.	1978	Guangdong	II	IW	
455	<i>Clarias lazera</i> Valenciennes	1981	?	II	IW	34
456	<i>Hypostomus plecostomus</i> Walbaum	?	?	II	IW	
Pleuronectiformes						
457	<i>Paralichthys dentatus</i> L.	2002	Shandong	II	OC	1
458	<i>Paralichthys lethostigma</i> Jordan & Gilbert	2001	Shandong	II	OC	14
459	<i>Scophthalmus maximus</i> L.	1992	?	II	OC	3
460	<i>Verasper moseri</i> Jordan	2004	?	II	OC	5
461	<i>Solea senegalensis</i> Kaup	2001	Shandong	II	OC	1
462	<i>Solea solea</i> L.	2003	?	II	OC	2
Anguilliformes						
463	<i>Anguilla anguilla</i> L.	1991	Jiangsu, Fujian	II	IW, OC	4
464	<i>Anguilla rostrata</i> Lesueur	1995	?	II	OC	4
Perciformes						
465	<i>Oreochromis aureus</i> Steindachner		Taiwan	II	IW, OC	3
466	<i>Oreochromis nilotica</i> L.	1978	?	II	IW	
467	<i>Perca fluviatilis</i> L.	1960s	Xinjiang	II	IW	1
468	<i>Micropterus salmoides</i> Lacépède	1970s	Taiwan	II	IW	4
469	<i>Lepomis macrochirus</i> Rafinesqus	1987	Hubei	II	IW	0
470	<i>Morone saxatilis</i> Walbaum	1997	?	II	IW, OC	1
471	<i>Lates calcarifer</i> Bloch	?	?	II	OC	
472	<i>Sciaenops ocellatus</i> L.	1991	?	II	OC	1
473	<i>Sparus aurata</i> L.	2001	Tianjin	II	IW, OC	4
Amphibia						
474	<i>Lithobates catesbeiana</i> (Shaw)	1959	Beijing	II	IW	10
475	<i>Lithobates grylio</i> (Stejneger)	1987	Guangdong	II	IW	1
476	<i>Lithobates heckscheri</i> (Wright)	1987	Guangdong	II	IW	1
Reptilia						
477	<i>Trachemys scripta elegans</i> Wied-Neuwied	?	Hongkong	II	IW	17
478	<i>Trachemys scripta scripta</i> Wied-Neuwied	?	?	II	IW	5
479	<i>Chelydra serpentina</i> L.	1997	?	II	IW	14
480	<i>Macrolemys temminckii</i> Troost	1988	?	II	IW	11
481	<i>Apalone ferox</i> Schneider	1993	Fujian	II	IW	11
Aves						
482	<i>Branta Canadensis</i> L.	1998	Hebei	II	IW	5

No.	Taxon	Year when IAS was first detected	Places where IAS was first detected	Pathways	Habitats	No. provinces / regions where IAS distributed
483	<i>Cacatua sulphurea</i> Gmelin	?	?	II	FM	1
	Mammalia					
484	<i>Mus musculus</i> L.	?	?	UI	FR, FM, RS	34
485	<i>Rattus norvegicus norvegicus</i> Berkenhout	?	?	UI	FR, FM, RS	34
486	<i>Rattus rattus rattus</i> Lineaus	?	?	UI	FR, FM, RS	4
487	<i>Ondatra zibethicus</i> L.	1950	Xinjiang	NS	FM, RS	13
488	<i>Myocastor coypus</i> Molina	1953	?	II	FR, FM	6

Note: Pathways: intentional introduction (II); unintentional introduction (UI); natural spread (NS)

Habitats: farmlands (FM, including fields, gardens, roadsides, grasslands, grassy slopes); inland waters (IW, including lakeshores, swamps, marshes); forests (FR, including forest margins); residences (RS); ocean (OC)